OECD Reviews of Regional Innovation

15 MEXICAN STATES

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Foreword

The importance of regional dynamics in supporting innovation is widely recognised. Strong dynamics of innovation generation in regions are crucial for achieving national innovation policy objectives. In addition, innovation performance can contribute to improving the overall economic competitiveness of individual regions. Policy recommendations are therefore being sought by both science and technology and regional policy actors, as well as the regions themselves.

OECD countries and regions are nevertheless struggling with how to best promote regional innovation. How should national innovation policies take into account this regional dimension (*i.e.,* the importance of "place")? How can regional actors support innovation that is relevant for their specific regional context? This role sharing in a multi-level governance for innovation is a new area for OECD countries.

The OECD launched in 2007 the series *OECD Reviews of Regional Innovation* to address this demand by national and regional governments for greater clarity on how to strengthen the innovation capacity of regions. These reviews are part of a wider project on competitive and innovative regions of the OECD Territorial Development Policy Committee. This work also supports the OECD Innovation Strategy. The series includes both thematic reports and reviews of specific regions.

This study, *OECD Reviews of Regional Innovation: 15 Mexican States*, took place concurrently with another study, *OECD Reviews of Innovation Policy: Mexico*. The two studies are complementary to provide a coherent package of recommendations to Mexico for both national and sub-national levels to work effectively together to support innovation-led sustainable economic growth throughout the country.

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Table of Contents

Tables

Figures

Boxes

List of Acronyms

AAGR	Average Annual Growth Rate
ADIAT	*Asociación Mexicana de Directivos de la Investigación Aplicada y el Desarrollo Tecnológico*
	Mexican Association for Applied Research and Technological Development
AMSDE	*Asociación Mexicana de Secretarios de Desarrollo Económico*
	Association of Mexican Economic Development Secretaries
ANUIES	*Asociación Nacional de Universidades e Instituciones de Educación Superior*
	National Association of Universities and Higher Education Institutions
BMF	Big Manufacturing Firms
CIDE	*Centro de Investigación y Docencia Económicas*
	Centre for Economic Research and Training
COEPES	*Comisión Estatal de Planeación de la Educación Superior*
	State Commission for Higher Education Planning
CONACYT	*Consejo Nacional de Ciencia y Tecnología*
	National Council of Science and Technology
CONAGO	*Conferencia Nacional de Gobernadores*
	National Conference of Governors
CONAPO	*Consejo Nacional de Población*
	National Population Council
FONAES	*Fondo Nacional de Apoyo a las Empresas de Solidaridad*
	National Fund for Aid to Firms
FDI	Foreign Direct Investment

FOMIX	*Fondos Mixtos*
	Mixed Funds
FUMEC	*Fundación México Estados Unidos para la Ciencia*
	The United States-Mexico Foundation for Science
GDP	Gross Domestic Product
GVA	Gross Value Added
HEI	Higher Education Institution
IMCO	*Instituto Mexicano para la Competitividad*
	Mexican Institute for Competitiveness
IMPI	*Instituto Mexicano de la Propiedad Industrial*
	Mexican Institute for Industrial Property
INEGI	*Instituto Nacional de Estadística y Geografía*
	National Institute of Statistics and Geography
IT	Information Technology
ITESM	*Instituto Tecnológico y de Estudios Superiores de Monterrey (Tecnológico de Monterrey)*
	Monterrey Institute of Technology and Higher Education
MFP	Multi Factor Productivity
MXN	Mexican Peso
NAFTA	North American Free Trade Agreement
NDP	National Development Plan
OECD	Organisation for Economic Co-operation and Development
PC	Personal Computer
PECYT	*Programa Especial de Ciencia y Tecnología* (2001-2006)
	Science and Technology Programme (2001-2006)
PECYTI	*Programa Especial de Ciencia, Tecnología e Innovación* (2008-2012)
	Science, Technology and Innovation Programme (2008-2012)
PIIT	*Parque de Investigación e Innovación Tecnológica*
	Research and Innovation Technology Park
PISA	Programme for International Student Assessment

PNPC	*Padrón Nacional de Posgrado de Calidad*
	High Quality Graduate Programmes
PPP	Purchasing Power Parity
PRC	Public Research Centre
PYME	*Pequeñas y Medianas Empresas*
	Small and Medium Enterprises
R&D	Research and Development
REDNACECYT	*Red Nacional de Consejos y Organismos Estatales de Ciencia y Tecnología*
	National Network of State Councils and Organisations for Science and Technology
RENIECYT	*Registro Nacional de Instituciones y Empresas Científicas y Tecnológicas*
	National Science and Technology Registry of Institutions and Firms
S&T/ S&T&I	Science and Technology/ Science, Technology and Innovation
SAGARPA	*Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación*
	Secretary of Agriculture, Husbandry, Rural Development, Fisheries and Food
SARE	*Sistema de Apertura Rápida de Empresas*
	Enterprise Rapid Opening System
SBDC	Small Business Development Center
SME	Small and Medium Enterprises
SNI	*Sistema Nacional de Investigadores*
	National Researcher System
TL	Territorial Level (OECD regional classification 1, 2 and 3)
UNAM	*Universidad Nacional Autónoma de México*
	National Autonomous University of Mexico
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USD	US Dollar

Assessment and Recommendations

Introduction

This review seeks to understand how to better support the competitiveness of Mexico through improved regional innovation systems and clusters that promote innovation in firms. Innovation is an important component of economic development and productivity growth, and hence the competitiveness of regions and nations. Firms are at the centre of this process, but they do not operate in isolation. They may benefit from linkages with other actors in a cluster and regional innovation system, where knowledge is created and/or diffused. Policies that support clusters and regional innovation systems (the spatial dimension of development) and the policy implications for different types of region have not received enough attention in Mexico. The main findings of this report are:

- To overcome low productivity growth and see incomes converge with other OECD countries, Mexico's lagging regions have to catch-up. Mexico has very high levels of inter-regional disparities in income levels and productivity. Investments in regional innovation systems and technology transfer mechanisms can facilitate the transition to a knowledge economy. Actions are needed to support a transition from "made in Mexico" to "created in Mexico".
- The national policy framework in Mexico does not effectively incorporate the region-specific dimension of policies. Regional innovation system approaches can effectively build competitiveness. This is why in many OECD countries, trends in regional development policy, science and technology policy, enterprise policies (sectoral, SME and FDI) and higher education policies increasingly adopt a regional approach to achieve national goals.
- States are increasingly encouraging clusters and regional innovation systems, but their efforts could be re-focused. Their approach tends to stress regulatory and infrastructure issues, with less attention paid to the policy requirements of knowledge economy factors. There is a positive trend, however, as states are incorporating more civil society actors into the decision-making and implementation process. With respect to clusters, what is required is a more realistic approach to what can be done to achieve critical mass, one option being greater inter-state co-operation. States also need to make more pro-active efforts to integrate S&T and innovation into their broader economic development and competitiveness agendas.
- Capacity-building and continuity are a challenge. Sub-national (state and local) efforts are particularly difficult in the Mexican context, given the high level of fiscal centralisation and problems of continuity in governance at all levels. Tools to help achieve the potential economic benefits of greater decentralisation and support vertical co-ordination include co-funded projects and contracts, among others. Across OECD countries, varying forms of contracts are used to account both for different region types

and the lack of up-front knowledge regarding how to achieve national goals through efforts in a particular region. Monitoring and evaluation tools are currently underdeveloped and would need to accompany such vertical co-ordination mechanisms.

To provide recommendations for national and state governments in Mexico generally across different types of states, this report is based on desk research as well as meetings with national and state-level stakeholders. Missions have been conducted in the 15 states that volunteered to participate in the study: Aguascalientes, Chihuahua, Coahuila, Colima, Guanajuato, Jalisco, Mexico, Michoacan, Nuevo Leon, Puebla, Queretaro, San Luis Potosi, Tamaulipas, Yucatan and Zacatecas (see Figure 0.1). Stakeholders met include: government actors mainly from state secretariats of economic development (or its equivalent) in the areas related to industry, competitiveness, SME support, investments and innovation; officials from the state S&T councils; representatives of the most important research centres and higher education institutions (HEIs) in the state; and individual firms as well as industry associations. Special focus was given to the automotive and software clusters for comparison across states.

Figure 0.1. Participating states

The economic and innovation challenges in Mexico

Despite major improvements in macroeconomic stability, stagnant labour productivity has led to insufficient economic growth; investment in innovation, despite the current financial crisis, is essential for long-term sustainable growth

During the last two decades, Mexico has implemented a series of adjustments to its macroeconomic policy to achieve economic stability. Similarly, openness to foreign trade has positively impacted Mexico's economic performance. Nevertheless, that progress has proved to be a necessary but insufficient condition to boost economic growth. Even though GDP per capita growth rates during the decade following the 1995 peso crisis have been similar to those found in the OECD, for convergence (towards the more advanced OECD economies) to occur, rates of well over 4% would be required. Even when put in a context of more comparable OECD country competing economies, Mexico seems to be losing ground and unless major reforms are implemented it will be difficult to reverse this tendency.

A number of factors contribute to Mexico's stagnant productivity (growth in GDP per hour worked close to 0%). Firm demographics are not favourable, with over 70% of employment in Mexico in SMEs including a disproportionately large share in micro-enterprises. FDI and exports, while showing relatively good performance, still lag behind competing economies. Human capital, regarded as one of the key elements to promote growth, remains a challenge while enrolment and higher education attainment have improved dramatically, overall levels are generally low and many questions remain with respect to the quality of education. Although there are diminishing poverty levels, over 40 million Mexicans (42% of the population) are living in some form of poverty which limits human capital investment. Another constraint is the limited accumulation and diffusion of knowledge. Other economies are surpassing Mexico as a result.

Investment in innovation inputs is also very low. In light of the current financial and economic crisis and given that innovation investment is pro-cyclical, even greater efforts are needed to ensure continued and increased investment for long-term growth. R&D as a percentage of GDP for Mexico is at 0.5% (where business R&D plays a particularly small role), *versus* an OECD average of over 2% and observed ratios for Brazil (0.9%), the Russian Federation (1.1%) and China (1.3%) all significantly higher. A similar trend of low performance is observed for the number of business researchers, patents and published scientific articles.

The data illustrate different "Mexicos" with respect to income levels, productivity and innovation-related statistics

While sound macroeconomic policies have yielded substantial benefits for Mexico overall, particularly marked regional disparities persist. Some of these trends include:

- In global comparison, the ***economic performance*** of Mexican regions is almost uniformly below OECD averages; however there is a great diversity in both levels of per capita GDP and economic growth rates. Poorer regions have not yet reaped the benefits of a more integrated and open economy, and the general trend for regions below the national average for GDP per capita is a slower rate of growth.
- ***Poverty*** is still a widespread problem in Mexico and a drag on country competitiveness but incidence varies greatly not only between regions, but also between urban and rural settings.
- Mexico possesses the ***highest levels of productivity differences*** (GDP per worker) across regions among OECD countries (after Belgium), while labour productivity differences are the main driver of the divergence process among Mexican states observed since the 1990s. There is a strong and positive correlation between labour productivity and tertiary educational attainment in OECD regions and for Mexican states the correlation is even stronger.

- Mexico's overall rate of ***tertiary educational attainment***, while below average, still outperforms several other OECD countries. However, Mexico also has the highest disparities in tertiary education rates across regions among OECD countries. While the sub-state region in Mexico with the highest share of adult population with tertiary educational attainment is at 29% (similar to national averages of more developed countries such as Norway and New Zealand), the region with the smallest share is at about 1% (by far the lowest of all OECD TL3 regions).
- ***Specialisation*** across Mexican states has increased since NAFTA. Northern border states and larger regional economies show greater levels of specialisation among manufacturing industries. This trend is even more evident by the technology level of output, with preliminary analysis showing a positive link between productivity and specialisation among Mexican states.
- ***FDI flows*** in Mexico are highly concentrated within two regions (Centre and Northern Border) that account for more than 90% of Mexico's FDI from 1994 to 2007. And while it is presumed that big manufacturing firms (BMF) and FDI will bring technological spillovers through S&T expenditures, greater productivity and higher wages, this is not necessarily the case. Productivity and wages per employee are highest in firms with less than 50% FDI (as opposed to none or more than 50% foreign capital). And firms with no FDI have wages only slightly lower than firms with more than 50% of FDI participation. There is a relatively low coefficient of science and technology (S&T) expenditure over total GDP (understood as the Census value-added) of 4.32% for all BMF. Surprisingly, BMF branches with no FDI present the highest coefficient (6% of GDP), while BMF branches with FDI present significantly lower coefficients (0.51% and 2.82% for BMF with less and more than 50% of FDI over the respective social capital).

A high ***concentration of innovation-related inputs and outputs*** in turn contributes to further deepening regional differences in terms of competitiveness and hence economic performance. There are a handful of states that are able to capture the bulk of national level S&T programme funds. The poorer regions also lag in terms of highly-skilled human capital. There is a high degree of concentration of researchers in particular states, with 44% of the nationally designated quality researchers (SNI) in the Federal District in 2005, albeit this is down from over 50% in 2000. In terms of co-patenting linkages, less than half of all Mexican states have registered co-patented inventions with other regions. In addition to low overall patenting rates, 58% of Mexico's patents are concentrated in 10% of the regions (a decrease from 65% in 1998), the third highest concentration after Turkey and Japan. In terms of the technology level of production, only a few states specialise in high-tech manufacturing activities, while nearly half of all Mexican regions (15 out of 32 states) have a share of less than 1% in high-tech sectors.

How can national policy help?

National policies do not sufficiently support clusters or regional innovation systems

In most OECD countries, but less so in Mexico, there is a convergence of national policies that contribute to regional competitiveness through support to regional clusters and innovation systems. These policy families include: regional development policy, science and technology (S&T) or innovation policy, higher education policy and enterprise-related policies (see Table 0.1). The orientation of the policy family (in other words, which ministry is funding the programme, or which sectoral "plan" it is part of) serves to frame the objectives, targets and scope of the policy. At the regional level, it is easier to join-up across policy streams when the central level has already done so.

Table 0.1. Policy trends supporting clusters and regional innovation systems

Policy Stream	Old Approach	New Approach	Cluster/ regional innovation Focus
Regional policy	Redistribution from leading to lagging regions	Building competitive regions by bringing local actors and assets together	• Target or often include lagging regions • Focus on smaller firms as opposed to larger firms, if not explicitly than *de facto* • Broad approach to sector and innovation targets • Emphasis on engagement of actors, public and private
Science and technology policy	Financing of individual, single sector projects in basic research	Financing of collaborative research involving networks with industry and links with commercialisation	• Usually high technology focus • Both take advantage of and reinforce the spatial impacts of R&D investment • Promote collaborative R&D instruments to support commercialisation • Include both large and small firms; can emphasise support for spin-off start ups
Higher education policy	Focus on teaching role of HEIs and basic research	Promoting closer links with industry and joint research; more specialisation among HEIs	• Usually high-tech focus (following research budgets) • Increasing emphasis on commercialisation (*e.g.*, support for spin offs in some HEIs) • Most joint work with large firms; increasing HEI-SME links is a new goal • Regional HEIs are increasingly core partners for regional policy-led innovation programmes.
Enterprise-related policies	Subsidies to firms; national champions	Supporting common needs of firm groups and technology absorption (especially SMEs); promoting FDI spillovers	Programmes often adopt one of the following approaches: • Target the "drivers" of national growth • Support industries undergoing transition and thus shedding jobs • Help small firms overcome obstacles to technology absorption and growth • Create competitive advantages to attract inward investment and brand for exports

Notes: HEI=higher education institution; FDI=foreign direct investment; SME=small and medium-sized enterprises.

Source: OECD (2007), *Competitive Regional Clusters: National Policy Approaches*, OECD Publishing, Paris with modifications.

There is no co-ordinated regional development policy approach in Mexico, with the current place-based efforts being focused on poverty or infrastructure rather than regional competitiveness

Mexico does not have an explicit regional development policy; however one is warranted for several reasons. First, regional development policies support growth in all regions given the place-based dimension of factors that can support firm productivity. In Mexico, 41% of GDP is concentrated in only 10% of its regions (11 OECD countries have at least 40% of GDP in the top 10% of regions). Second, there are "neighbourhood effects" with respect to economic growth and innovation whereby strong performance in one region can have positive spillovers in a neighbouring region. The opposite is also true, as weak performance in one region can have negative spillovers for a neighbouring region. Finally, regional development policies can partially alleviate the disparities across Mexico to address equity and efficiency concerns, as severely lagging regions are a problem for national growth.

Existing policies with a place-based dimension tend to have either a poverty or infrastructure focus. A number of valuable programmes and cross-sectoral policy approaches, such as the Micro-Regions strategy, the *Oportunidades* programme and several rural development programmes, are focused on achieving important economic and social development goals but not within a wider context of regional competitiveness.

Mexico initiated a meso-regions strategy in the last administration; however this does not appear to be part of the current strategy and has not resulted in a change in policy approaches. In the 2001-2006 National Development Plan, the 32 states were grouped into five meso-regions. A small Trust Fund was created as an incentive for inter-state collaboration, but few structures or resources were put in place to support the concept. Furthermore, there is no legal basis for inter-municipal collaboration across states.

In spite of an appropriate diagnosis on the rationale and mechanisms to address an integrated approach to regional development in the 2007-12 National Development Plan, no actions have been taken to implement this. Thus far, meso-regions have mainly focused on infrastructure planning and overall economic development with only initial efforts made at joint action to support common sectors, clusters or innovation assets. The South-Southeast meso-region has actually gone the farthest in terms of acting "regionally" within this meso-region approach. Other bottom-up multi-state approaches also exist. There are several OECD examples of pan-regional action to support innovation systems and clusters with varying degrees of intensity. The size of the area and the existing or potential linkages among the cluster/RIS actors will determine, in part, the nature of the collaboration.

A notable trend in the transition of regional development policy approaches in many other OECD countries is the increasing accent on innovation for regional competitiveness. National policies have also required that regions develop clear priorities for cluster support and the development of regional innovation systems, both to spur regional economic development and to establish priorities for national/regional alignment of resources. This increasing regional focus on competitiveness has implied that some economics ministries are considering the spatial dimension of economic activity for national growth.

Only a few enterprise-related policies (sectoral, SME, FDI programmes) are made jointly with states and take regional specificities into account

Sectoral policies: place-blind and place-based examples

There are several sectoral programmes promoted by the Ministry of Economy as part of the national competitiveness approach outlined in the 2001-06 National Development Plan. Many of these programmes are still in place, however under the new administration these programmes and sectoral choices are being reviewed. Ten sectors were initially selected in that plan. The five sectors that have direct programmes include IT, leather and footwear, textile and clothing, automotive and electronics. These sectors were selected in some cases because of the significant levels of employment but diminishing competitiveness and in others because of the sector's transversal nature that could have many positive spillovers for other sectors (such as logistics and IT). Other selected sectors under consideration (chemicals, tourism, *maquiladora* and aerospace as well as agriculture, commerce and construction) have not yet resulted in specific programmes.

There is minimal acknowledgement of the spatial dimension of the sectors being supported, and the links with actions taken at regional level are not clear. This is even more important considering that in some cases a few states account for most of the national output in those sectors. One programme with a notable focus specifically on cluster development and innovation is Prosoft. It was reported in state visits to have played an active role in supporting local projects to develop software clusters with SMEs. Many states are also actively involved in the Prologyca programme to support logistics clusters.

FDI policy: need to seek regional spillovers and greater co-ordination

FDI policy is important for the development of particular clusters as well as the promotion of technological spillovers; however there are several barriers for this in Mexico. The sectoral priorities of industrial policy do not appear directly linked with FDI attraction. Micro-level analysis on territorial clusters highlight that FDI is not necessarily the source of backward and forward linkages in Mexico. There is evidence of barriers to these linkages that include: the lack of standardisation in the new measurement system, the vertical integration of original equipment manufacturers (OEMs) with clients and intra-firm standards. These barriers present strong limitations on these forms of industrial organisation in order to allow for learning and innovation processes from FDI and to integrate local and national suppliers to chains led by transnational corporations.

Policy measures are needed to address the lack of a positive association between FDI, S&T and productivity. This rather surprising result, in which Big Manufacturing Firms (BMF) with no FDI present the highest levels of S&T expenditure (compared to other BMFs), implies a need for specific instruments to strengthen trade-intensive FDI activities in Mexico and in particular their backward and forward linkages with the rest of Mexico's economy. Given that over 90% of FDI flows to the Northern Border and Centre regions, the North-South cleavage in FDI flows is likely to continue without additional policy action.

National FDI policy has so far not allowed for a harmonisation of FDI incentives and benefits at the state level. In some specific cases, competition for attracting FDI of specific firms has led to a "race to the bottom". At the same time, no major co-ordination efforts (neither among states nor from the federal government) can be identified in terms of a FDI strategy. There is a lack of co-ordination of federal and state-level policies to attract FDI, in addition to a generally missing long-term strategy at both levels. The former lack of co-ordination is also reflected at the statistical level. State-level and federal statistics on FDI differ substantially.

SME policy: general support and networking

Supporting the upgrading of micro enterprises and SMEs is vital to improving productivity in Mexico, particularly since such firms account for over 70% of employment (over 50% in micro and small firms alone) and the overwhelming majority of firms. Policy intervention for SMEs is typically justified by a number of market failures or other problems associated with their small size. Mexico's SME policy in its own right at the national level began in 2000 and has massively expanded its outreach. The current set of SME programmes fall under four broad categories, some of which encourage firm collaboration and innovation explicitly. Since 2005, there has been a significantly increased accent on innovation in the SME Fund, including "collective process innovation". A non-negligible share of the services in these programmes is basic business support, which could support process innovations. Support for technology parks and SME parks are another axis of SME Fund innovation support.

Several areas of progress in the SME Fund have been noted in prior OECD reports, although many challenges identified have not yet been addressed thus undermining efforts to support regional innovation systems. One of the positive results of the SME Fund strategy, in addition to expansion, is the development of private intermediaries that can provide technical services to SMEs. Capacity building and certification of intermediary organisations, in addition to vouchers, are strategies to ensure a higher quality of service delivery. A joint CONACYT/Ministry of Economy Technology Innovation Fund was developed in 2007 that targets SMEs, with some areas for improvement previously noted by the OECD in terms of endowment size, project assessment and a sectoral requirement that complicates management.

A number of operational matters for the SME Fund are considered problematic by the states, intermediary organisations and participating firms whether this be for cluster-related projects or others. There are timing issues, as calls for proposals and procedure manuals are issued relatively late in the year. While changes in the procedures manuals may be part of an ongoing programme improvement process, the frequency of change makes programme use complicated for beneficiaries, intermediaries and state governments. A balance needs to be achieved between the significance of the change and the frequency of changes. Programme rules and procedures manuals establish specific criteria for applications, however the final decision for the approval of projects (that have been pre-approved at sub-national level) are not sufficiently transparent to all stakeholders and feedback on rejected applications is not provided.

It is likely that the overall SME Fund will change yet again in 2009, and care should be given to learn from lessons of past programmes and address existing gaps. The budget that passed November 2008 significantly increases the level of funding for the SME Fund from MXN 3.5 to 5.2 billion. There is also a recommendation by the Congressional Commission that covers the Ministry of the Economy to decentralise 30% of the SME

Fund to the states directly (100% of the fund already involves state co-matching). Such decentralisation could resolve several operational constraints, but requires strong monitoring mechanisms. This is currently a recommendation but its application (or not) would need to be decided in 2009.

A new classification of firms is being considered as the SME Fund may transition to a broader firm development approach, which if adopted, would diversify the portfolio of instruments. The firm categories would be entrepreneurs as well as micro, SME, gazelle and "tractor" firms. Several reports have already recommended a separate treatment for micro-enterprises to both increase their participation in programmes and to meet their more basic firm development needs. The challenge for the expansion to larger firms is to identify a true policy need to support such firms directly and to avoid "creaming". There is likely to be a greater emphasis in the future on gazelle firms with a goal of more rapid job creation for Mexico. The expected job creation targets for high-growth SMEs should be based on realistic calculations. Programmes in Mexico (many of which are supported by the SME Fund) such as TechBA, Endeavor and Visionaria all reveal the importance of selection as well as the quality and intensity of services to achieve high-growth goals.

Many other SME programmes are promoted by other federal bodies, as well as sub-national entities. One analysis noted more than 500 private sector development programmes across ministries and state governments. There is no common registry for SME support to ensure that firms are not taking advantage of multiple programmes inappropriately. Therefore, at the state or even municipal level, it is more difficult to not only map but to rationalise the existing offer. The Business Support Simplification Programme in the UK is one example of an initiative to rationalise firm support programmes through one national gateway.

While leading academic institutions have performed evaluations of the SME Fund, further improvements could be made for efficiency and programme impact, albeit this is true for many other policies. Given the large size of the SME Fund, an amount could be set aside for greater indicator monitoring and evaluation, where sub-national governments could play a key role, especially if some funds are decentralised. The definition of further outcome-oriented indicators that also track firm development over time (where again state governments could help) may further enhance programme efficiency and effectiveness while increasing transparency. The OECD has developed a framework for evaluating SME programmes, as have many other international bodies. And international benchmarks on different aspects (*e.g.*, per firm spending) could complement in-country comparisons.

S&T and innovation policy is increasingly recognising the importance of regional innovation systems, however territorial concentration and capacity building require greater action in Mexico

In addition to low levels of investment and adverse framework conditions, the high level of territorial concentration of innovation resources has been identified as a threat to Mexico's national innovation system. Therefore, greater involvement of states in supporting S&T&I and greater attention by national government to the territorial dimension of both resources and outcomes is required. Furthermore, the path dependency of regional growth implies that the territorial disparities of innovation inputs, outputs and outcomes are likely to be reinforced over time. A key question for Mexico, and other

OECD countries, is whether national policy supports the development of regional innovation systems generally, and if so does it address the development needs of lagging regions as well. National science and technology policy in Mexico has been working towards the new paradigm which has positive benefits for regional innovation systems. Mexico is increasingly emphasising research collaboration and its relevance for firms, in some programmes, with an implicit spatial dimension.

The overall budget for science, technology and innovation programmes is very small, and the allocation with a regional focus is only a small, but increasing, share. While the budget of the National Council on Science and Technology (CONACYT) was approximately USD 457 million in 2005, the share going to student scholarships and the national researcher system (SNI) was over 57%. The amount available for direct programmes is therefore less than half of the budget. While several of the programmes do benefit regional innovation systems where the recipients are found, the actual amounts dedicated to the state level funds are less than 5% of this budget, approximately USD 25 million for all 32 federal entities (states) in Mexico. Since 2005, that share has increased in some years. Furthermore, in 2006, CONACYT accounted for less than one third of national S&T spending. Ministries that devote spending mainly to technology development, competitiveness and SMEs (the Ministry of Economy and the Ministry of Environment and Natural Resources) accounted for less than 5% of S&T related spending that year.

A large amount of public S&T support to firms has been the R&D tax credit scheme (*Estímulos Fiscales*). It is highly concentrated in a limited number of states and firms. In 2006, over 65% of the tax credits went to the top two states and were concentrated in multinational firms in a few sectors. In 2009, these tax credits were transformed into active support programmes with CONACYT totalling MXN 2.5 billion to support SMEs (INNOVAPYME), new technologies (PROINNOVA) and firm competitiveness (INNOVATEC). There are greater financial incentives for projects that support collaboration between firms and public research centres or HEIs. Furthermore, in collaboration with AMSDE, the state economic development secretariats and state S&T councils are working with CONACYT to both promote these programmes and make an initial selection of projects to recommend for national funding. This collaboration has several benefits, including the very practical need to spend the funds in the same fiscal year.

CONACYT's Mixed Funds (*Fondos Mixtos* or FOMIX) is the most direct instrument aimed at promoting scientific and technological development at the state and municipal level. The instrument channels resources through the constitution of trust funds with resources coming from the federal government and either state or municipal governments (in Puebla and Ciudad Juarez only). The programme is conducted through calls for proposals responding to state specific demands requiring S&T solutions issued in each state.

A number of challenges with FOMIX have been raised. First, the utilisation across states varies considerably based not only on industrial or scientific capacity, but also on the financial commitment and the administrative management of the state. There are also notable administrative delays with the programme. A progressively increasing share of responsibility at the state level needs to be coupled with capacity building efforts and greater clarity on selection criteria and outcomes.

A few states are already engaged in an agreement with CONACYT regarding decentralisation of several innovation funds. This experiment does not yet include

FOMIX, as has been previously recommended by the OECD. Lessons learned from the decentralised management for certain states should be used to identify effective strategies for regional funds, both to progressively build up sub-national capacity and to increase the administrative efficiency and coherence with other regional/state level actions. There are many OECD examples of an increasingly regionalised approach to innovation policy at the national level generally as well as addressing the high levels of concentration of innovation resources (infrastructure, human capital, etc.) within a country.

The FORDECYT (Institutional Fund for Regional Development through the Promotion of Science, Technology and Innovation) was created to complement the FOMIX programme with an initial budget in 2009 of MXN 500 million. The Fund has an innovative approach by targeting both geographic regions (neighbouring municipalities or states) and thematic regions (groups of municipalities or states that share a common problem). The instrument could serve to: build flexible regional collaboration, address major socioeconomic problems for Mexico more effectively and potentially increase the average size of financed projects (to reduce transactions costs and provide better incentives for project participants). In addition, a special 2008 call for proposals for strategic projects, part of the FOMIX programme, gave an opportunity for states to present projects of general benefit to the regional innovation system. In many cases, the state proposals have focused on technology parks.

There are no formal assessments of sub-national S&T&I needs or mechanisms for recognising the nature of science and technology expertise by region. However, a new initiative to map research competencies is underway within CONACYT based on the information collected through several years of the FOMIX applications from across the country. The goal is to be better able to link the needs of the country to the existing resources, wherever they are located within Mexico. One small example of what could be done is to simply better track the relevance of the work of those national researchers receiving CONACYT funds for meeting innovation-related needs within the country. Other private organisations such as ADIAT and ARCO are supporting mappings of technological/cluster competencies as well as regional innovation system development assistance. The Networks of Competence programme in Germany is one example of how such mappings can be used as a tool with international visibility.

Higher education policy needs to better support regional clusters

Higher Education Institutions (HEIs) play a vital role in supporting regional clusters and innovation systems but there are common barriers for regional engagement. This "third mission" of HEIs to support regional development is underdeveloped in Mexico. Mexico's policy of diversifying the types of higher education institutions and supporting decentralisation has benefitted regional innovation systems. Given their mission, the technological institutes and universities were consistently reported to play an active role across the states, notably for adaptation to labour market needs. The traditional public universities were reported to have greater difficulty in meeting local labour market demands; however they are the pillars of research and expertise for their regions and actively engage with state governments. While private universities have no specific mandate for regional engagement, they are often engaged because of their business model. The *Instituto Tecnológico y de Estudios Superiores de Monterrey* (ITESM) is a unique case given its very active regional engagement through campuses in states across the country.

While the Ministry of Education does not use policy to promote engagement, other federal actors offer different types of incentives. CONACYT has several instruments to promote joint projects involving HEIs that provide incentives for university-industry linkages regarding research and knowledge transfer. They also finance post-graduate training, competitive research, scholarships and a network of public research centres. Furthermore, it provides designations of quality through different labelling systems, including the National System of Researchers and, with the Ministry of Education, the High Quality Graduate Programmes. More action could be taken to reap the benefits of such programmes, such as making the publication of SNI recipients mandatory and an obligation for SNI researchers to report information on their research that could potentially serve other actors in Mexico. The Ministry of Economy, through the SME Fund, also finances programmes that involve HEIs, such as the Programme for Innovation and Technology Development with its business accelerators and innovation laboratories that in many cases are housed within HEIs.

There are examples in OECD countries of cluster-based approaches with a focus on universities, as well as other higher education policies, that Mexico could consider to increase regional engagement. Furthermore, HEIs are stable institutions with a long-term view in a governance context of insufficient continuity. For example, in the UK, regional engagement of universities is also supported by a Higher Education Innovation Fund, which is based in part on measures of engagement as collected through the annual Higher Education-Business and Community Interaction Survey. The Ministry of Education and the National Association of Universities and Higher Education Institutions (ANUIES) in Mexico can play a greater role. They could promote regional engagement, support information sharing and collect regular statistics. Both entities already collect statistics annually on universities and could begin to add indicators of regional engagement.

National policy approaches should better serve different "types" of states based on their characteristics in terms of clusters, industrial capacity and scientific capacity

As suggested for the different policy streams, there is a need for national policy to be more responsive to variations across Mexican states. Some of these variations are related to geographic proximity, as in some form of meso-region. However, these variations may concern the industrial sectors dominant in the state's economy, which are not necessarily only based on geographic proximity. The type and level of innovation assets (industrial, scientific) can also vary by state with, for example, some states specialised in lower-technologies sectors possessing strong scientific capacity and other states with strong industrial capacity but few scientific capacity resources. Furthermore, the effectiveness of the mobilisation of different actors in a regional innovation system or a potential RIS can be found in states that are not necessarily the largest economies. All OECD regions benefit from more conducive framework conditions; however more marginalised regions may require different active policy intervention. While the following policies are required for all states in Mexico, there are some areas of priority that may be relevant for certain types of states more than others (see Table 0.2).

Table 0.2. Policy priorities by type of RIS

Category	Description	Policy priority to complement overall national innovation policy agenda
Intensive and diversified S&T&I	Strong scientific profile with qualified human resources, prestigious public and private universities and postgraduate programmes as well as CONACYT research centres, diversified industry in mature and high tech sectors, strong relationship between Council and other public entities, high participation in most CONACYT programmes.	• Greater decentralisation of national programmes • Learn from experimentation to inform national policy
Industry intensive, innovation	Strong industrial activity, high utilisation of innovation-related programmes, some important universities but few Public Research Centres.	• Greater decentralisation of national programmes • Consider public research investment relevant for strong industrial base • Use competitiveness poles to capitalise on industrial expertise, bringing in scientific capacity • Emphasis on spillovers from the greater FDI flows noted in these states
Rising scientific and technological capabilities	Presence of CONACYT Research Centres and active S&T Councils, lower participation in innovation-related as opposed to scientific-related national funds.	• Need for greater industrial innovation support • In addition to supply chain linkages with international firms, support of domestic SMEs with networking programmes
Strong scientific capabilities, lesser innovation performance	Strong scientific community with high number of recognised researchers (the SNI designation) but lesser application of this research to economic needs (in these states more agricultural than some others), success in FOMIX calls and projects from national Fundamental Research funds	• Greater incentives to link strong research with local needs, particularly with low-technology sectors like agriculture • Increased technology transfer and outreach
Unexploited S&T/innovation potential	These states do not have as many basic science related resources and have captured less national resources in both innovation and science funds, in part due to the newness of the Councils in several of the states.	• More explicit capacity building support, including technical support with respect to accessing national programmes • Importance of cross-border networks among states to increase critical mass

What should states do?

State approaches to competitiveness need to adapt to a knowledge economy, although some progress has been made in developing long-term goals with private sector involvement

Mexican states have made "competitiveness" a priority for state action; however they take a more ranking-based than holistic approach. Several states use the different competitiveness indices in Mexico as the diagnosis for a competitiveness plan, with a focus on regulation and the general business environment. The challenge with these indices, in addition to the inability for an index to identify a state's unique characteristics, is that they tend to have few knowledge economy related indicators that also impact productivity. Furthermore, the state competitiveness approaches tend to focus on a relative position with other Mexican states, but not on the state's niche in a global context. There is an opportunity for the federal government to set an example for states by taking a more holistic approach to competitiveness. And the spatial dimension of economic activities around the country could be taken into account to a greater extent for national competitiveness goals.

The process of developing a competitiveness strategy as well as its implementation is also important. One highly positive trend is the increasing involvement of civil society actors in the development of these strategies. Several states are now using public-private councils or initiatives to support their competitiveness approaches, a vehicle for ensuring greater longevity of important strategies and gaining credibility with the business community. Another positive trend is the cross-sectoral approach to public sector mobilisation behind the competitiveness strategies in several states, representing a more comprehensive approach. The S&T councils were not typically involved in the public sector competitiveness groups.

On cluster policy, states have to co-operate with each other and set realistic goals

Mexican states prioritise a series of sectors, often stated in their State Development Plans, however they tend to be broad and similar across most states. The prioritisation of sectors is not necessarily consistent across different sets of actors at state level either. For example, a state economic development secretariat may target one list while the same state's S&T council may target another list. The specificities of each state with respect to these common sectors merit greater clarification, as well as the potential links among the different specialisations in the same state. In many OECD regions, what appears to make the difference is not one sector but the combination of different specialisations and technologies that create a niche for the region in the global context.

Sectoral approaches are increasingly nuanced with the concept of clusters, but some caution should be used with respect to the trend of *clusterización* in Mexico. There are different definitions of clusters used across OECD countries. They generally, but not always, imply a spatial dimension as relational proximity is typically supported by geographical proximity. A certain degree of duplication across states is inevitable, but the economic costs of the competing strategies could be monitored. The lack of critical mass among many "clusters" that the states seek to support could be solved in part by creating stronger links across states when a cluster footprint crosses state lines. However, cluster support observed in the states often did not seek to take into account these naturally occurring linkages.

While FDI attraction is at the top of state agendas for cluster development, there are a range of other cluster development tools that can be supported by the states. There are policies to engage actors that may include mapping/benchmarking analyses, the use of brokers, incentives for firm networking, cluster awareness-raising events, and support of cluster initiatives. A handful of states have begun cluster mapping studies and several are promoting cluster initiatives. The cluster focus tends to be on a model of a multinational firm and its suppliers ("hub and spoke"), however more could be done to support other cluster configurations, especially in lagging states. SME support instruments may be targeted towards business development, supplier development and supply chain linkages, export networks, market intelligence, and technical standards/ISO certification support, although the latter could receive greater emphasis in state approaches as a tool to support the other policy initiatives. Cultivating a skilled labour force to meet cluster needs is another policy area. Some cluster initiatives had identified lacking skills (including in many cases medium and lower level technical skills and English language skills), and states could work more closely with vocational and higher education institutions to meet these local labour needs.

States should go beyond project-based approaches to supporting regional innovation systems and better integrate S&T policies with broader economic development goals

The concept of a regional innovation system is not yet integrated into the policy approach of most participating states. However, there is an increasing desire to change from a "made in Mexico" to a "created in Mexico" approach. Many of the common problems for the national innovation system are observed across states including disincentives and cultural barriers for collaboration between firms and HEIs/PRCs (but with a positive trend in collaboration rates) and a lack of intermediary institutions to support firm technology and research needs. Studies of the regional innovation systems within Mexico are rare.

While the states do not have a regional innovation strategy per se with a systemic focus, many have an S&T plan that is supported by an S&T council. Not all the 32 states are equally advanced in the execution of their state level S&T commitments. Of the 15 participating states, nine have developed a formal S&T plan. Consistent with the tradition of different ministry or government-wide plans, the S&T plans tend to be more ideals or action items rather than overall strategies. An analysis of the plans reveals that there is often a lack of coherence between priorities or detected problems, aims/strategies definition, programme design and, finally, their implementation. As with many OECD regions, the financial means associated with the strategies typically fall far short of the goals. There are also challenges for continuity for such long-term planning, as there is a trend in state governments to change course in each six-year development plan with a new administration.

The prominence and effectiveness of the S&T councils varies widely across states, and is not always correlated with the state's level of development. There are a number of challenges for the councils from an operational standpoint in terms of operating budgets, project budgets, turnover and strategic thinking. As an order of magnitude, spending ranges from approximately MXN 10 million to over MXN 300 million (approx. USD 730 000 to 22 million), however that upper bound is unusual, most of the budgets are very low relative to the size of state economies and their needs. The ministry or entity to which the S&T councils report (where they are "sectorised") can play a role in its perception within the state and the focus of the policies it will implement. Some councils are now under the direct administration of a governor's office, hence gaining in terms of flexibility and autonomy, or have a clear link with other ministries to use S&T in support of a wider set of state needs.

States have taken very different strategies in terms of the kinds of innovation programmes they have created. At a minimum, states implement the national FOMIX programme for joint research projects. In some states, this is the only S&T support programme. Other states have helped local firms, HEIs and PRCs access a wider range of national S&T programme funds. State-initiated programmes (beyond national programmes) include exchange visits and scholarships to visit foreign firms or study in foreign universities, support for intellectual property registration, technology transfer and innovation network support (including the creation of new intermediaries) and even technology parks, the most prominent example being the PIIT in Nuevo Leon that is part of the City of Knowledge initiative. For sustainability and to diversify the landscape of intermediaries, states can support the development of non-university research and technology institutes. Similar to national level higher education policy, regional engagement of HEIs was not promoted by state level education policy, however there are many international examples of regional consortia to support HEI engagement, such as Springboard Atlantic in Canada to support commercialisation or the cross-border Oresund Science Region in Denmark/Sweden.

Given the lack of data at sub-national level, one area for analysis with respect to state access to innovation resources is the utilisation of national innovation/technology and scientific research programmes. The most active states participating in innovation and technological development programmes are among those with a strong and highly developed industrial base. Different states have shown greater success in capturing scientific research funds. Use of national programmes is not always correlated with the scientific capacity of a state. For FOMIX, the number of projects may be more related to administrative issues than state capacity. In addition there are 14 sectoral funds, some accessed by only a few states. For agriculture funds, low levels are observed in states with a strong agricultural vocation.

There are different types of regional innovation systems across OECD regions. Overall performance on innovation inputs, linkages and outputs gives a sense of ranking across Mexican states on these parameters. However, it is the combination of these variables that helps categorise different types of regional innovation systems. And what is perhaps more important, and more difficult to measure, is the effectiveness of different systems relative to their assets. Unfortunately, due to a lack of sub-national data, Mexican states can't be easily compared quantitatively with other OECD regions in terms of regional innovation. There are several types of RIS across the participating states based on their industrial capacity, scientific capacity and utilisation of national S&T programme resources.

What governance tools support the policy objectives?

All levels of government are responsible for regional competitiveness and continuity is an issue

In Mexico, like other OECD countries, all three levels of government have an impact on regional competitiveness: federal, state and local levels. In Mexico, the municipal level has many of the traditional roles of a local government, however the variation and burden of regulatory requirements coming from the municipal level is a barrier to competitiveness. The municipal level suffers from low public sector capacity levels, an election cycle that results in high and frequent levels of staff turnover, and a range of disincentives for long-term investments that have longer-term payoffs for the competitiveness of a place. Therefore, the size of a state (in terms of the number of municipalities and their average size) influences both municipal service provision and the ability of a state to co-ordinate across municipalities.

While Mexico is a federal country, where in theory the influence of the state level should be very strong, the national government has a leading role on a number of areas relevant for competitiveness such as innovation-related resources. Regions, or in the case of Mexico states, can serve different roles in this process of multi-level governance of economic and regional innovation policy. Even where the constitutional framework suggests one model or another, there are choices to be made about what the role of the region is within the governance arrangement. Most Mexican states are currently serving a passive role by implementing jointly national policy or simply replicating a trend across states (*e.g.*, technology parks), however there are a few advanced states that are being given more autonomy to be partners with national government or implementing their own interesting policy experiments with respect to innovation support programmes. The fiscal centralisation, lack of state capacity and tradition of following national policy cues help explain why most states do not take as active a role as they could as independent regional innovation policy makers.

Continuity in governance is another barrier for long-term strategies in support of regional competitiveness. Re-election is not possible at any level of government, resulting in frequent turnover in political leadership at the sub-national level. And while there is a national public civil service which supports a certain degree of continuity in the public sector, there is no comparable system at sub-national levels where staff turnover with a new administration is very high. In addition to the political and civil service turnover, there is also a common practice of policy turnover with development of new plans and programmes. This discontinuity is problematic for policy development and evaluation generally. For longer term economic and innovation development strategies, this discontinuity poses additional challenges, particularly with respect to the negative impact of uncertainty for firm investment decisions. Efforts to involve non-public actors in the strategy development and implementation for cluster and regional innovation system support are one vehicle for addressing this governance challenge.

Cross-sectoral collaboration and "gatekeepers" are needed for regional development

One of the classic challenges for place-based policies is the co-ordination across the different sectors that influence regional development and competitiveness. Not only are different policy streams relevant, but also the coherence across those different policy streams to support regional competitiveness goals. Coherence of national policy approaches to regional development can be promoted through different models of a "gatekeeper". In a few OECD countries, there is actually a ministry in charge of regional development policy. Others, such as Canada and the UK, have created regional development agencies that bring together different national funding and policy streams in service of the economic development of a particular region. Both those models include an innovation component. There have also been mergers of national level ministries that have a strong link in terms of their impact on regional development, yet another strategy.

Many OECD countries choose inter-ministerial co-ordination bodies at the national level as an alternative mechanism to the above options that Mexico could consider. The French Inter-Ministerial Committee on Territorial Planning and Competitiveness is an interesting example. There are at least seven ministries that have an important impact on regional development in Mexico and while there have been some attempts at developing a national gatekeeper, there is none in place currently with an over-arching regional development mission. Such a gatekeeper would seem needed in order to fulfil the regional development goals of the current National Development Plan.

A number of interesting cross-sectoral initiatives are observed at state level to support regional competitiveness. These models include a gatekeeper within the governor's office or in the state's economic development ministry. These groups, with a more general regulatory and business environment focus, do not sufficiently incorporate science and technology related actors at the state level. There are also an increasing number of public-private initiatives to support economic development generally within the state, and several of them have a competitiveness focus. And while in many states the S&T council is not necessarily given prominence within the state, there are some councils that have multiple ministries on the board or who have sought to be placed outside of a particular ministry so as to serve a greater cross-ministerial function.

There are economic benefits to some decentralisation

One of the reasons for this strong national level role for regional competitiveness financing in Mexico is the fiscal centralisation of revenues and expenditures. Sub-national governments therefore rely heavily on inter-governmental transfers, federal programmes and decentralisation agreements (*convenios*). In fact, only approximately 3% of total tax revenue comes from sub-national sources. Municipalities have a slightly higher share of own revenues (22%) relative to states (7%). Tax reforms have given states the authority to levy new taxes but they have been hesitant to take advantage of this. State budgets are overwhelmingly made of transfers from the federal government with most of those transfers earmarked (approximately three-fifths), further restricting state financing flexibility. In addition to the challenge of strong centralisation of resources, the overall level of government expenditure is low, preventing sufficient investment in areas to sustain regional competitiveness.

There are several arguments for promoting decentralisation; however the effectiveness is highly dependent on country context. A number of OECD and non-OECD countries are increasingly "decentralising" to the regional level to achieve some of these potential benefits. Different forms of decentralisation in stages include deconcentration (national authorities with national budgets in a region), delegation (national level subcontracts with and supervises sub-national level) and devolution (sub-national level acts independently perhaps with some unrestricted national transfers). Mexico is a federal system where there is no legislative mechanism that requires vertical co-ordination generally. Therefore, alternative mechanisms are required to inform national policy of both concerns of the states with respect to national policy overall as well as the specific differential impacts on certain states of any given policy. The National Conference of Governors (CONAGO) and the Association of Mexican Economic Development Secretaries (AMSDE) are two examples of associations that serve in part this role.

Vertical co-ordination tools, including joint funding and "relational" contracts, help policies adapt to regional specificities

There are a range of tools for supporting regional development goals across levels of government, even with a specific focus on clusters and innovation systems. Shared responsibility for the selection and/or funding is a common vehicle for supporting policy coherence across levels of government. In Mexico, some of the innovation-related programmes launched by the national level are based on a shared selection and financing arrangement, such as with FOMIX trust funds for S&T projects and the SME Fund, although several operational improvements could be implemented to improve their effectiveness.

Contracts are another commonly used tool in OECD countries for joint action across levels of government. However, when the funds are to be used to improve regional competitiveness through factors such as supporting clusters and regional innovation systems, it is not always clear upfront from the national level, or even regional level, what the best solutions are. This is why the concept of "relational" contracting is more adapted to regional development. The sub-national level has better information about what is needed to support these regional needs. At the same time, the federal government has the resources and needs to ensure that resources are used efficiently and effectively. If the agreement between national and state governments were for a very specific target only, then a more transactional contract is appropriate. With regional development being more complex, a broader contract for regional development is not suited to the transactional contract model.

OECD experience revels that relational contracts serve to build capacity and trust between national and sub-national levels. Much of the benefit of the learning is in the nature of the discussion about the needs of the region and how to best support them. Unlike a general call for proposals, whereby the national government evaluates the responses, relational contracting is more interactive. It serves as a vehicle for managing a relationship that involves information sharing over time. In Mexico, *convenios* serve as a contract between federal and state governments but there are several characteristics that could be improved to match OECD good practices. Examples that could serve as models for Mexico include the *Contrats Plan Etat Region* in France, the *Accordi di Programme Quadro* in Italy, or the *convenios* in Spain.

Monitoring and evaluation are not sufficiently developed in Mexico, but they are needed to improve policy and vertical co-ordination efforts

The effectiveness of contracts and other tools for multi-level governance arrangements to support regional competitiveness depends in part on the appropriateness of the monitoring mechanisms. In Mexico, there is a clear need to develop greater transparency with regard to use of public funds. The information is necessary to build greater trust between federal and state levels that would allow for increased sub-national participation in national programme goals. Given that the contracting relationships for regional development can be more towards the relationship form as described above, indicators can be used for co-operation building and not only for monitoring. Experience in several OECD countries with monitoring systems has illustrated the importance of this relationship-building component.

One helpful way of using indicators is to consider the different timeframes and their links with different stages of programme objectives. Such indicators can be classified into inputs, outputs and outcomes. Ultimately, for many of the programmes to support RIS and clusters, the results are in the long term. This is why, for example, the Economic Development Administration in the US, has three, six and nine-year outcome targets to take account of the importance of different timeframes for outcomes to appear and be measurable. A distinction should also be made between monitoring and evaluation. Monitoring involves a system used continuously to track progress, whereas evaluation is more designed for a progress check at specific points in time. While both are of course valuable, monitoring is a critical first step. More sophisticated evaluation methodologies are available for the range of programmes that could support regional innovation systems and clusters.

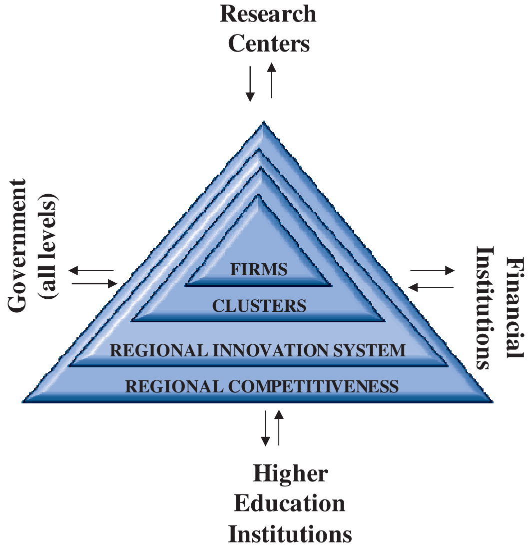
Methodological Introduction

This review seeks to understand how to better support the competitiveness of Mexican regions through improved regional innovation systems and clusters. While the links between innovation and economic growth are not linear, innovation contributes to productivity improvements and hence the competitiveness of a region. The economic literature shows that clusters and regional innovation systems play a role in supporting this innovation process and in improving firm productivity.

Firms are at the core of regional competitiveness, but they do not operate in isolation (see Figure I.1). They may be grouped into a cluster, and while definitions of a cluster vary, it is commonly known as a concentration of firms and other related actors and institutions that are inter-connected, and where geographic proximity facilitates this interaction. A cluster initiative is the term commonly used to describe a formal organisation whose mission is to support the development of a cluster.

These clusters can be part of a broader regional innovation system, where knowledge is created and/or diffused and applied. Per the OECD Oslo Manual, an innovation is the implementation of a new or significantly improved product (good or service), process, marketing method, or organisational method in business practices, workplace organisation or external relations. The term regional innovation system (RIS) generally refers to the interaction of key economic actors, public organisations and private institutions in the generation, dissemination and use of knowledge.

Figure I.1. Basis for regional competitiveness



To provide recommendations for national and state governments in Mexico generally across different types of states, this report is based on desk research as well as meetings with national and state-level stakeholders. Missions for case study examples have been conducted in the 15 states that volunteered to participate through the Mexican Association of Economic Development Secretaries (AMSDE): Aguascalientes, Chihuahua, Coahuila, Colima, Guanajuato, Jalisco, Mexico, Michoacan, Nuevo Leon, Puebla, Queretaro, San Luis Potosi, Tamaulipas, Yucatan and Zacatecas (see Figure I.2). As the states that participated were those that volunteered, there are some states that may be more (such as Baja California) or less (such as Oaxaca) developed in terms of their innovation resources and success in supporting regional innovation systems relative to the sample. Nevertheless, the basic principles of this review are applicable in different region types throughout the country.

Stakeholders that were met during state visits include: government actors mainly from the state secretariats of economic development (or its equivalent) in the areas related to industry, competitiveness, innovation, SME support, investments and innovation; officials from the state councils of science and technology; representatives of the most important research centres and HEIs in the state; and local businessmen and business chamber organisations from the private sector. Each state selected clusters in two industries as a focus for firm meetings. Most states selected automotive and IT for these discussions.

Figure I.2. Participating states

Part I: Synthesis Report

Chapter 1

Mexico's Regional Economic and Innovation Performance

Introduction

This chapter provides quantitative evidence for the need of a regional approach to improving Mexico's competitiveness. First it reviews the national context within which state performance should be contextualised. This context is one of macroeconomic stability but slow growth and stagnant productivity due in part to low levels of investment in knowledge economy drivers. The chapter then discusses the regional economic performance differences across the country, a tale of different "Mexicos" with persisting income and productivity gaps. Finally, there is an analysis at the state level of the inputs, linkages and outputs related to innovation performance. There are significant sub-national data gaps in Mexico for such an analysis, but available information shows there is clearly a concentration of innovation inputs and outputs in a limited number of Mexican states.

The national context

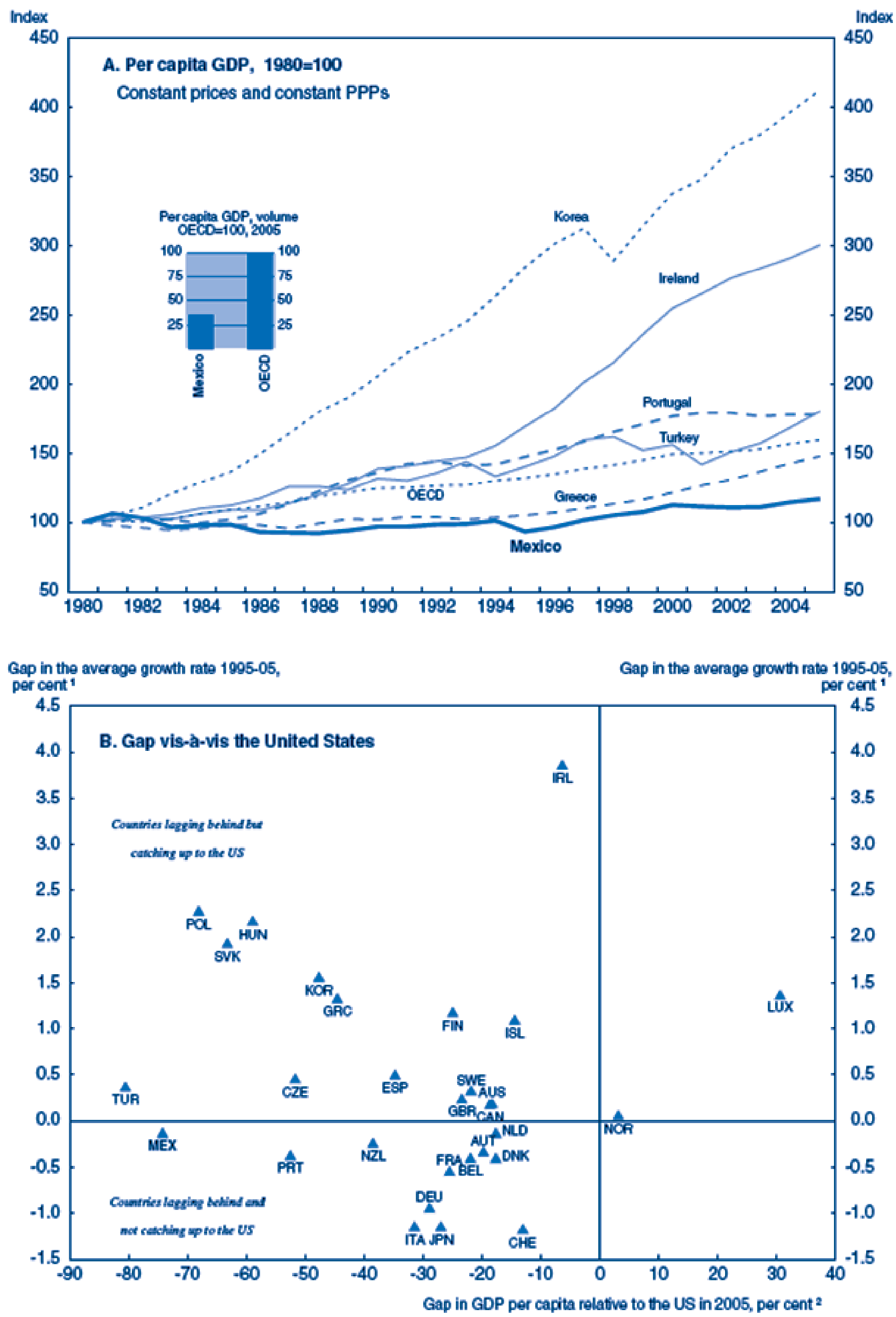
Macroeconomic stability but insufficient growth

Over the last two decades, Mexico has implemented a series of adjustments to its macroeconomic policy aimed at achieving macroeconomic stability. The so called "structural reforms" have yielded a positive effect in terms of macroeconomic stability and relatively higher growth. Average annual growth in the Gross Domestic Product (GDP) per capita of 2.5% for the decade following the Mexican crisis of 1995 has been similar to the mean of other OECD countries. Inflation has stabilised at acceptably low levels, mainly as a consequence of Central Bank autonomy and clear inflation targets. Interest rates have been stable and relatively low, especially during the last ten years, and fiscal discipline has been rigorously observed as means to further enhance macroeconomic stability. The budget deficit has consistently declined and the budget is close to balanced. Public debt as a percentage of GDP has not changed significantly over the last few years and compares favourably to other emerging economies or even to those more developed, while foreign debt has decreased its share of total public debt (Werner and Ursua, 2005).

Similarly, openness to foreign trade has positively impacted Mexico's economic performance. Since joining NAFTA in the early 1990s, Mexico signed a large number of international treaties in accordance with its "openness-led growth strategy". This has resulted in strong performance indicators in terms of exports, which grew (in volume) at just under 9% for the period 1995-2005, and especially for manufactured goods which experienced an average growth of close to 11% in USD terms (OECD, 2007h).

While this first set of reforms has yielded important positive results, they have proved to be a necessary but insufficient condition to boost economic growth. Mexico will not catch up to the living standard levels of other economies within the OECD unless growth rates substantially increase (see Figure 1.1). The average real income of the Mexican population (in purchasing power parity terms) is still lagging far behind at only 25% of its neighbouring country the US (OECD, 2007h). While poverty has gradually declined following the 1995 crisis, especially amongst the poorest, it is still widely spread and alleviation will require higher rates of growth. For convergence to OECD levels, growth rates of well over 4% would be required (OECD, 2007c).

Figure 1.1. Mexico's growth performance in comparison



Notes: 1) The average growth rate of GDP per capita is calculated on the basis of volumes data. 2) The level of GDP per capita is calculated on the basis of 2005 PPPs.

Source: OECD (2007), *OECD Economic Surveys: Mexico* – Volume 2007 Issue 18, OECD Publishing, Paris based on OECD, *National Accounts* database, OECD (2007) *Going for Growth: Economic Policy Reforms*.

Several factors limiting economic growth

To promote stronger economic growth, several challenges will have to be addressed by all levels of government. Among the factors limiting economic growth are the structural weaknesses in public finance, low levels of labour productivity, remaining barriers to trade and FDI, insufficient human capital formation and the limited knowledge creation and diffusion.

The first key challenge is the structural weakness underlying public finance in Mexico. Although major progress has been achieved in terms of budgetary discipline, as mentioned above, upcoming expenditure needs (including pensions, infrastructure and investments in health and education) must be met with resources coming from stable sources. Two main concerns are the high dependence on oil-revenues (and the consequent uncertainty in terms of oil-prices and production capacity) and the very low tax/GDP ratio when compared both in the OECD and Latin American contexts. A recent reform introducing a new corporate tax is expected to alleviate part of this pressure. However, further efforts will be required to build a more "modern, competitive and efficient fiscal system" including elimination of distortions, widening of the tax base and diversification of income sources (Werner and Ursua, 2005).

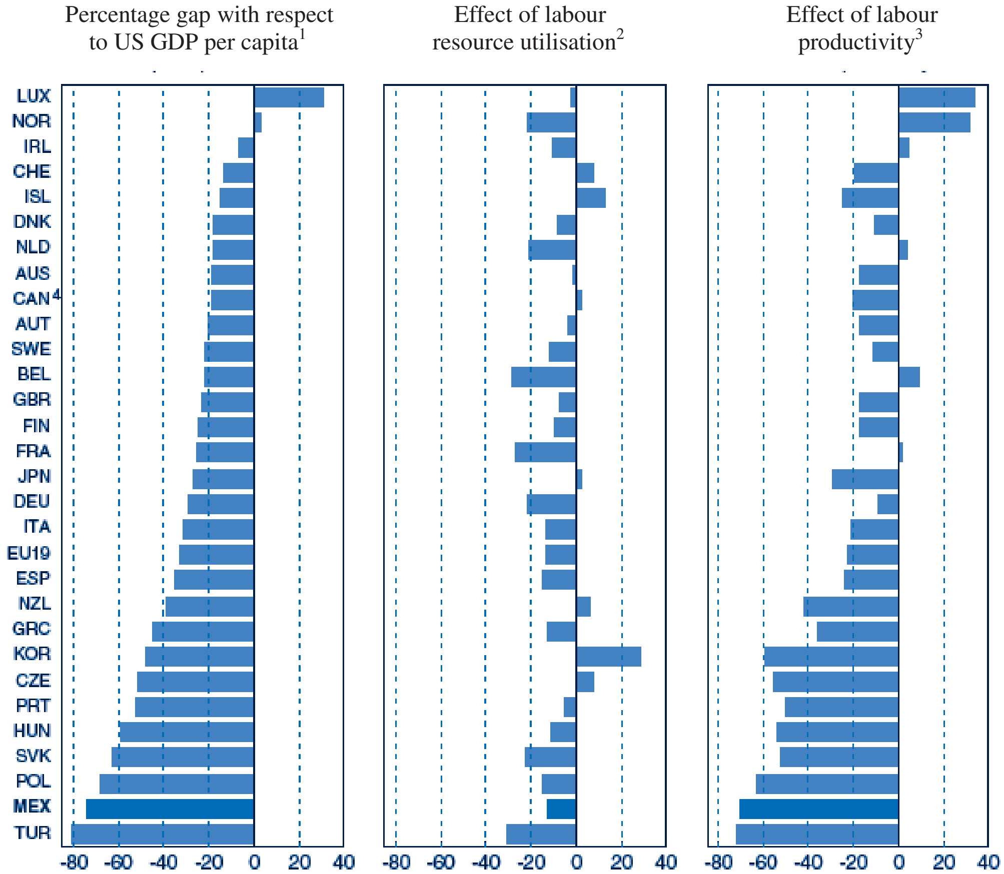
Productivity matters

There is a need for policy measures to increase labour productivity in Mexico, the main source of the GDP per capita gap (see Figures 1.2 and 1.3). Mexico compares unfavourably in terms of GDP per hour worked, where it ranks second to last among OECD countries, and it is not catching up, with an average growth rate of productivity close to 0%. To achieve a sustained increase in labour productivity, a comprehensive strategy is required that addresses different public policy arenas. Concretely, major improvements will be required to reduce the cost of doing business, facilitate trade and FDI, reinforce the rule of law, strengthen competition, improve educational attainment and quality, promote life-long learning, make the labour market more flexible and foster greater innovative activity (OECD, 2007c).

There is also a need for greater job creation to prepare for and benefit from the upcoming demographic bonus. In terms of labour utilisation, Mexico has an above average participation of older and younger population cohorts in the labour force, while female inclusion still falls short of the OECD average. The bonus, a young and abundant working age population, will be unique and transitory and last approximately 21 years from 2012 through 2033 (CONAPO, 2008). A main obstacle to fully enjoying these benefits will be the imbalance between labour supply and demand. Given recent trends, the economy has been unable to generate a sustained demand for jobs resulting in a proliferation of informal sector jobs that now account for more than 27% of the labour force (INEGI, 2008a).

Figure 1.2. The sources of persisting real income differences

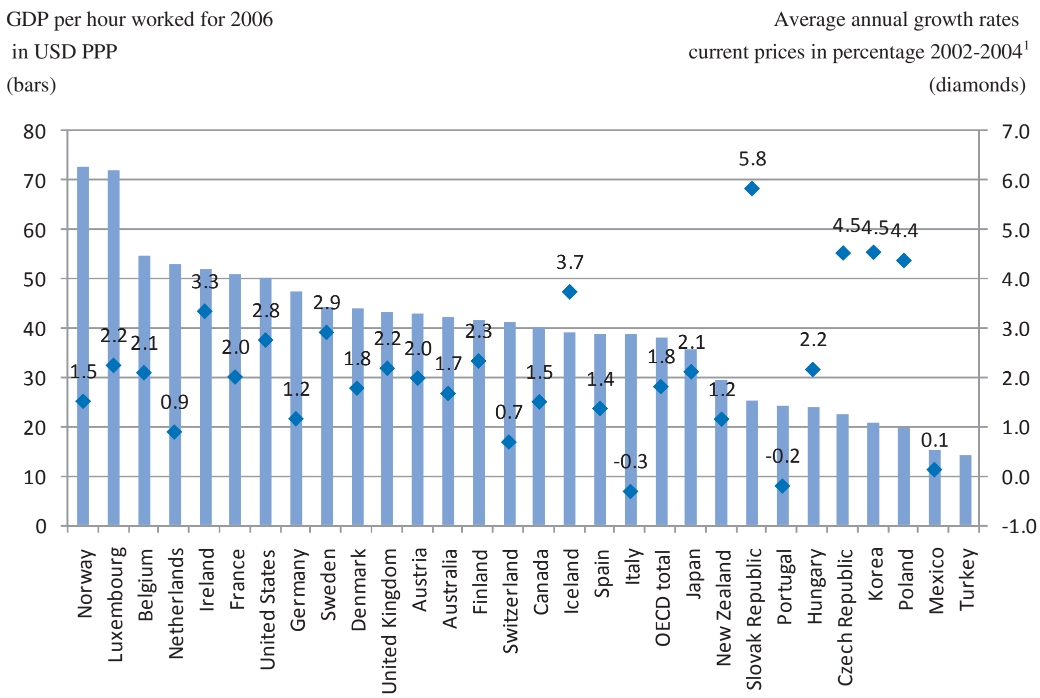
2005



Notes: 1) Based on purchasing power parities (PPPs). 2) Labour resource utilisation is measured as total number of hours worked divided by the population. 3) Labour productivity is measured as GDP per hour worked. 4) Data for Greece do not take into account the 25% upwards revision to the level of GDP announced in 2006.

Source: OECD (2007), *Going for Growth: Economic Policy Reforms*, OECD Publishing, Paris based on OECD, *National Accounts of OECD Countries*, 2006; *OECD Economic Outlook*, No. 80; and *OECD Employment Outlook*, 2006.

Figure 1.3. GDP per hour worked and growth in productivity



Notes: 1) Or latest available period (no data available for Turkey).

Source: OECD Dataset: Estimates of labour productivity for GDP per hour worked; productivity growth from OECD (2006), *OECD Factbook: Economic, Environmental and Social Statistics*, OECD Publishing, Paris.

Openness: getting the most out of a globalised economy

Mexico could also increase its trade levels, as previous empirical work shows a positive and strong correlation between trade and growth (OECD, 2007h). As mentioned above, Mexico experienced a sustained growth of exports (especially manufactured goods) over the ten years following the 1995 crisis, which by 2006 accounted for 28% of GDP. However, these positive results still compare unfavourably with those of the strongest exporting economies in the OECD (Czech Republic, Hungary, Ireland, Poland, Slovak Republic and Turkey). Mexico has also lost market share since the beginning of the decade to other emerging economies (particularly China) specialising in similar manufactured products (Chiquiar *et al.*, 2007). In this sense, it would seem reasonable to promote policies aimed at lowering barriers to trade, and improving overall infrastructure and transport conditions.

The changes in Mexico's comparative advantages with respect to the performance of manufacturing exports could be attributable both to productivity differentials and differences in relative factor endowments (Amoroso *et al.*, 2007). Therefore, Mexico needs to increase average productivity to compete against emerging economies and to make major investments (in physical and human capital) to move up the value chain.

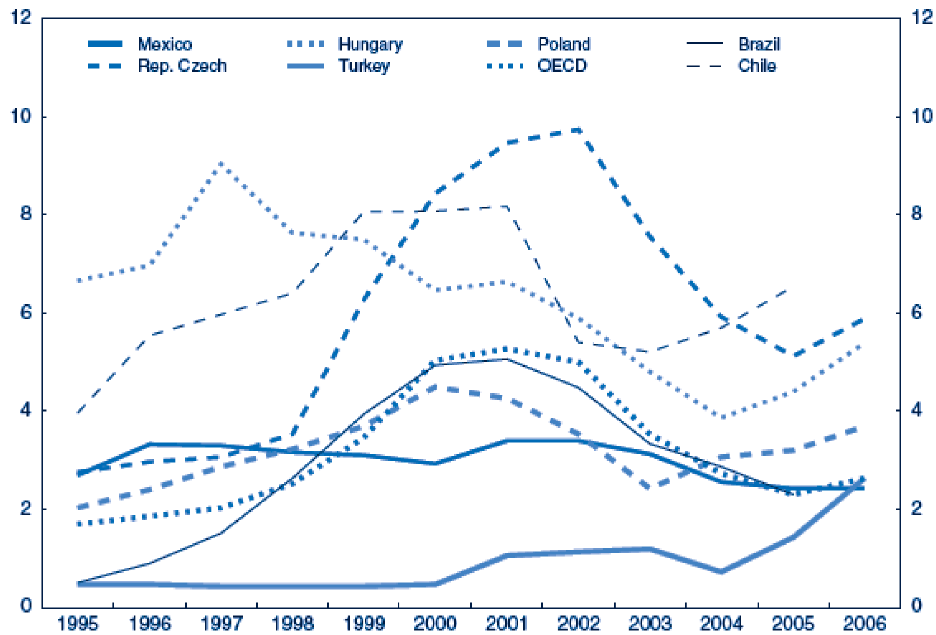
- Mexico's comparative advantages with respect to more developed economies such as the US are associated with its relative abundance of low-skilled labour (a difference in factor endowments).
- When comparing Mexico with China and other competitors which have similar factor endowments in terms of trade, "differences in the patterns of comparative advantages and exporting performance mainly reflect relative productivity differentials at the sector level." However, it is also true that when compared to competing countries that have achieved higher levels in the value chain, endowments of human capital also have certain explanatory power.
- Those competitors that have climbed higher in the value chain and have achieved greater accumulation of human and physical capital (Korea, Taiwan and Hong Kong), have built comparative advantages in goods that are more intensive in terms of both factors.

Greater openness of the economy can also lead to positive spillovers of R&D investments made in other countries. Previous studies show that for industrialised countries, foreign R&D in a certain industry produces significant spillovers, which in turn translate into productivity gains (for the domestic economy) in the same industry (Keller, 1997).[1] Similarly other research illustrates that for a sample of 77 lesser developed countries, spillovers (that impact productivity gains) of R&D performed in industrialised countries is greater for those countries more open to international trade (Coe *et al.*, 1997). In this sense, there is an area of opportunity for Mexico to leverage the number of free trade agreements and further increase international trade with the goal of promoting greater benefits of foreign R&D to relevant Mexican industries.

Over the last decade, the share of FDI flows in the Mexican economy is similar to OECD averages, but less so than other peer "catching-up" economies. FDI constitutes a major source of investment capital inflows for the Mexican economy, but has been on a relative decline. FDI represented around 3% of GDP during the late 1990s and slightly over 2% in the early 2000s (see Figure 1.4). Furthermore, much of this FDI has been related to the acquisition of financial institutions and other privatised industries that may not in and of itself make important contributions to national productivity. While this is similar to the average in the OECD, it still lags behind other "catching-up" member countries such as Hungary (5%), the Czech Republic (7%), and Ireland (11%). The observed gap is in part the consequence of a restrictive regulation across sectors, which is exemplified by the fact that according to the OECD index (measuring such restrictiveness) Mexico ranks 28th out of 29 countries (OECD, 2007h).

Figure 1.4. Gross foreign direct investment in comparison[1]

As a percentage of GDP



Notes: 1) Three-year moving averages. Estimates for 2006 are based on the first three quarters of the year.

Source: OECD (2007), *OECD Economic Surveys: Mexico* – Volume 2007 Issue 18, OECD Publishing, Paris.

A new set of FDI-friendly policies may be particularly useful to increase the volume and quality of FDI. These measures would of course need to be done in parallel with further improvements in the overall business environment. Additionally, in some cases, there might be an important role for public policy makers to foster initiatives that help local firms integrate into supply chains, such as those aimed at raising labour quality standards, widening the access to financing sources or increasing quality standards.

The central role of knowledge

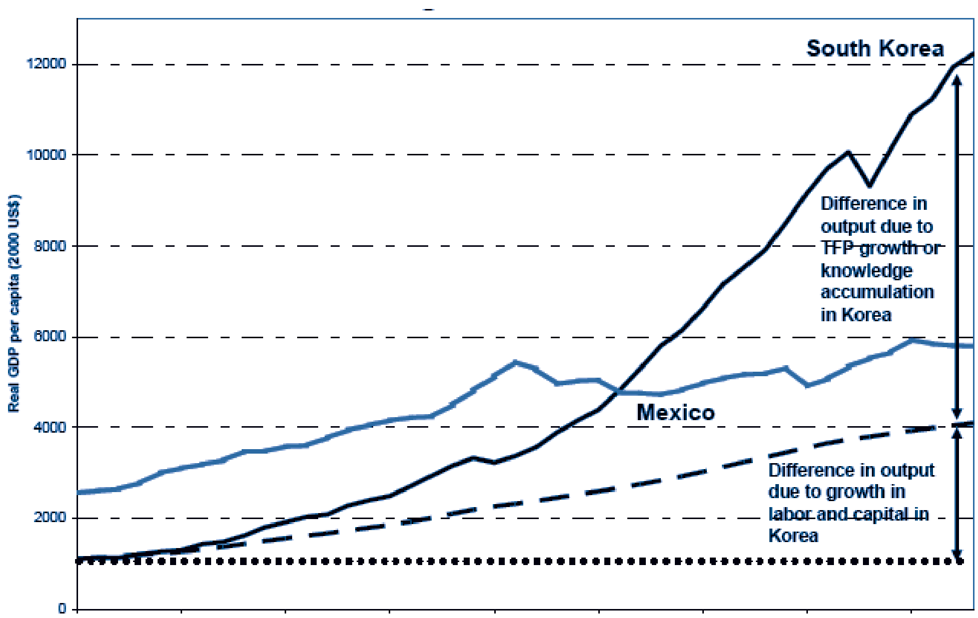
Another major constraint hindering Mexico's economic performance has been the limited role of knowledge accumulation and diffusion in increasing productivity. This is true not only for moving towards more technologically sophisticated sectors, but also in applying and developing knowledge related to more traditional sectors, such as those that dominate the Mexican economy. Increasingly, globalisation imposes stronger competition on local markets, while information technologies facilitate the access to existing knowledge. Competitive advantages are moving from low production costs to those in which innovation supports the creation of greater value added. Empirical evidence from a study analysing 14 manufacturing groups in Mexico shows that for these groups, multi-factor productivity (MFP) is the most important element in terms of explanatory power for variations in the growth rate of value added and labour productivity (Salgado and Bernal, 2007).[2] Conclusions show that MFP explains between 58% and 69% of aggregate output growth, while for the case of labour productivity growth it accounts for 62%.

Recent studies show that sustained economic growth depends strongly on developing strategies associated with the use and creation of knowledge at the centre of economic activity (Chen and Dahlman, 2006). For lesser developed countries, this will probably imply using strategies related to leveraging existing knowledge and adopting foreign technologies in domestic production. However, for higher levels of economic development, strategies will be more directly linked to innovation and the production of goods and services of greater value added.

An illustrative comparison of the potential for growth through investment in knowledge creation is with Korea. As can be seen in Figure 1.5, where the role of knowledge is represented by MFP, Mexico has fallen well behind Korea in terms of real per capita GDP in spite of the fact that in 1960 Mexico had a GDP per head over double that of Korea. However, by 2003 roles had inverted with Korea at USD 12 200, whereas Mexico had only increased to USD 5 800 in per head terms. The same figure decomposes the sources of growth for Korea and illustrates the role of knowledge accumulation (measured in terms of MFP) that is attributable to the differentiated economic growth paths. Even more, it is worth highlighting that, without the effect of MFP, Korea's real GDP per capita would still be below that of Mexico (Chen and Dahlman, 2006).

Figure 1.5. Factors contributing to differences in output

Mexico and Korea



Source: Chen, Derek H. C. and Robert Dahlman (2006), "The Knowledge Economy, the KAM Methodology and World Bank Operations" The World Bank Stock No. 37256, Washington, DC.

This obstacle for growth seems to be the result of low levels of investment in knowledge generation and diffusion in Mexico that lag below OECD averages and other competing economies. It is broadly acknowledged that innovation is a key driver of economic growth; in fact, it is this factor that is responsible for most of the rise in living standards in the modern era.[3] However, a number of framework condition barriers exist that impede innovation processes in Mexico (Box 1.1).

When measured in terms of expenditures in R&D as a percentage of GDP, Mexico ranks at the bottom of OECD members. Mexico registers around 0.5%, while observed ratios for Brazil (0.9%), the Russian Federation (1.1%) and China (1.3%) are relatively higher (Figure 1.6). This trend, all other factors constant, would result in a continued relative decline of Mexico's competitive advantages against its main competitors and could diminish productivity growth. On the positive side, recently Mexico has shown above average growth in terms of R&D expenditure.

Box 1.1. **Obstacles for innovation in Mexico**

The *OECD Review of Innovation Policy: Mexico* has identified a number of framework conditions that impede innovation processes throughout Mexico:

- ***Unexploited benefits from Mexico's integration in the global economy***, including through further boosting international trade, attracting more FDI and strengthening the spillovers of FDI projects to domestic firms, including SMEs. This requires fostering the absorptive capacities of Mexican firms including through improvements in the adequate formation and efficient use of human capital. Expanding exports will require a diversification towards goods and services with greater knowledge content.

- ***Difficulties in accessing capital.*** Access to financing capital by new technology-based and more generally innovative firms remains difficult as the effects of the traditional conservatism of the banking system, inherently adverse to financing intangibles, are compounded by scarce and costly systems of guarantees and the paucity of alternative sources of finance. Financing instruments such as private investment and venture capital funds remain notoriously underdeveloped.

- ***Lack of competition.*** There is still a significant potential to boost innovation and productivity by strengthening competition through better regulation, notably in network industries and rigorous enforcement of competition policy. Notwithstanding improvement of competition regimes in the markets for goods and services, competition remains low in several key sectors.

- ***Problems concerning intellectual property rights***, standards and quality certification. In other areas of the business environment more directly related to the technological infrastructure and that affect the capacity or propensity of firms to innovate, the impact of advances in institutional development in Mexico has not always met expectations.

- ***Barriers to entrepreneurship.*** There are still many barriers that hamper entrepreneurial activity, although it is recognised that some administrative barriers have decreased.

- ***Lack of private intermediary institutions.*** Most public research institutions, in particular CONACYT research centres, play a positive role in metrology services and technology transfer. However, contrary to the majority of OECD countries, Mexico suffers from a lack of private intermediary institutions such as "technology brokers" active in knowledge transfer and provision of technology upgrading services.

Box 1.1. **Obstacles for innovation in Mexico** (continued)

- ***Shortcomings in the physical infrastructure.*** Existing weaknesses in the physical infrastructure hamper productivity growth and international trade performance and reduce the attractiveness of Mexico as a destination of FDI and thus is a factor in determining the level of innovative activity.

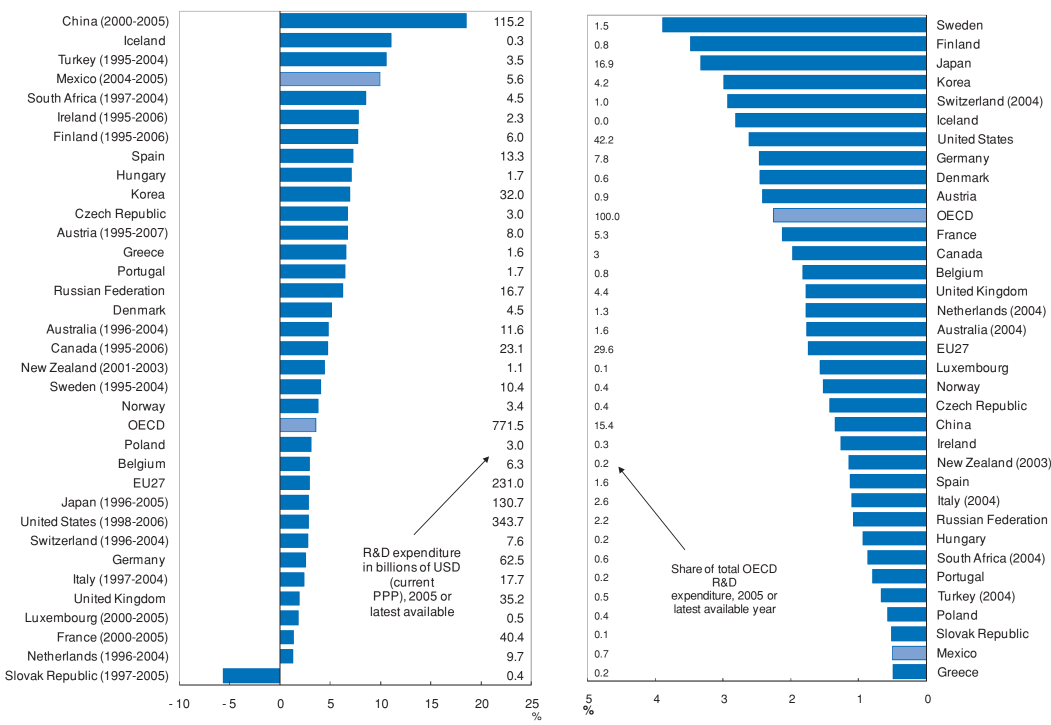
- ***Deficiencies in corporate governance***, notably in the public sector, which reduce the incentives for pursuing efficiency gains and introduce a bias against R&D and innovative activity.

- ***Investment in human capital*** is a key factor of growth and competitiveness in knowledge-based economies while at the same time contributing to the reduction of inequalities and alleviation of poverty. Despite the recognition of its importance and the major efforts undertaken over the last 20 years to expand education services, by OECD standards, Mexico still fares poorly in the quantitative and qualitative formation of human capital at all stages of education, from primary schooling to life-long learning.

Source: OECD (2009) *OECD Reviews of Innovation Policy: Mexico,* OECD Publishing Paris, forthcoming.

Figure 1.6. R&D intensity and evolution of gross domestic expenditure on R&D

1995-2005



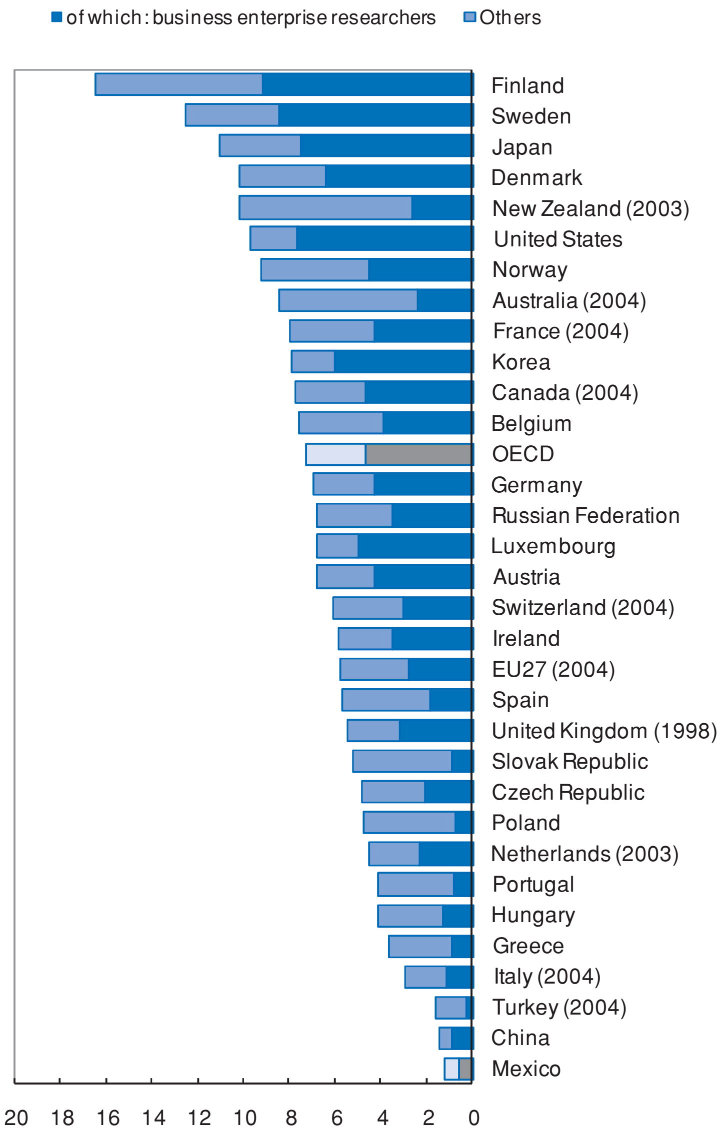
Source: OECD (2007), *OECD Science Technology and Industry Scoreboard: Innovation and Performance in the Global Economy*, OECD Publishing, Paris.

Researchers play an important role in promoting innovation, yet Mexico lags in terms of both firm-based and overall numbers of researchers. Researchers generate knowledge which may in turn be used by firms as a means to increase productivity through improved processes, introduction of new technologies, creation of better organisational schemes or development of new products. The extent to which researcher intensity in a region may materialise into actual economic benefits is dependent in part on the linkages with regional specialisation and relevant industries. Mexico (at under 0.6) is among the group of OECD countries with the lowest number of business researchers per 1 000 employees in industry (see Figure 1.7). This result is in part due to the Mexican innovation system, where higher education and government play a larger role as compared to the business sector. Even when measured overall, Mexico (1.2) has low researcher intensity and compares unfavourably to competing economies such as China (1.5), Turkey (1.5) or Poland (4.7). This in turn translates into a more limited innovative capacity for the country and a major obstacle for firms that seek to increase value added.

Mexico scores poorly on two common measures of knowledge generation outputs that could lead to innovation: patents and published scientific articles. Mexico ranks at the bottom of both triadic patent families and scientific article publications (both per million inhabitants) (Figures 1.8 and 1.9). The evolution of patents over the period 1995 to 2005, while at 3.5%, has been relatively slow compared to other emerging economies such as China, Turkey, India or Brazil. On the positive side, scientific articles have increased at a faster rate of almost 8%. However, further efforts are needed to converge more quickly in terms of scientific publications.

Figure 1.7. Researchers, 2005

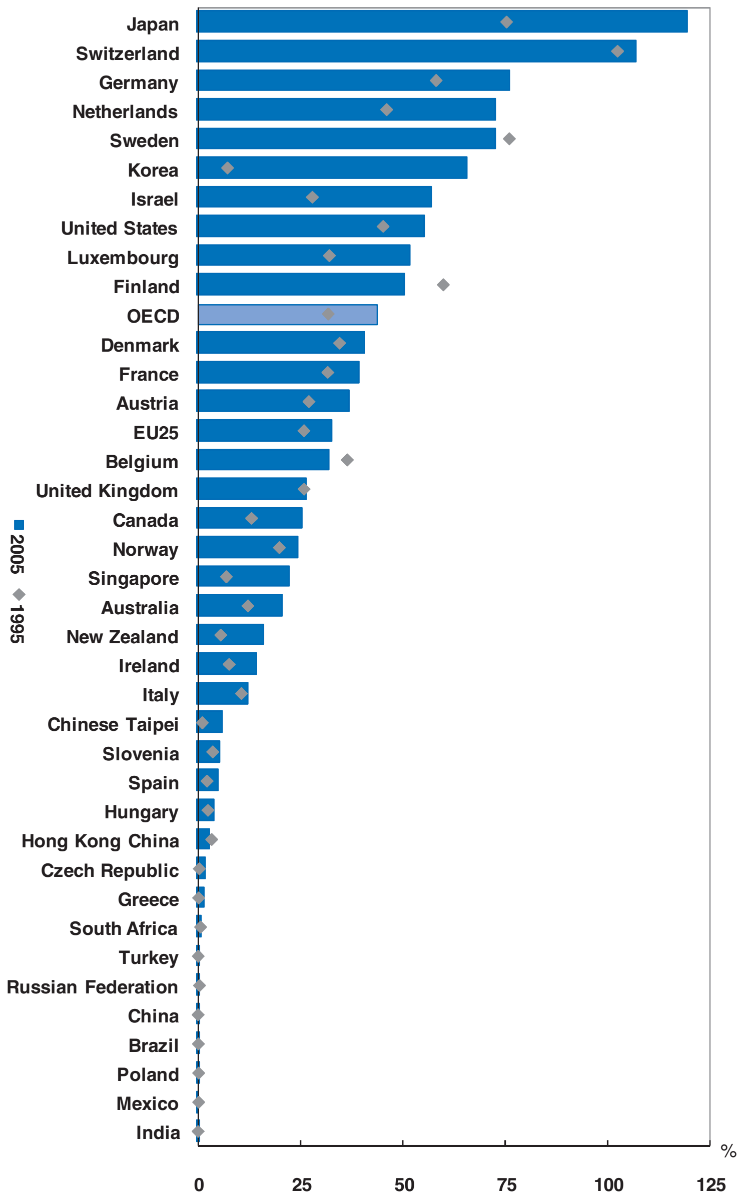
Per 1 000 employees



Source: OECD (2007), *OECD Science Technology and Industry Scoreboard: Innovation and Performance in the Global Economy*, OECD Publishing, Paris.

Figure 1.8. Triadic patent families per million population

1995 and 2005

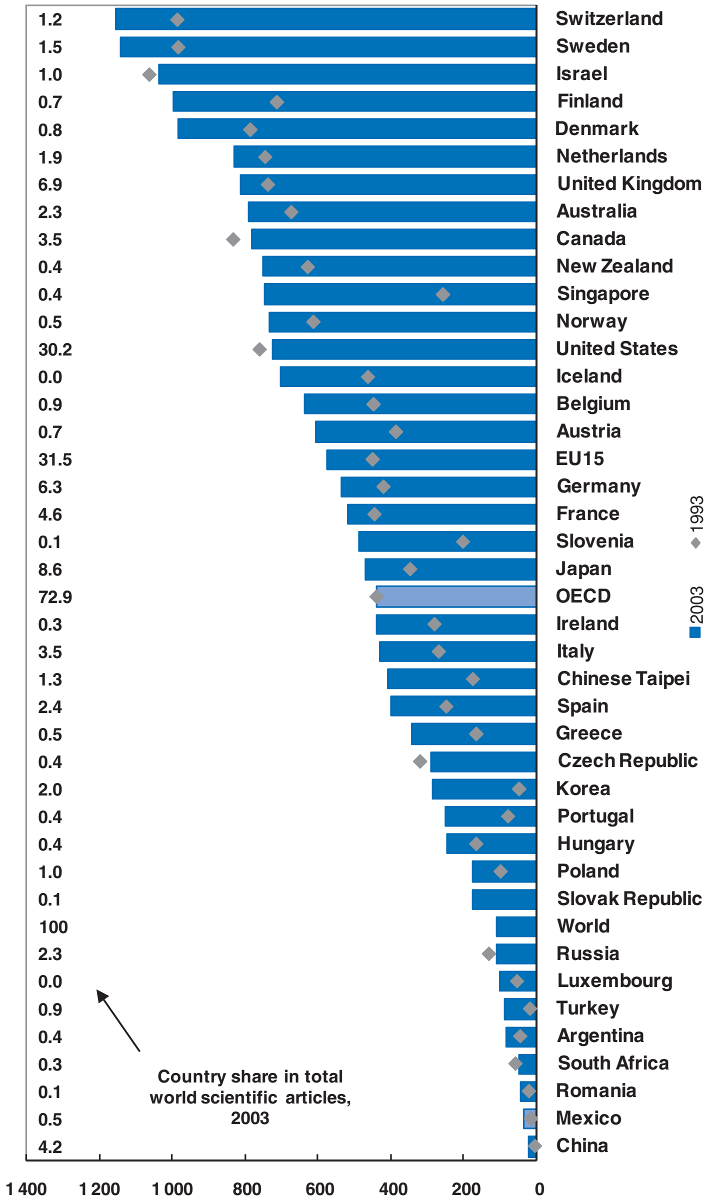


Notes: i) Patents filed at the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the Japan Patent Office (JPO) which protect the same invention. Data from 1998 onwards are OECD estimates. *ii*) Only countries/economies with more than 10 families in 2005 are included.

Source: OECD (2007), *OECD Science Technology and Industry Scoreboard: Innovation and Performance in the Global Economy*, OECD Publishing, Paris.

Figure 1.9. Scientific articles per million population

1993 and 2003



Source: OECD (2007), *OECD Science Technology and Industry Scoreboard: Innovation and Performance in the Global Economy*, OECD Publishing, Paris.

Table 1.1. Educational attainment of the adult population

Distribution of the 25-to-64-year-old population by highest level of education attained 2003

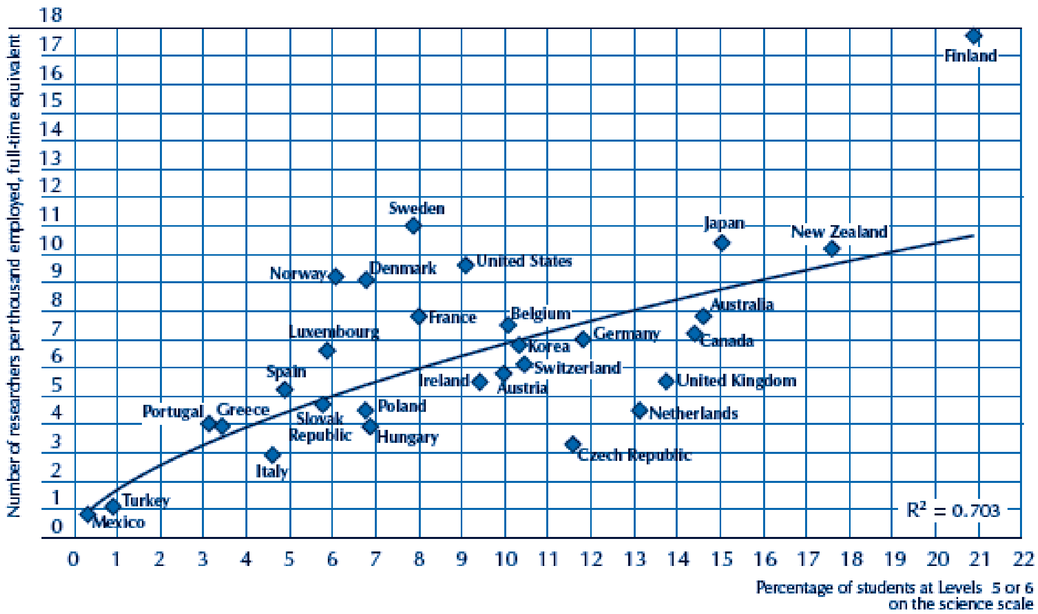
	Pre-primary and primary education	Lower secondary education	Upper secondary education			Post secondary education	Tertiary education			All levels of education
			ISCED 3C short	ISCED 3C Long/3B	ISCED 3A		Type B	Type A	Advanced research programmes	
Mexico	53	25	a	6	b	a	2	14	c	100
OECD mean	14	17	3	16	22	3	8	15	1	100

Notes: (a) Does not apply; (b) included under "Lower secondary education"; (c) Included under "Type A".

Source: OECD (2005), *Education at a Glance: OECD Indicators*, OECD Publishing, Paris.

Expenditure on education as a percentage of GDP has grown, but the efficiency of this spending could be improved. That percentage was estimated at 6.4% in 2004 (above the OECD country mean of 6.2%) compared to 5.6% in 1995. Still, many questions remain regarding the efficiency with which this relatively high amount of resources is employed, an assertion closely linked to the quality of education provided. Quality will not only affect productivity of future workers, but will also impact negatively on society's ability to produce knowledge and innovations as is shown in the positive relationship between PISA performance (science skills at age 15) and the number of researchers (Figure 1.10). Some programmes in Mexico have been put in place to address quality improvements. These concerns are aggravated by the high proportion of resources that are absorbed by teacher wages (high when measured in percentage of GDP per capita), leaving little room for investments in capital and other required expenditures. In fact, recent evidence suggests that Mexico performs rather poorly when contrasted to what would be expected from its level of per-student spending (OECD, 2007b). There is a positive relationship between expenditure in education and a country's educational performance, however, the link is not a strong one, as it explains only 15% of the performance variation (Figure 1.11).[4] Therefore, the bottom line for policy action doesn't seem to be "spend more", but rather "spend better".

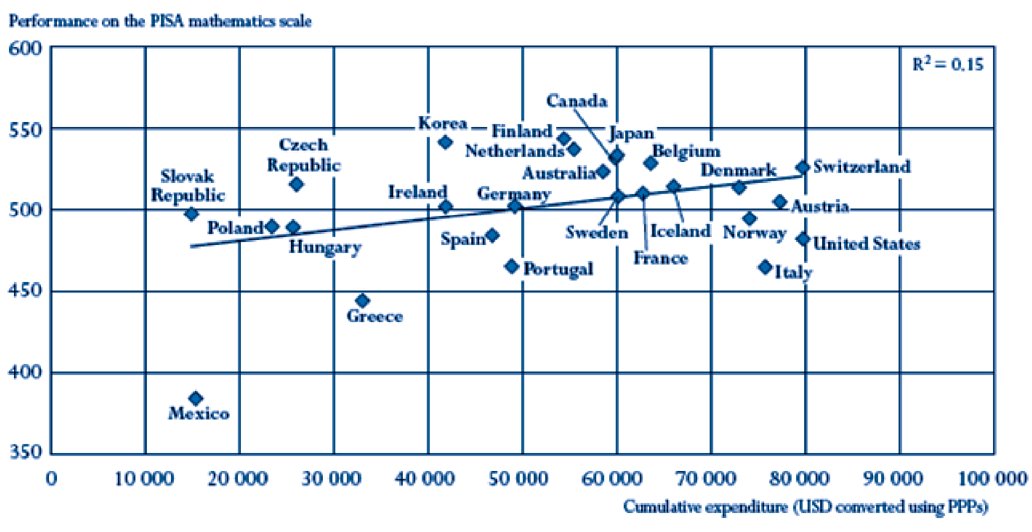
Figure 1.10. Top performers in the PISA science assessment and country research intensity



Source: OECD (2007), *OECD Science Technology and Industry Scoreboard: Innovation and Performance in the Global Economy*, OECD Publishing, Paris.

Figure 1.11. Student performance and spending per student

Relationship between performance in mathematics and cumulative expenditure on educational institutions per student (aged 6 to 15), in USD, PPP



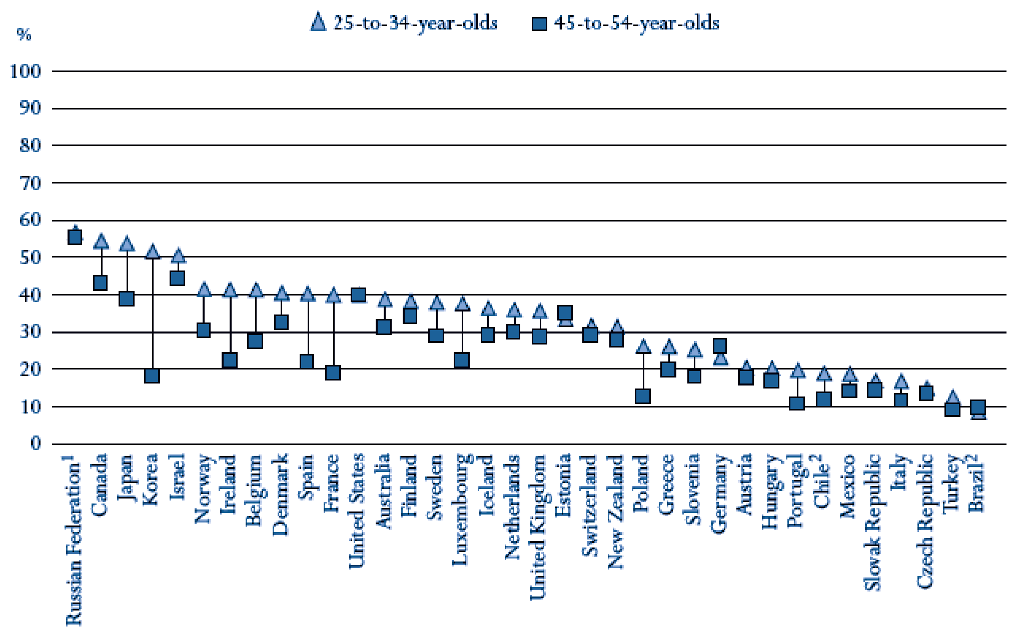
Note: PPP=Purchasing Power Parity.

Source: OECD (2007), *Education at a Glance: OECD Indicators,* OECD Publishing, Paris.

Higher education in Mexico is required for full integration into the knowledge-based economy. A population with higher levels of tertiary attainment is more conducive to the generation and acquisition of new knowledge, which in turn tends to translate into an increase in economic growth. During the last fifty years, the percentage of the relevant age cohort attending higher education increased from 1% to over 26%, but attainment (at 16% among 25-to-34-year-olds) remains below the OECD average. Unfortunately, while there has been some minor progress in recent years, performance compares quite unfavourably with other similar economies (OECD, 2007b) (Figure 1.12).[5] Higher education institutions also play a number of important roles in supporting innovation systems (see Chapter 2).

Figure 1.12. Population with tertiary attainment, 2005

Percentage (by age group)



Notes: Countries are ranked in descending order of the percentage of 25-to-34 year-olds who have attained tertiary education. 1) Year of reference 2003. 2) Year of reference 2004.

Source: OECD (2007), *Education at a Glance: OECD Indicators*, OECD Publishing, Paris.

The regional perspective: a tale of different "Mexicos"

Regional economic performance

The overall national growth rate is dependent on the performance of regions around the country. That growth is required to raise living standards, alleviate poverty and move towards higher levels of development. While sound macroeconomic policies have yielded substantial benefits for Mexico overall, regional disparities continue. Therefore, regional development strategies could help improve economic performance and boost productivity.

In global comparison, the economic performance of Mexican regions is almost uniformly below OECD averages, however there is a great diversity in both levels of per capita GDP and economic growth rates. Evidence shows that, in spite of the fact that the OECD encompasses 30 of the world's most developed economies, there are significant variations when analysed at a regional level, even within best performing countries. Of the 32 states in Mexico, 24 have per capita incomes in the bottom quintile of all OECD regions, while only one (Mexico City) has a GDP per head within the top three-fifths of OECD regions.

These trends can be further categorised by looking simultaneously at income levels (GDP per capita) and GDP growth rates (see Table 1.2 and Figure 1.13). A simple classification of the 326 OECD regions based on these variables highlights regional differences and policy implications. Only one Mexican region is close to the OECD average in terms of GDP per capita and has above average growth rates (the Federal District) due mainly to benefits derived from an important concentration of economic activity, financial services and the federal government's presence. There are many Mexican states that have above average growth rates despite having lower than average income levels. Most of the richer states within Mexico are located in the north and have benefited (particularly since NAFTA) from the proximity to the US market. There are some states that show well above average growth rates, hence converging faster towards OECD levels. However, there remain other Mexican states, concentrated in large part in the south, that continue to have low income levels and low growth rates (even if slightly above the regional OECD average), implying continued divergence (or very slow convergence) from the OECD and country averages.

Table 1.2. Classification of OECD and Mexico regions

Income levels and economic performance

Quadrant	Category	Description	Mexican States
I	Rich and well-performing regions	Above the OECD mean in terms of GDP per head, and are also growing at a faster pace than the OECD average.	None
II	Rich but under-performing regions	Are growing at lower rates than the average of the OECD but still present higher income levels.	None
III	Lagging and under-performing regions	Income levels below the OECD mean and growing slower than OECD average. Regions are diverging from the regional average.	Campeche, Sonora, Veracruz and Zacatecas
IV	Lagging but dynamic regions	Regions that despite income levels below the OECD mean are recording higher growth rates than the average. Regions are closing the income gap and gradually converging.	Aguascalientes, Baja California, Southern Baja California, Chiapas, Coahuila, Colima, Chihuahua, Durango, Federal District, Guanajuato, Guerrero, Hidalgo, Jalisco, Mexico, Morelos, Michoacan, Nayarit, Nuevo Leon, Oaxaca, Puebla, Queretaro, Quintana Roo, San Luis Potosi, Sinaloa, Tabasco, Tamaulipas, Tlaxcala and Yucatan

Source: OECD (2007), *OECD Territorial Reviews: Yucatan, Mexico*, OECD Publishing, Paris based on the OECD Regional Database.

Figure 1.13. OECD regional classification by income levels and growth rates

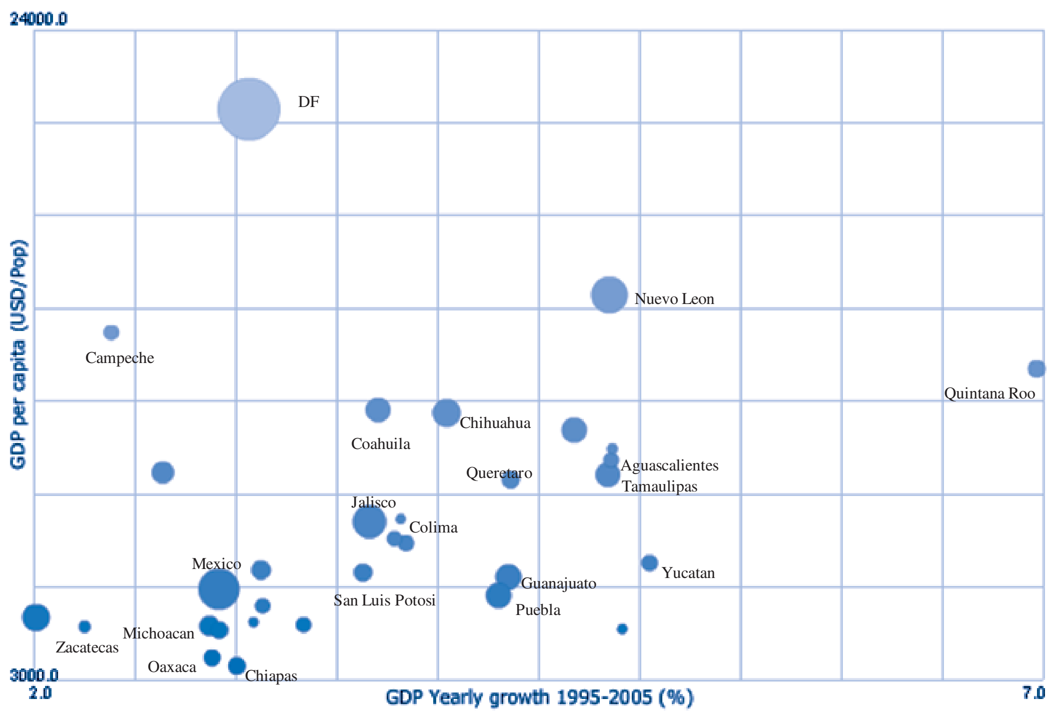
Source: OECD (2007), *OECD Territorial Reviews: Yucatan, Mexico*, OECD Publishing, Paris based on the OECD Regional Database.

Far from being a homogenous set of regions encompassed within a nation, Mexican states vary widely in terms of economic well-being and performance. It is also true that, despite the fact that some convergence has been observed among OECD regions, important inequalities within OECD countries remain. Again, this statement may not be applied in the same way to all member countries, among which some show a more balanced territorial development (European countries, Japan or Australia) while others (particularly Mexico and Turkey) show higher levels of inequality.

Another measure of the disparities between regions in Mexico is a comparison of the richest to the poorest state ratio (measured in terms of GDP per capita). In fact, previous OECD work shows that for the period from 1993-99 this ratio (Federal District/Oaxaca) increased from 3.5 to 6.1 (OECD, 2003). As of 2004, the same ratio for The Federal District and Chiapas was around 6.2. In spite of important reforms and increased foreign trade in the past decade, territorial inequality has not improved in Mexico, with the process of convergence not occurring (OECD, 2007j). Poorer regions have not yet reaped the benefits of a more integrated and open economy, and the general trend for regions below the national average for GDP per capita is a slower rate of growth (Figure 1.14).

Figure 1.14. GDP, GDP per capita and growth rates

By TL2 regions in Mexico



Notes: GDP and GDP per capita correspond to 2005 data. Average annual growth rates (AAGR) are for the period 1995-2005 (or latest available); size of state GDP indicated by the size of the bubbles of each data point.

Source: OECD Regional Database, 2008.

Territorial disparities

Two main questions (among many) arise in relation to these notable regional disparities. The first is to ask what are the economic consequences of marked disparities between regions. There are differing viewpoints on this question (see Box 1.2). The second derives from the fact that growth and openness have neither triggered the convergence process in Mexico, nor prompted greater equality and hence socio-economic improvement. In this sense, it is relevant to ask what the role for regional development policies is in making sure that regions achieve their full economic potential.

The focus of this report is to identify areas for policy action to promote increased productivity and economic growth through clusters and regional innovation systems to address growth needs in all region types. A number of other OECD studies have addressed the broader question of regional development in Mexico.[6] An important conclusion of previous OECD work is that firms in many regions in the country have not benefited from integrating into clusters in different sectors, and remain much more dependant on local markets, hence not reaping the benefits of trade and an open economy (OECD, 2003). These firms seemingly have been unable to benefit from existing technologies, new knowledge and production techniques, and in many cases lack innovative capacity. In this sense, such limitations will hinder the ability of regions to upgrade in the value chain, a clear requirement as globalisation has brought about increased competition from other emerging economies.

Box 1.2. **Regional disparities and economic growth**

During a period of economic transformation, regional disparities can be seen from several points of view. One perspective sees inequality as providing incentives for economic growth. That is, high personal and corporate income levels are a necessary condition for saving, which in turn allows for investment and growth (Kaldor, 1957). A second reason to view inequality as a condition for growth is that income and wealth needs to be concentrated to finance investment or innovation projects in the absence of market mechanisms – which is the case in many developing countries. A third argument is based on the assumption that greater equality is a product of income redistribution; hence greater taxation reduces the returns to savings and, in turn, on wealth accumulation resulting in lower growth. Thus, from these perspectives, regional inequality is initially a necessity but will eventually be corrected through sustained and strong growth over time.

However, empirical evidence suggests that convergence of regional disparities through growth occurs slowly, if at all. OECD's tracking of regional GDP in member countries suggests that there is little correlation between national growth rates and regional levels of inequality. Because of this, in some circumstances at least, acknowledging that convergence is not assured through market mechanisms is a justification for a regional development policy that should be carefully considered, particularly in Mexico where the periods of growth have not eased the disparities between regions.

There are also arguments as to why pursuing greater equality may in fact lead to greater economic growth (Todaro, 2000; Aghion, Caroli and García Peñalosa, 1999; Alesina and Rodrik, 1994). Todaro (2000) acknowledges that inequality brings about restrained access to credit and impossibility to finance children's education, which limits their lifetime earnings potential. Second, capital drain and lack of investment results when the wealthy invest abroad because inequality lowers the attractiveness of domestic investments. Third, inequality impinges on health, nutrition and education levels that limit productivity growth. Fourth, inequality limits domestic demand for consumption goods and reduces the potential development of the domestic market. Finally, inequality could produce political and/or social unrest that is a disincentive for production.

Furthermore, new growth theorists have recently begun to agree that in some instances inequality can hamper growth and that redistribution can, in fact, spur growth. The new evidence, based on endogenous growth theory, suggests that inequality reduces the rate of growth (Aghion, Caroli and García Peñalosa, 1999; Alesina and Rodrik, 1994). The underlying argument is that inequality determines both human capital and physical investment and they in turn impinge on growth rates.

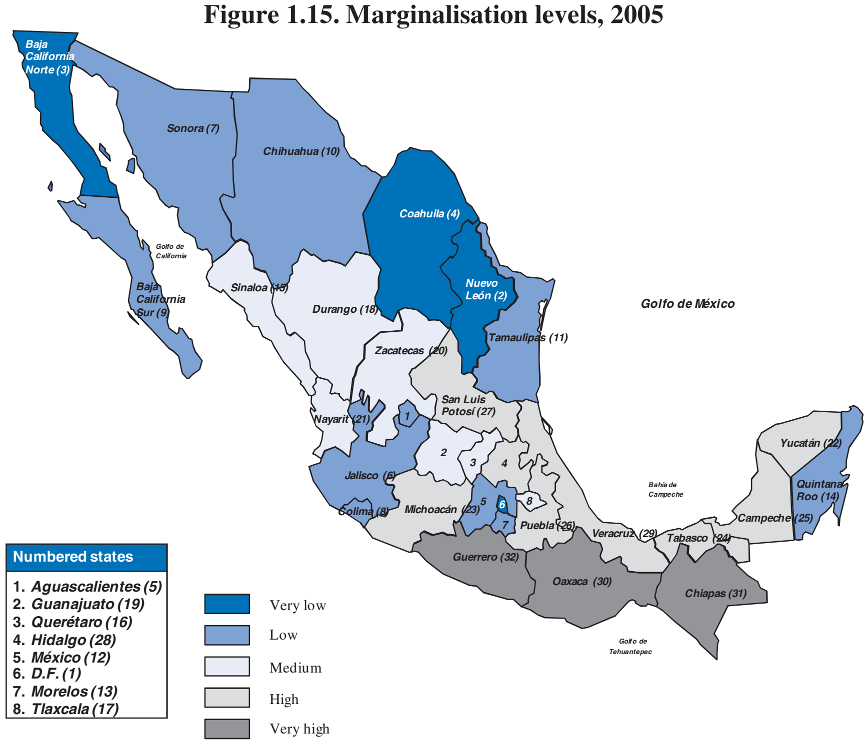
Source: OECD (2007), *OECD Territorial Monitoring Review:Mexico* (unpublished).

Poverty and inequalities

Poverty is still a widespread problem in Mexico and a drag on country competitiveness. It has been widely acknowledged that the social programme *Oportunidades* (previously *Progresa)*, in place since the mid-nineties, along with other social programmes, have had an important positive effect on poverty alleviation. This is particularly true for the poorest households, where poverty has gradually transitioned to more moderate levels and away from extreme conditions. However, those living in extreme poverty still constitute a significant percentage of the population. Previous OECD work suggests that in 2004 almost 12% of the total population was still living with an income of under USD 2 per day (OECD, 2007h). According to the most recent figures of population living under the different national poverty lines, almost 14% lived under the "food poverty" line, while slightly over 20% lived under the "capacity poverty" line and more than 42% did not reach the "patrimonial poverty" threshold (CONEVAL, 2006).[7] While this latest data shows dramatic improvements from 1996 levels (following the "peso crisis") of 37.4%, 46.9% and 69% respectively, there is still plenty of room for further improvements, as more than 40 million people remain in some form of poverty.

Poverty is far from being a uniform story across the country, and incidence varies greatly not only between regions, but also between urban and rural settings. Broader measures of welfare, such as the Human Development Index (UNDP, 2007) and the Marginalisation Index (CONAPO, 2006) show similar variations between Mexican states, and further reinforce the need for regional strategies and policies (Figure 1.15 and Table 1.3).[8]

Figure 1.15. Marginalisation levels, 2005



Note: The numbers in parantheses are the state's ranking in Mexico on the index.

Source: CONAPO (2006), *Índices de marginación municipales y estatales 2005*, México D.F: *Consejo Nacional de Población*, *http://www.conapo.gob.mx/publicaciones/indice2005.htm.*

Table 1.3. Poverty, inequality and human development in regions

Percentage or index value

State	Total Population	Poverty definition			Inequality and human development measures	
		Food poverty	*Capacity poverty*	*Patrimonial poverty*	Theil Index	Human Development Index
Aguascalientes	1 065 416	14.9	23.6	51.1	0.309	0.827
Baja California	2 844 469	1.3	2.3	9.2	0.252	0.839
Baja California Sur	512 170	4.7	8.0	23.5	0.252	0.833
Campeche	754 730	20.0	27.3	51.4	0.411	0.826
Chiapas	4 293 459	47.0	55.9	75.7	0.463	0.718
Chihuahua	3 241 444	8.6	13.3	34.2	0.264	0.834
Coahuila	2 495 200	8.6	15.2	41.0	0.282	0.836
Colima	567 996	8.9	14.9	38.5	0.373	0.810
Distrito Federal	8 720 916	5.4	10.3	31.8	0.308	0.884
Durango	1 509 117	24.4	33.7	59.4	0.347	0.804
Guanajuato	4 893 812	18.9	26.6	51.6	0.441	0.778
Guerrero	3 115 202	42.0	50.2	70.2	0.449	0.739
Hidalgo	2 345 514	25.7	33.0	54.2	0.348	0.764
Jalisco	6 752 113	10.9	17.2	41.6	0.337	0.806
México	14 007 495	14.3	22.4	49.9	0.362	0.787
Michoacán	3 966 073	23.3	30.8	54.5	0.349	0.758
Morelos	1 612 899	10.7	17.3	41.4	0.428	0.801
National	**103 263 388**	**18.2**	**24.7**	**47.0**	**0.351**	**0.803**
Nayarit	949 684	17.2	23.3	43.8	0.344	0.775
Nuevo León	4 199 292	3.6	7.2	27.5	0.293	0.851
Oaxaca	3 506 821	38.1	46.9	68.0	0.46	0.734
Puebla	5 383 133	26.7	35.3	59.0	0.445	0.767
Querétaro	1 598 139	12.5	17.9	37.7	0.487	0.809
Quintana Roo	1 135 309	11.0	16.0	36.5	0.374	0.830
San Luis Potosí	2 410 414	25.7	33.3	55.5	0.433	0.785
Sinaloa	2 608 442	13.7	20.5	44.2	0.394	0.796
Sonora	2 394 861	9.6	15.8	40.4	0.291	0.825
Tabasco	1 989 969	28.5	36.6	59.4	0.441	0.780
Tamaulipas	3 024 238	10.3	17.5	44.9	0.337	0.825
Tlaxcala	1 068 207	17.9	26.2	51.4	0.307	0.775
Veracruz	7 110 214	28.0	36.3	59.3	0.417	0.757
Yucatán	1 818 948	18.1	26.2	51.7	0.406	0.783
Zacatecas	1 367 692	20.9	29.3	53.6	0.349	0.772

Notes: Poverty figures for 2005. Theil Index calculated for 2000 by Szekely *et. al.* Human Development Index 2004 of the United Nations Development Programme.

Source: UNDP (2007), *Informe sobre desarrollo humano México 2006-2007*, Mexico D.F: *Oficina Nacional de Desarrollo Humano PNUD-México*; Székely, Miguel *et al.,* (2007), "*Poniendo a la pobreza de ingresos y a la desigualdad en el mapa de México*" *Economía Mexicana Nueva Época*, Vol. XVI no. 2, pp. 239-303, July-December 2007; CONEVAL (2006), *Evolución de la pobreza 1992-2006*, Mexico D.F: *Consejo Nacional de Evaluación de la Política de Desarrollo Social*.

Another important consideration in terms of regional disparities regards income distribution. An uneven distribution of income is an acute national phenomenon and no major progress has been observed on this front. While the poorest 20% of the population account for under 5% of total income, the two highest deciles account for more than 50% (OECD, 2005b). From a regional perspective, the case seems to be quite similar. Recent mapping of poverty and inequalities in Mexico shows (Table 1.3) that there are significant differences across states in terms of internal inequalities (Szekely *et al.*, 2007). Queretaro (which paradoxically ranks relatively well in other measures) is the state with the highest level of inequality according to the Theil Index, followed by the three poorest states (Chiapas, Oaxaca and Guerrero), while the four most equal states in Mexico correspond to Southern Baja California, Baja California, Chihuahua and Coahuila. This is particularly important since it has been found that around 83% of national inequality is attributable to intra-state income inequalities while the remaining 17% is due to differences between states (Szekely *et al.*, 2007).

Sources of persisting GVA per capita differences

While disparities among regions in Mexico are particularly high, the last several years have seen increased divergence in regional income levels. There is evidence that some convergence actually occurred between the 1960s and the 1980s, which was particularly marked during the 1970s (Esquivel and Messmacher, 2002). However, several studies suggest that important divergence has occurred since the 1990s. Some highlight that such divergence was attributable, especially since NAFTA, to the proximity of northern states to the US border (where *maquiladora* investments played a key role), and to the restructuring of the manufacturing industry outside of Mexico City (Sánchez-Reaza and Rodríguez-Pose, 2002). Increased openness to trade and elimination of commercial restrictions were said to be important determinants of sustained increases and flows of FDI to richer states closer to the US (Aguayo Tellez, 2004).

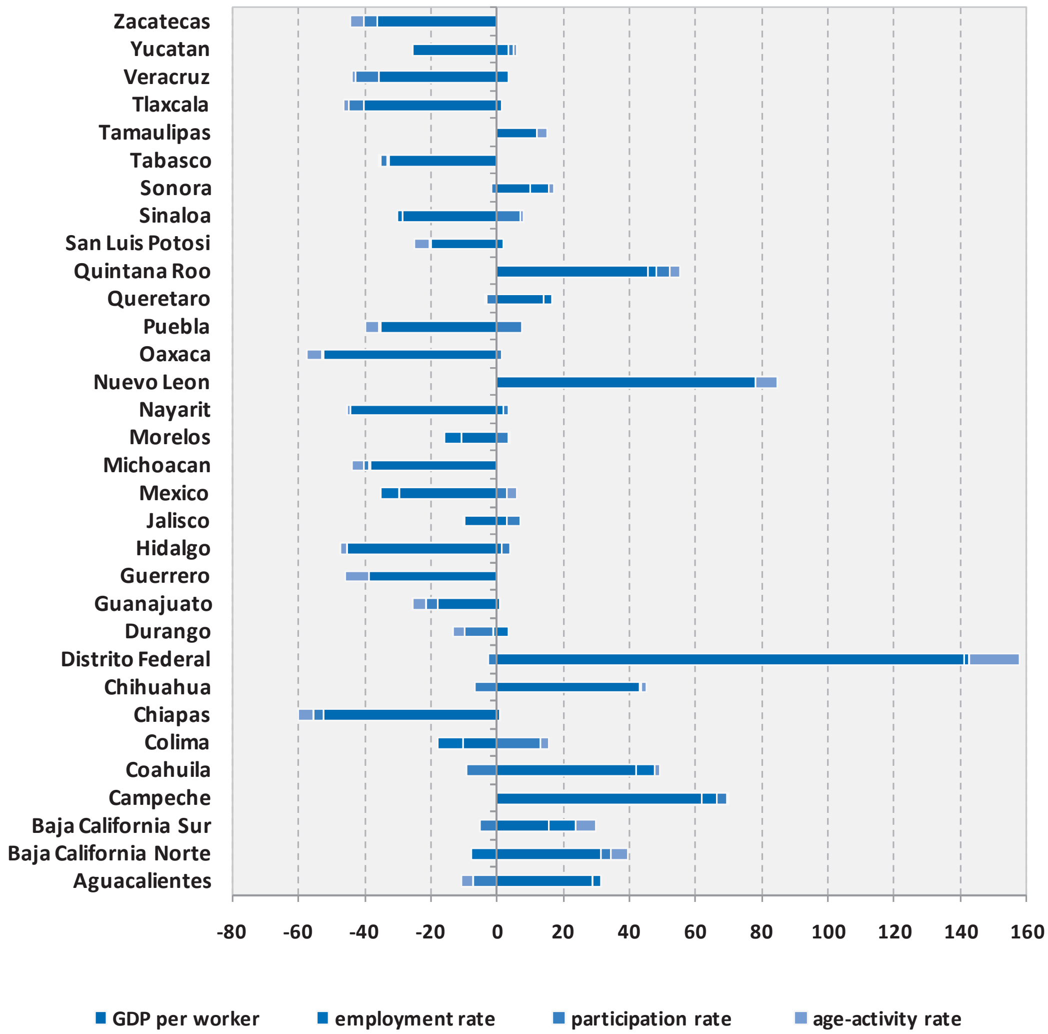
Labour productivity

Labour productivity differences are the main driver of the divergence process among Mexican states observed since the 1990s. The most recent data suggests that disparities in GDP per worker have been the key driver for prevailing differences of gross value added (GVA) per capita, with smaller impacts of demographic and labour market variables (Figure 1.16). A similar analysis concludes that for any given point between 1960 and 2000, 82% of the differences in output per capita was due to differences in the level of labour productivity, while only 10% is attributable to the participation rate (labour force/working age population), the second most important explanatory variable (Esquivel and Messmacher, 2002). This is particularly worrisome since the observed trend in labour productivity since 1990 seems to be of increasing disparities (Figure 1.17). This trend will exacerbate the already significant regional disparities in GDP per head if it is not reversed.

Labour productivity is also a central determinant of economic performance across OECD countries. The range among OECD member countries illustrates this fact, as the top performing nation (Luxembourg) displays a GDP per worker of over USD 82 000 (measured at PPP in constant prices), while the two least performing countries, Turkey and Mexico display levels of 22 419 and 23 075 respectively.

Figure 1.16. Factors contributing to differences in regional GVA per head

2004, difference from the Mexico average (0)

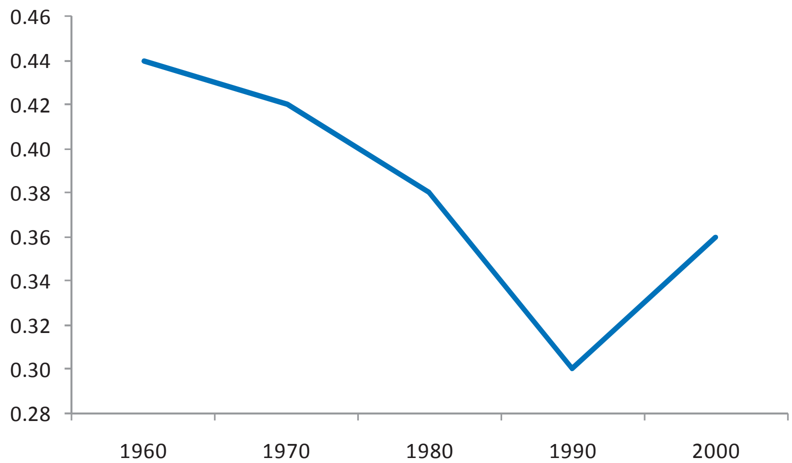


Source: OECD Regional Database, 2008.

Disparities in terms of productivity are larger if viewed from a regional perspective. In this sense, Mexico is no exception and shows great variation between states, as GDP per worker in the top region in 2003 (DF) was 2.56 times the national average, while the least performing was less than half (44%) the national average. In terms of dynamics, for the period 1998 to 2003, the productivity gap between the region with the lowest and highest labour productivity in Mexico widened the second most of all OECD countries at 0.17 percentage points, only behind the US (0.21). Even more, if compared not through the range of top and bottom regions, but through disparities among all country regions (measured with the Gini index), Mexico shows the largest disparities of any OECD country in 2003 (Figure 1.18). The index has actually increased from 1998 levels.

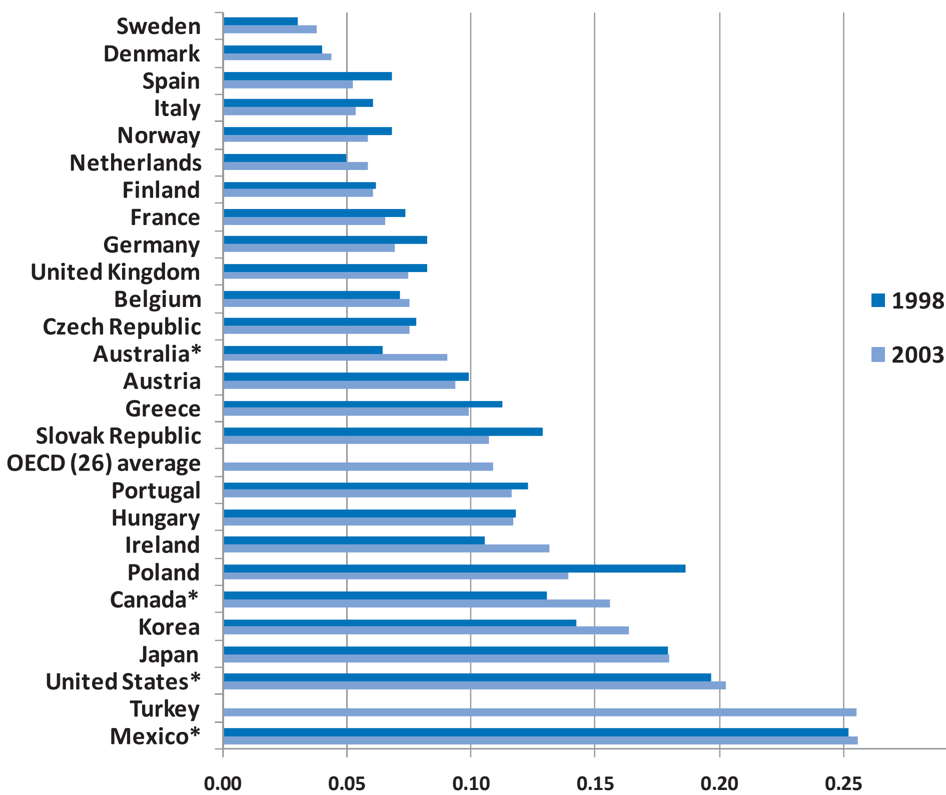
Figure 1.17. Evolution of GDP per worker

Cross-state variations measured in terms of standard deviations



Source: Esquivel, Gerardo and Miguel Messmacher (2002), *Sources of Regional (non) Convergence in Mexico*, World Bank: Washington, DC.

Figure 1.18. Gini index of inequality of GDP per worker

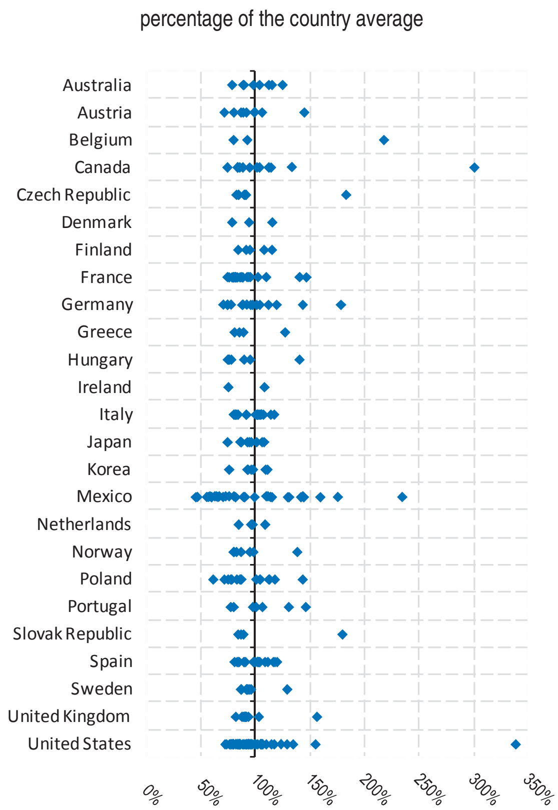


Notes: Analysis based on TL3 (Territorial Level 3) which corresponds to the smallest category of regions in the OECD Regional Database, except for countries with an asterisk where the unit of analysis is Territorial Level 2.

Source: OECD (2007), *OECD Regions at a Glance*, OECD Publishing, Paris.

Figure 1.19. Regional dispersion in GDP per worker

2005



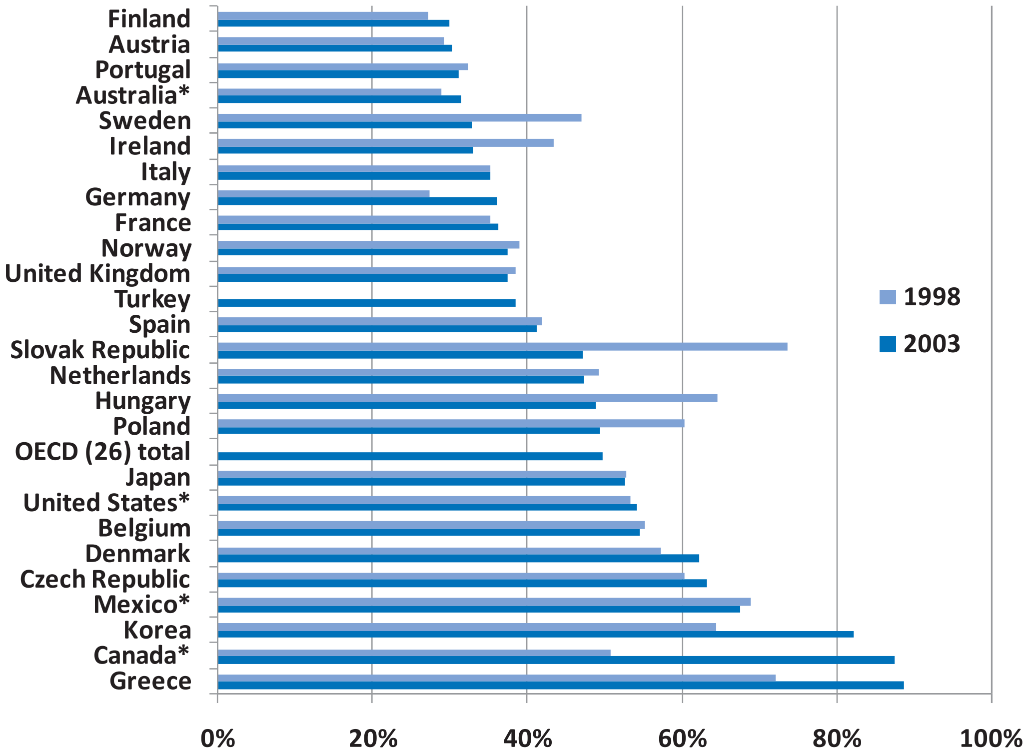
	No. Regions	No. regions above national average	CV change 99-05
Australia	8	4	+
Austria	9	2	+
Belgium	3	1	-
Canada	12	6	-
Czech Republic	8	1	+
Denmark	3	1	+
Finland	5	2	-
France	22	4	+
Germany	16	6	+
Greece	4	1	+
Hungary	7	1	+
Ireland	2	1	+
Italy	21	11	+
Japan	10	3	+
Korea	7	2	+
Mexico	32	12	-
Netherlands	4	1	-
Norway	7	1	-
Poland	16	7	+
Portugal	7	4	+
Slovak Republic	4	1	+
Spain	19	10	+
Sweden	8	1	-
United Kingdom	12	2	+
United States	51	15	+

Notes: The coefficient of variation (CV) is the ratio of the standard deviation to the mean. It indicates a high or low degree of variability in relation to the mean value. The higher the coefficient, the higher is the dispersion of the variable under analysis. For the year 1999, data for Mexico refer to 1998. For the year 2005 data for Mexico refer to 2004.

Source: OECD Regional Database, 2008.

The share of total employment in regions with levels of productivity below the national average gives a sense of the share of workers affected by this problem. For this indicator, the OECD average is around 50%, while Mexico compares unfavourably with over two thirds of total employment in regions where productivity is lower than the country’s mean (Figure 1.20). All these facts lead to an important conclusion of the need to raise productivity levels (especially in less-performing regions) to ensure better overall economic growth and stop the divergence process of recent years.

Figure 1.20. Percentage of workers in regions with GDP per worker below the national average



Notes: Analysis based on TL3 (Territorial Level 3) which corresponds to the smallest category of regions in the OECD Regional Database, except for countries with an asterisk where the unit of analysis is Territorial Level 2.

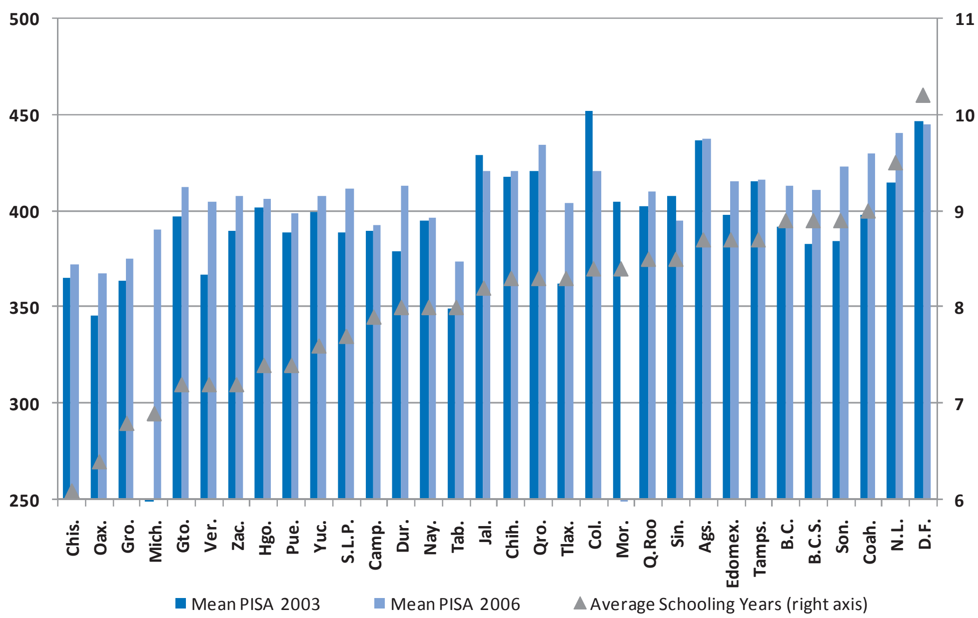
Source: OECD (2007), *OECD Regions at a Glance*, OECD Publishing, Paris.

The tougher question concerns what actually determines labour productivity and, if at all, it can be enhanced through policy action. A recent study finds that there is concluding evidence that "uniform productivity gaps" exist between states even when considering the same sectors. This would imply that sectoral composition is not the only determinant for observed levels of labour productivity. In turn, education and human capital have been found to play an important, but not exclusive, role in determining the levels of productivity. Other, and perhaps the most important, explanatory factors seem to be an "augmented" measure of MFP and physical capital (Esquivel and Messmacher, 2002).[9] These findings confirm that the importance of knowledge accumulation and technology as key drivers of economic growth is not only present at the national level but also on a regional dimension. Finally, the study finds that an important structural change in the factors contributing to economic growth lies beneath the recent evolution of regional productivity trends. In this sense, the so called structural change is directly linked with human capital formation and infrastructure as determinants of economic performance; and these two elements can be directly influenced through efficient design of public policy.

Education and human capital

The importance of education and the consequent formation of human capital, as means to boost economic performance, have already been discussed. It is also true that the levels of education and human capital vary widely across Mexican regions not only in terms of average schooling years, but also in the performance of current students (see Figure 1.21). It is once again those regions that are performing economically better (predominantly northern states, Aguascalientes and Quintana Roo) that show the highest averages in schooling years and PISA results. Additionally, these same states have shown the most improvement in student performance (as measured by PISA). Mexico City shows the highest levels in both average schooling years and PISA scores, while some regions around the capital (Morelos and the State of Mexico) have also shown above average results in both indicators. Lagging regions display low educational results, especially in the poorer southern region of Chiapas, Oaxaca and Guerrero. A recent empirical study on Mexico shows that around 40% of regional disparities are attributable to persisting differences between regions in terms of human capital (Barceinas and Raymond, 2005). Others have empirically analysed the regional disparities and the role of education in economic growth, and have concluded that human capital investment is a key driver to ensure and speed up the convergence process (Diaz-Bautista and Diaz Dominguez, 2003).

Figure 1.21. PISA results and average schooling years

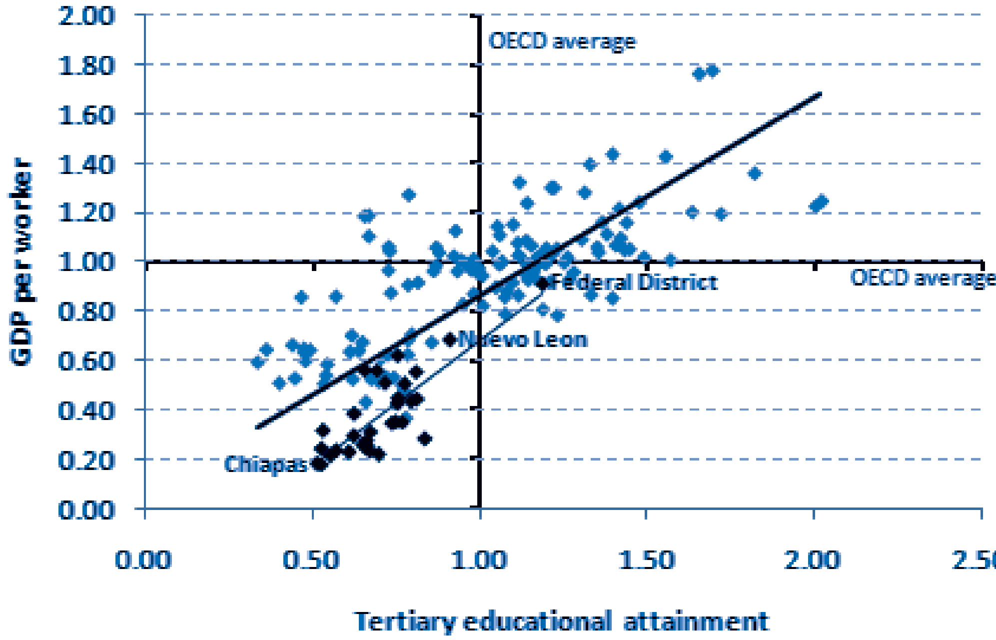


Notes: No results are available for Michoacan in 2003 and Morelos in 2006.

Source: OECD (2007), *PISA 2006: Science Competencies for Tomorrow's World*, OECD Publishing, Paris;INEGI (available at www.inegi.org.mx); and Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. (*Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México*. Mexico, INEE, 2007.

There is a strong and positive correlation between labour productivity and educational attainment in OECD regions (Figure 1.22).[10] For the regions within Mexico, the correlation is even stronger. While correlation does not necessarily imply causation, recent studies for the Mexican economy have documented this causal relationship, confirming that education contributes significantly to economic growth, specifically through certain variables such as average schooling years, tertiary education graduates, total expenditure in education and primary education institutions (Carton, 2008).

Figure 1.22. GDP per worker and tertiary attainment



.

Note: OECD average normalised to 1.0 on both variables.

Source: OECD Regional Database, 2008.

Mexico's performance in overall rates of tertiary educational attainment, while below average, still stands above several other OECD countries. Among OECD members, the share of adult population with tertiary education varies substantially.[11] Countries leading on this indicator include Canada, the US and Japan, which exhibit tertiary attainment rates of 42%, 37% and 34% respectively. Although Mexico at 15% is below the OECD average of 23%, it actually performs better than Italy (10%), Portugal (9%) and Turkey (8%). However, observed differences between countries are smaller than variations among regions. Far from being an exception, the Mexican case exemplifies these regional disparities.

The highly educated population is nevertheless very concentrated within Mexico. While the region in Mexico (at the TL 3 level) with the highest share of adult population with tertiary educational attainment shows levels of 29% (similar to national averages of more developed countries such as Norway and New Zealand), the region with the smallest share is at about 1% (by far the lowest of all OECD regions). Furthermore, if variations across all regions within a country are considered, Mexico ranks as the most unequal of all member countries. Its Gini index (ranging from 0 to 1) of 0.33 is 0.13 above the second highest and 0.19 above the OECD mean. Regional concentration of highly skilled workers could potentially bring benefits derived from the agglomeration of a critical mass of highly educated workers; however, if great disparities persist, the growth potential of other regions (with low levels of tertiary attainment) is severely restricted.

Regional specialisation and clusters

The concept of specialisation is far from new to economic theory. History has shown that particular locations tend to specialise in certain activities, and in that sense, firms specialised in the same sector or productive chains seem to cluster together. Perhaps the most known theory of specialisation comes from David Ricardo in the nineteenth century. He argued that countries and regions specialised in particular economic activities based on their comparative advantages. The same theory proved that great economic benefits could be derived from such specialisation when considering trade between nations or regions which concentrated in the activity in which they were relatively more competitive. Later on, Alfred Marshall demonstrated that important gains could be obtained in terms of firm productivity when several firms specialised in the same economic activity located within a same geographical location, as a result of labour market pooling, knowledge spillovers and supplier specialisation. More recent work suggests that through the effects of the market, investments would be driven towards best performing regions in terms of factors such as infrastructure, skills and education of the working force, geographical location and lower levels of uncertainty and risk (Krugman and Venables, 1990). Moreover, other theorists argue that specialisation in particular sectors will imply accumulation of assets and advantages (cumulative causation), which is in itself a self-reinforcing process. Finally, the work of Michael Porter highlights how specialisation and clustering is directly related with the innovative process through mechanisms such as the quality of factor inputs (*i.e.*, education), innovation resulting from strong competition between firms, and the institutions that foster and support innovative activity (Porter, 1990).

One of the benefits attributed to clustering is greater firm productivity, derived in part from the circulation of knowledge, people and ideas. As such, it has been widely acknowledged that such circulation is key to the generation and diffusion of innovations in the form of new developments and technologies. Consequently, it is not only R&D investments by themselves, but also diffusion of new knowledge and the externalities that it generates, the mechanisms by which R&D is linked to economic growth. The latter benefit can be maximised, at least in theory, in regions where such circulation is less costly or more accessible. This argument is based on the idea that innovations could flourish in environments which are best suited for knowledge generators to interact, interconnect and collaborate. Some authors argue that while the dominant approach has placed market forces as the main driver for innovation, “the creation of sheltered spaces that can sustain public conversation among a diversity of economic actors who would be unable to interact in this way on their own” is a vital element for inducing innovation (Lester and Piore, 2004). In this sense, a cluster could potentially provide the setting for such interactions to occur.

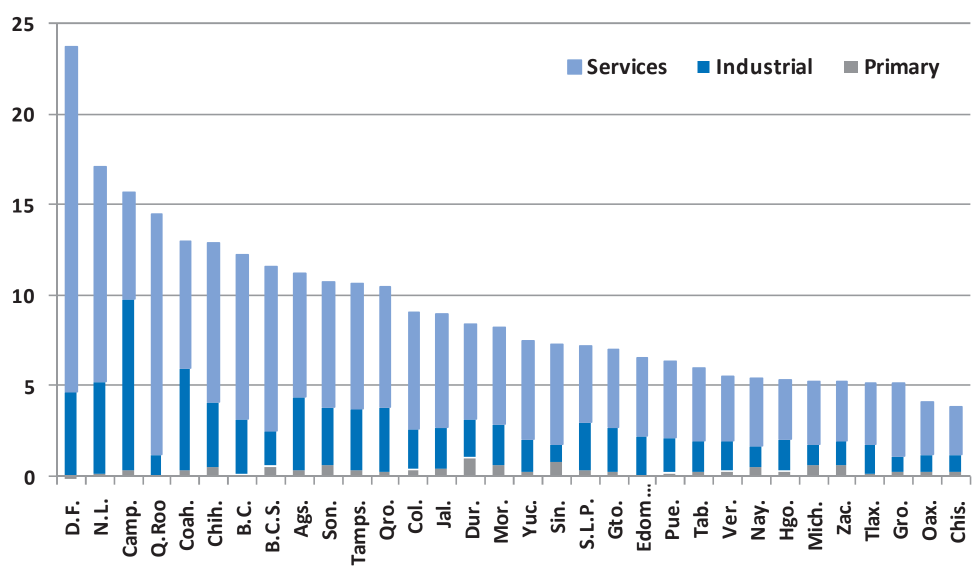
Finally, it is necessary to assess what could potentially be the drawbacks of specialising or clustering in certain activities. Although specialisation does not necessarily imply an over-dependency on a certain economic activity, regions may in fact become vulnerable to unexpected shocks if their economies are too concentrated in a limited number of sectors. Risks could be particularly important for regions specialising in a certain activity, based on the existence of one big firm (multinational, state owned, or large domestic company), as the latter may decide to change its location, go out of business or reduce its current size. While many policy makers seek to support clusters, they may seek high growth or fashionable sectors in which international competition is particularly high or the costs associated with building a critical mass may outweigh the potential benefits.

Regional specialisation in Mexico: status and trends

The broad economic structure of states has changed over time, with an increasing share in the services sector, albeit less so than most OECD regions. This sector is predominant in all but one (oil-based Campeche) of the states (Figure 1.23). However, it is particularly high in tourist-driven economies such as Quintana Roo, Guerrero and Southern Baja California as well as the capital Mexico City with shares ranging from 78% to 92%. States with the lowest shares tend to be those specialised in manufacturing activities including Coahuila (54%), San Luis Potosi (58%), Guanajuato and Aguascalientes (both at 61%), but not too far from the national average of 67%. In terms of the industrial sector, Campeche (60%) stands out as particularly concentrated, based mainly on its oil-extraction industry. The average share in the industrial sector is around 28% with highest concentrations coming from those states with the lowest shares in the services sector. Finally, the primary sector seems to be relatively high in Durango, Michoacan, Zacatecas and Sinaloa with shares of over 10%, contrasting with the Mexican state average of 5.5%. Three of the strongest regional economies (D.F., Nuevo Leon and Quintana Roo) show particularly low percentages at less than 1.2%.

Figure 1.23. Distribution of state GDP per capita by main economic sector

thousands of USD (PPP)



Source: OECD calculations based on INEGI.

Within this context, there are a number of regional specialisations across states that could indicate the presence of a cluster. Concentration of employment in particular industry codes can generate location quotients that reveal whether there is a higher concentration with respect to the national average. Cluster mapping studies, beyond location quotient analysis, serve to diagnose whether there are linkages that would make this concentration an actual cluster. However, given the limited availability of large scale empirical reviews on clusters in Mexico, mapping the level of regional specialisation may at least give us a sense of where (and in which areas) states could gain from the benefits of concentrating resources in a particular sector or economic activity.

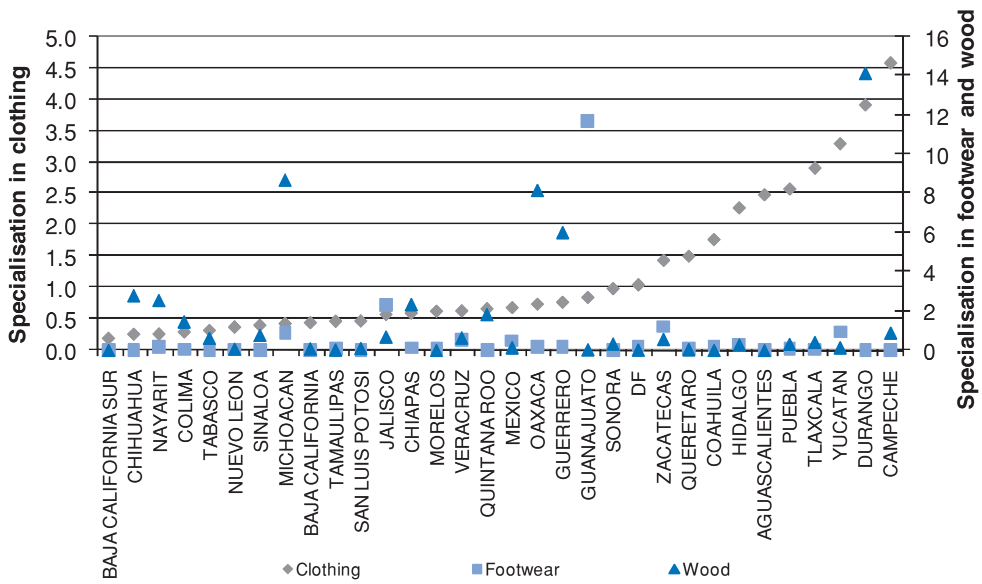
Analysing specialisation across Mexican states reveals that an increasing tendency of specialisation, reinforced since NAFTA, has been observed at the regional level. This analysis is even more interesting when grouping specialisation in industries classified by their technological level (see Figures 1.24, 1.25, 1.26, and 1.27). While these results present a snapshot of specialisation of states in particular industries (three per technology level), there are also important changes over time (see Figures 1.A1.1 to 1.A1.5 in Annex 1.A1). However, although a state may be specialised in a given industry (due to its share of employment), this does indicate that it is a particularly strong sector (or that a critical mass exists) as it does not show the overall or absolute value of employment in such a sector.

As would be expected, there are important variations across Mexico in terms of what regions specialise in, depending on the technological level of sectors and the degree to which state economies are developed. However, there are examples of advanced regions showing marked specialisation in lower technology sectors. And these industry code classifications do not take into account the technology level of the activity within the sector (see later Table 1.9 and discussion). In terms of the clothing industry, Yucatan, Campeche and Durango come up as the most specialised, but more advanced economies such as Aguascalientes, Coahuila and Queretaro also show well above average specialisation levels. On the other hand, states specialising in higher technology levels correspond to more advanced economies within Mexico. In the mid-high tech classification, and concretely in the auto industry, northern states are particularly specialised with Chihuahua and Coahuila showing high specialisation indices. Other states with a strong specialisation pattern in auto include Tamaulipas, Queretaro, Aguascalientes, Sonora and San Luis Potosi, most of which are among the more advanced economies. In terms of the electric equipment and machinery sector, the same tendency is observed with Nuevo Leon, San Luis Potosi Queretaro, Tamaulipas and Chihuahua among the most specialised.

Finally, with respect to the high-tech manufacturing sectors, the relationship between more developed economies and specialisation is particularly clear. For the electronics industry, Baja California, Sonora, Tamaulipas, Chihuahua, Aguascalientes and Jalisco are the only states showing specialisation in the country (*i.e.*, with an index above 1). In terms of the information technology sector, Jalisco and Chihuahua come out clearly as the most specialised states in Mexico, while Tamaulipas also shows an important degree of specialisation. The last analysed sector corresponds to the pharmaceutical industry where Mexico City and nearby Morelos and the State of Mexico (with Jalisco also showing some specialisation) as the most specialised regions (only these four have an index above 1). The proximity of these three states may indicate that this sector has located around one specific area in the country which could potentially be or become a cluster, however, further analysis would be needed to make such a statement. Acknowledging the limitations of only looking at the data of three sectors per each technology level, it can be said that specialisation in higher tech sectors is found predominantly in northern border states and the centre/centre-west regions, which in turn corresponds to the relatively more advanced states in the country.

Figure 1.24. Specialisation in specific low-tech manufacturing industries

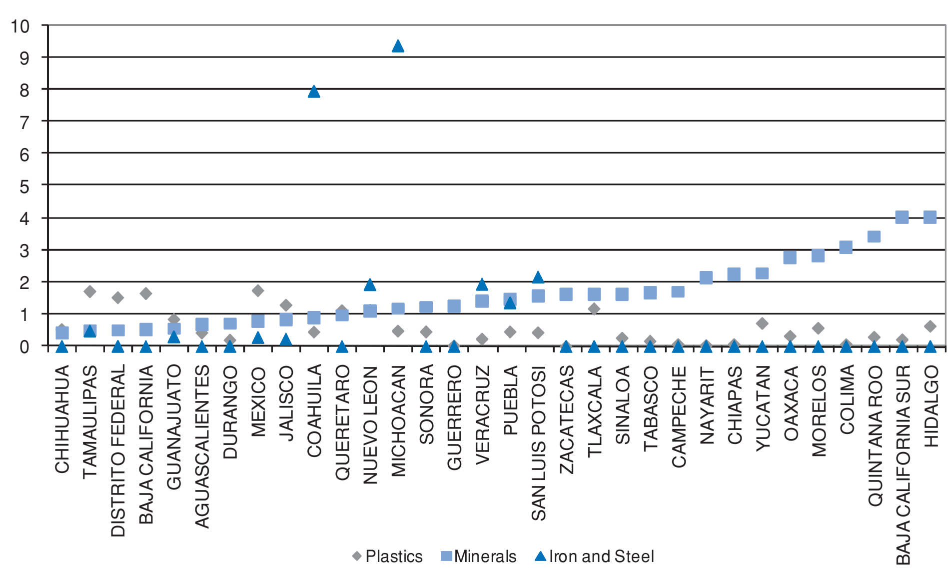
2003



Source: OECD calculations based on data from INEGI.

Figure 1.25. Specialisation in specific mid-low tech manufacturing industries

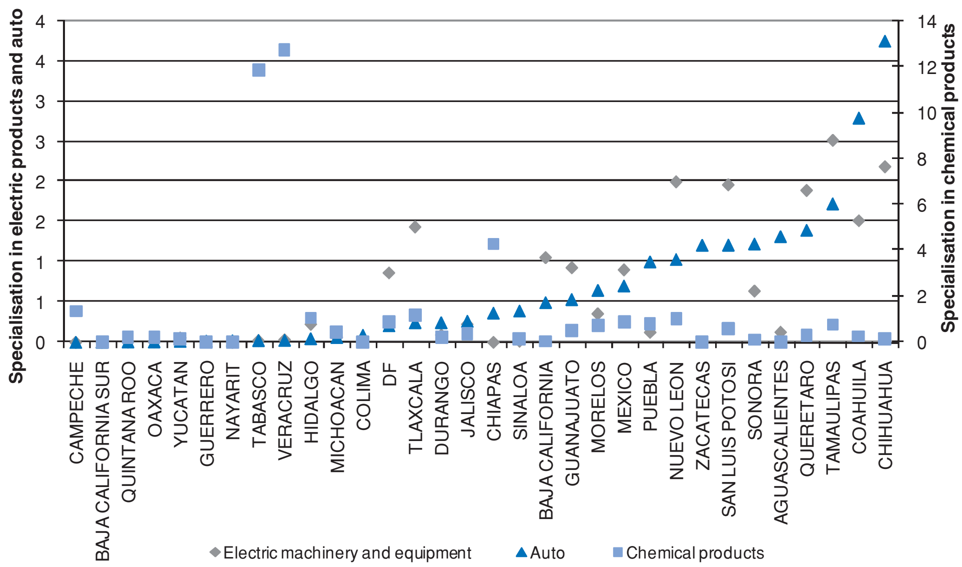
2003



Source: OECD calculations based on data from INEGI.

Figure 1.26. Specialisation in specific mid-high tech manufacturing industries

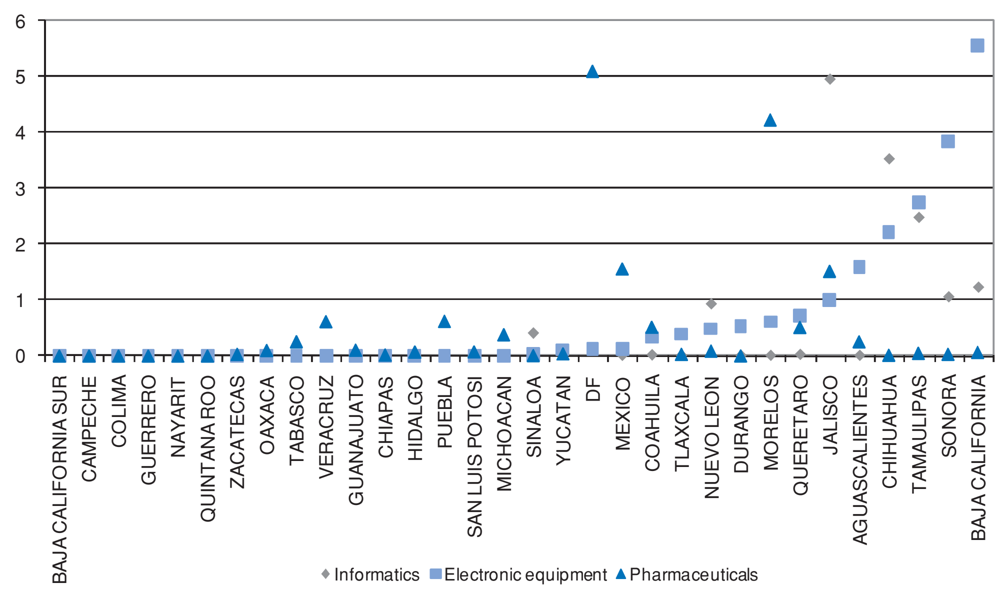
2003



Source: OECD based on data from INEGI.

Figure 1.27. Specialisation in specific high-tech manufacturing industries

2003



Source: OECD calculations based on data from INEGI.

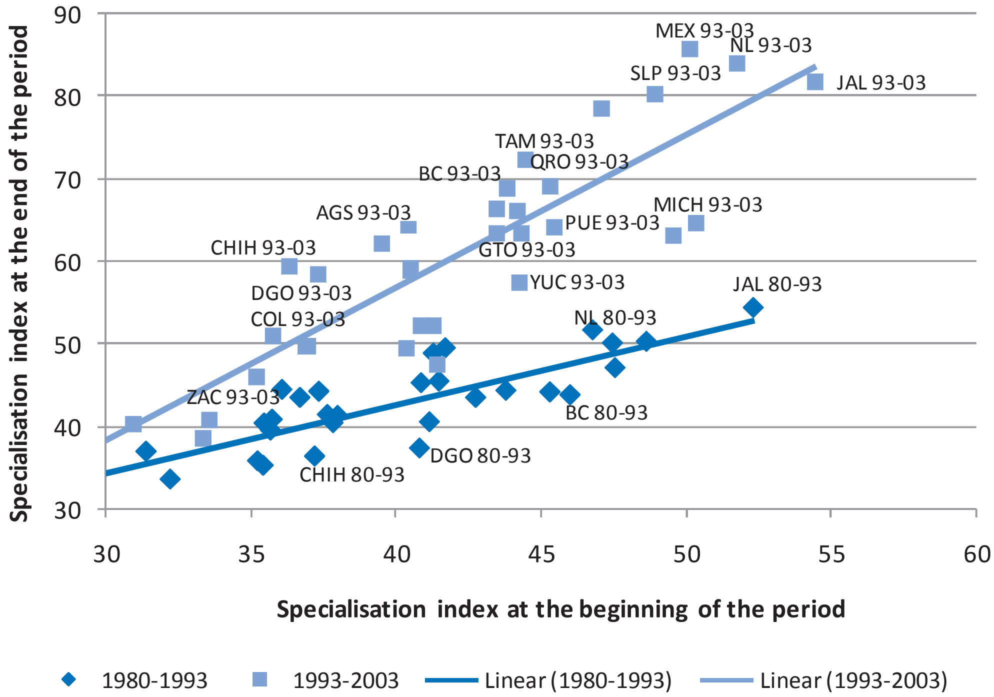
When analysed together, these different industry specialisations within manufacturing reveal a general trend towards greater specialisation. A "general specialisation index" in manufacturing based on traditional measures of specialisation such as the Balassa-Hoover index (or location quotient) was developed for this analysis.[12] This data suggests a first interesting conclusion, showing an increasing specialisation since the signing of NAFTA (Figure 1.28). In this sense, free trade has supported specialisation, and further specialisation could be expected as Mexico has signed a number of free trade agreements with other countries since 1993. The states that were initially more specialised at the beginning of the period were also those more specialised at the end of the period studied. These results are consistent with the fact that, with the exception of Chihuahua, all other states located in the northern border have shown (for 2003) degrees of specialisation within the 10 highest in Mexico (Figure 1.29). It is also important to note that the four biggest economies (State of Mexico, Nuevo Leon, Jalisco and Mexico City) are four of the five most specialised states in the country.

These manufacturing specialisation trends in Mexico have also increased the technological disparities between regions. High-tech related activities have shown a tendency to locate in higher income states. However, some of the so-called lagging but performing states seem to be in some way catching up; this includes states in the northern non-border region such as San Luis Potosi, and Yucatan in the south-east region. This trend reveals a possible industrialisation wave from north to south, but also could be related to further divisions within high-tech sectors. Although the data does not provide sufficient information to make this conclusion, it is possible that these results are due to higher value-added processes such as software or IT locating in the north and electric components for the electronics industry locating in the south.

This preliminary analysis also illustrates a positive link between productivity (measured as gross value added per worker) and specialisation (Figure 1.30). While there are many determinants of productivity, as has been previously mentioned, this evidence confirms that there may be potential benefits from a certain degree of regional specialisation.

Figure 1.28. Regional specialisation

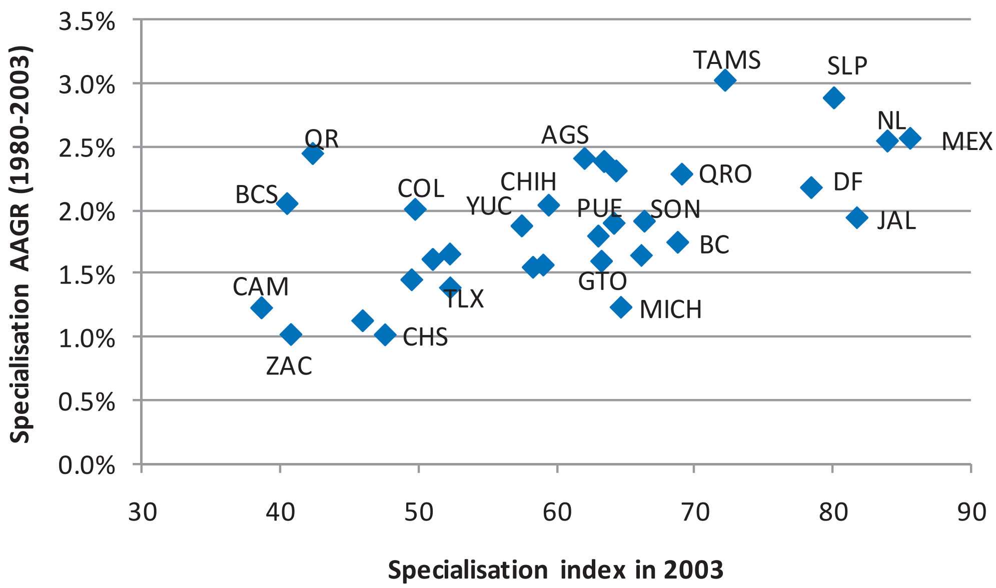
By state in manufacturing (1980-2003)



Source: OECD calculations based on data from INEGI.

Figure 1.29. Changes in regional specialisation

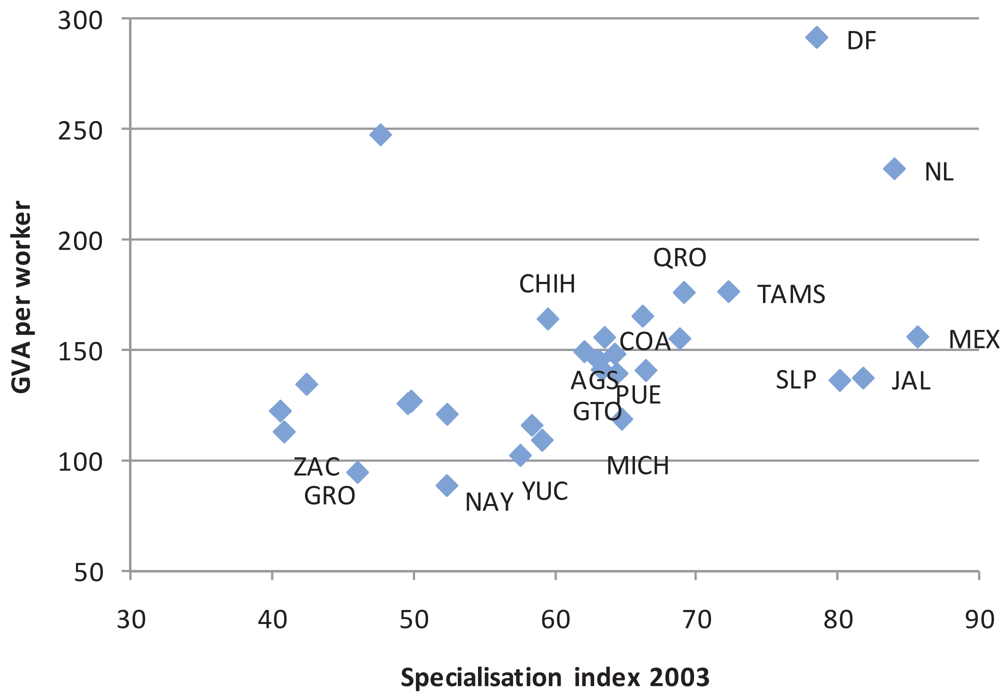
AAGR (1980-2003) and index values (2003)



Source: OECD calculations based on data from INEGI.

Figure 1.30. Specialisation and labour productivity

2003



Source: OECD calculations based on data from INEGI.

Regional disparities in Mexico's FDI: employment, productivity and R&D investment

The pursuit of foreign direct investment is a high priority across Mexican states. Overall, for the period 1994-2007, FDI accounted for 2.4% of Mexico's GDP and 16.2% of gross formation of fixed capital (gross fixed investments). Between 1994-2001, FDI inflows increased significantly with NAFTA. However, since 2002 there has been a higher level of uncertainty, coming from the impacts of US economic activity (and its stagnation in the early 2000s) as well as increasing competition from Asia. Even more troubling is the fact that the share of FDI in new investments has fallen significantly to below 30% in 2006. In this sense, intra and inter-firm arrangements have increasingly substituted for new investments. The service sector, notably with banking sector privatisation, has attracted an increasing share of FDI. Finally, the source of Mexico's FDI has shifted. Prior to 2001, FDI was mainly from the US, but since 2001 the US accounts for less than 40% with an increasing amount from EU countries, Asia and Latin America.

There has been little systematic research on Mexico's FDI from a territorial perspective despite the strong territorial concentration of FDI flows. However, the academic literature has increasingly considered FDI from a systemic perspective (Box 1.3). These new approaches elaborate the mechanisms through which FDI can have an influence on employment, productivity, R&D investment and innovation.

Box 1.3. **FDI and a systemic approach**

The potential effects of FDI are increasingly being discussed from a systemic perspective, *i.e.*, at the micro, meso or institutional and macroeconomic levels of analysis (Meyer-Stamer, 2005; Messner, 2002). Such a systemic perspective is particularly relevant for understanding the effects of FDI on innovation, productivity and employment, since the effects can vary depending on the specific level of analysis and there are at least four forms to channel technology, knowledge, organisational methods and learning processes. These channels include: *i*) the imitation and use of processes, methods and technologies, *ii*) the acquisition of skills, *iii*) export-promotion, and *iv*) increasing competition generated by FDI. Technology transfer, from this perspective, can take place at different levels of analysis.[13] In addition, typologies and specific characteristics of global commodity chains and the meso-economic and institutional level of analysis are critical, as well as the degree of integration between firms that allows for different levels of learning, innovation and collective efficiency (Humphrey, 2004; OECD, 2001). More specifically, regarding the topic of innovation, Lester and Piore (2004) highlight the relevance of this meso-economic level in terms of the concept of the “interpretative process” that generates processes of creativity in the economy in contrast with processes only based on efficiency, competition and market-mechanisms. As a result, the authors argue for the creation of protected spaces that enhance this interpretative process in educational institutions, management and engineering, for example. From another perspective, Rodrik (2006) also finds profound changes in China’s exports in the last decades, resulting from long-term public industrial policies that allowed for an effective upgrading and innovation process (Yusuf 2004). These topics allow for a deeper understanding of Dunning’s (2006) eclectic approach of FDI.

The study of Ruiz Duran (2006a) shows that the main characteristic of Mexico’s territorial restructuring since the 1990s has been the decentralisation of processes in Mexico City and its “hinterland” (including the State of Mexico, Morelos, Tlaxcala, Hidalgo and Puebla) towards Northern states close to the US border such as Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon and Tamaulipas) and states of reindustrialisation (Jalisco, Aguascalientes, Guanajuato, Queretaro and San Luis Potosi). This new territorial pattern of development reflects one of the main features of Mexico's export-oriented industrialisation since the late 1980s; the more resource-based south of Mexico was not integrated to this process.

Several studies of Corona Treviño (1999, 2005) reflect on the national innovation system and different phases in Mexico. Issues analysed include technology-based firms and technological research centres by industrial activity and region, in particular in the regions of El Bajio, Cuernavaca (Morelos), Guadalajara (Jalisco), Monterrey (Nuevo Leon) and Mexico City. Conclusions show that in general, technological activities are scarce; technology-based firms are on average small firms of national capital with only 15.5% of innovating firms being controlled by foreign capital. As a result of field research the analysis points out that innovation in Mexico could be divided in three periods: *i*) Centralised take-off in Mexico City until 1958, *ii*) Regionalised growth (1958-1994), and *iii*) Fall (1994-2000). Particularly in the latter period, expenditures in science and technology and institutional weaknesses affect the national innovation system, while deepening the lack of integration with Mexico’s southern region.

Another recent study (Dussel Peters *et al.* 2007) examines the performance of Mexico’s FDI from a micro, meso, macro and territorial perspective. It concludes that FDI is positively associated with GDP, employment, wages and exports, among other variables, although the share of FDI in Mexico’s total economy is not sufficient for pushing the rest of the economy. Moreover, FDI has deepened territorial polarisation and the north-south cleavage, and its association to expenditures in technological R&D is negative in manufacturing. The coefficient of R&D over production fell substantially for the main 10 and 20 economic classes according to their share in terms of FDI, and was lower than for the rest of Mexico's manufacturing sector.

FDI flows in Mexico are highly concentrated (Table 1.4). Two regions – the Centre and Northern Border regions – accounted for more than 90% of Mexico's FDI during 1994-2007, although with a notable decline in the Centre region and in particular for Mexico City (whose share fell by 21.5% during the period). There has also been increasing activity in the Pacific region which has quadrupled its share since 1994.

Additionally, the share of FDI over GDP (which accounted for 2.4% of national GDP during 1994-2007) presents huge territorial disparities. Table 1.5 reveals that the potential learning processes of FDI are highly concentrated in the Northern Border and Centre regions, with an FDI/GDP coefficient of 3.36% and 5.65% for 1994-2006, respectively. The Southern and Gulf & Caribbean regions, on the contrary, present coefficients of 0.11% and 0.46%, hence, given the low levels of FDI, the potential spillovers are virtually non-existent. (See Chapter 2 for more information on FDI policy).

Table 1.4. FDI by region (1994-2007)

Percent of year total

	1994	2000	2005	2007	1994-2007
Northern Border	19.25	31.10	39.39	31.05	25.66
Southern Region	0.07	0.07	0.16	-0.07	0.14
Pacific Region	2.13	6.98	6.84	8.85	4.11
Center-North Region	2.32	3.61	2.74	3.31	2.78
Center-Region	75.30	57.00	48.98	55.41	65.97
Gulf and Caribbean	0.93	1.24	1.90	1.45	1.34

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.5. FDI/GDP by region

Percentage

	1994	2000	2005	2006	94-06	94-01	02-06
Northern Border	2.38	4.41	4.85	2.71	3.36	3.01	3.14
Southern Region	0.04	0.05	0.10	0.11	0.11	0.09	0.12
Pacific Region	0.48	2.10	1.88	1.14	1.02	0.85	1.03
Centre-North Region	0.65	1.26	0.84	0.38	0.88	0.78	0.72
Centre-Region	5.09	5.06	4.02	4.29	5.65	3.88	5.61
Gulf and Caribbean	0.27	0.47	0.61	0.46	0.46	0.29	0.50
TOTAL	2.76	3.51	3.14	2.55	3.29	2.47	3.20

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy and INEGI.

There are also notable regional trends in the industrial branches with FDI flows. The main 10 branches in terms of FDI flows accounted for 60% of FDI during the period 1999-2007. An index of FDI specialisation was developed for this regional analysis (see Annex 1.A1 for more details) with the following results:

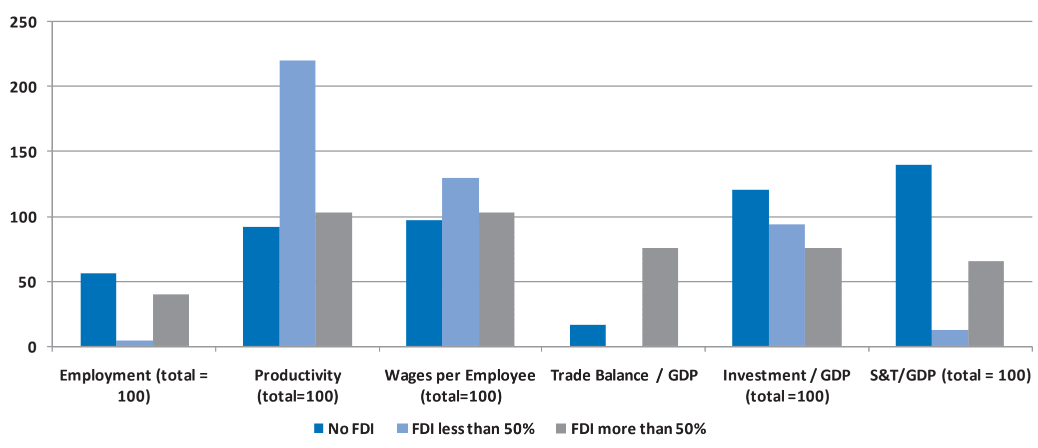
- The Northern Border region presents high coefficients in manufacturing – and three branches related to transport equipment and automobile branches – as well as in services related to these processes.

- The Centre region has specialised in infrastructure, in the auto parts-automobiles chain and manufacturing and trade-related activities in food and beverage branches; six out of the main ten branches are related to manufacturing.
- The Centre-North region is highly specialised in agro-industry activities such as wood and food products, as well as in services for these activities.
- The rest of the regions – in particular the Southern, Pacific and Gulf & Caribbean regions – present high specialisation patterns in services and agriculture. Fishery, construction and tourism play an important role in the Gulf and Caribbean region.

While it is presumed that big manufacturing firms (BMF) and FDI will bring technological spillovers through S&T expenditures, greater productivity and higher wages, this is not necessarily the case (see Figure 1.31).[14] Productivity and wages per employee are highest in firms with less than 50% FDI, while firms having no FDI had values only slightly lower than firms with more than 50% of FDI participation. There is a relatively low coefficient of science and technology (S&T) expenditure over total GDP (understood as the Census value-added) of 4.32% for all BMF. Surprisingly, BMF branches with no FDI present the highest coefficient (6% of GDP), while BMF branches with FDI present significantly lower coefficients (0.51% and 2.82% for BMF with less and more than 50% of FDI over the respective social capital). BMF branches with no FDI account for 56% of total employment and the lowest productivity levels (but only slightly below those BMF branches with more than 50% of FDI); the same group of BMF branches also presents the highest levels of investments/GDP (15.8%) and a positive trade balance. Firms with a controlling stake of FDI in BMF present a much higher export-orientation than the rest of the firms (148% of their GDP and thus reflecting a high share of processes based on temporary imports to be re-exported), but present the lowest rates in terms of investments and S&T coefficients well below those of BMF with no FDI. An analysis of these big manufacturing firms by branch reveals that of the 86 branches, only nine present S&T coefficients above the BMF average, with 25% of BMF branches showing practically no S&T expenditure at all.

Figure 1.31. Big manufacturing firms by FDI share

Main economic characteristics (2003)



Source: Dussel-Peters for the OECD based on data from INEGI.

The informal sector constraint

Another barrier to raising productivity is the importance of the informal sector of the economy. Informal employment usually implies social hardship, few opportunities for human capital upgrading, high job uncertainty and in many cases, low productivity, but it is a complex problem (see Box 1.4). Although it is not easily measured and there is no consensus on a universal definition, it can be said that employment in the informal sector has grown with total employment (OECD, 2007h). For Mexico overall, that share remains large at over 25%. The informal sector could represent as much as 12.2% of the economy's total gross value added. According to official data, from 2002-04 over 260 000 informal micro businesses were created while 10 176 formal micro businesses disappeared (Marquez-Padilla and Tapia, 2006).

Box 1.4. **The informal economy in Mexico: multiple issues**

The results of informality on the economy are not entirely straightforward. On the one hand, some workers who have not been able to find occupations in the formal sector or lack the skills and education, will then be relegated into the informal economy, usually implying lower earnings coming from low-productivity jobs. On the other hand, recent studies show that workers transitioning out of the formal sector increased their average earnings by about 25%, while those moving from informal activities into formal jobs gained around 15% (Maloney, 2002). This mixed evidence would in turn imply that, to some extent, the informal workers are voluntarily so, suggesting that there is a self-selection process into informal activities in which employees weigh and compare costs and benefits of being formal or not (OECD, 2007h).

The drivers of a large informal sector vary widely. One potential explanation is the high costs associated with entrepreneurial activity and starting a new businesses, costs particularly high for smaller sized firms. Others are based on whether the labour market shows important rigidities, with burdensome regulations (which more often than not are difficult to enforce) and the high costs associated with adjustments in the number of employees. In this context, informality is again often a choice in which costs and benefits of being formal are compared. Previous work by the OECD illustrates how "a low productivity/high-informality trap" can be envisioned where small businesses pursuing expansion and/or movement into higher-value added sectors would have to comply with different regulations, including labour and tax-related regulations (OECD, 2007c). For these firms, the perceived benefits do not outweigh costs, making the common response to remain in informality and hence keeping most workers in low-productivity jobs. In this sense, regions may contribute to making formality more attractive by reducing the burden for firms, while improving the services they provide.

Two of the problems arising from the large informal sector found in Mexico are noteworthy in the context of this study. The first refers to the negative impact it has on tax collection by reducing the tax base. In turn, a narrow base of taxpayers will allow only limited spending on critical programmes aimed at increasing human capital (through health and education services), fostering firm productivity and alleviating poverty. Previous OECD work describes the negative effect the informal sector has in the economy as it undermines the possibility to collect taxes to fund public services (OECD, 2003). This problem is partly caused by the general perception that the costs of taxpaying are higher than the benefits obtained from public goods and services provided by the government, and the consequent reluctance to comply with tax regulations. The second problem refers to the financial restriction faced by informal firms or self-employed workers in this sector. In the absence of a formal firm, it will be difficult for informal owners to obtain credit in which there is limited liability and would hence have to risk personal goods for entrepreneurial projects. The lack of well-registered assets or formal legal status will most likely exclude the informal sector from formal financial options. This will

Box 1.4. **The informal economy in Mexico: multiple issues** (continued)

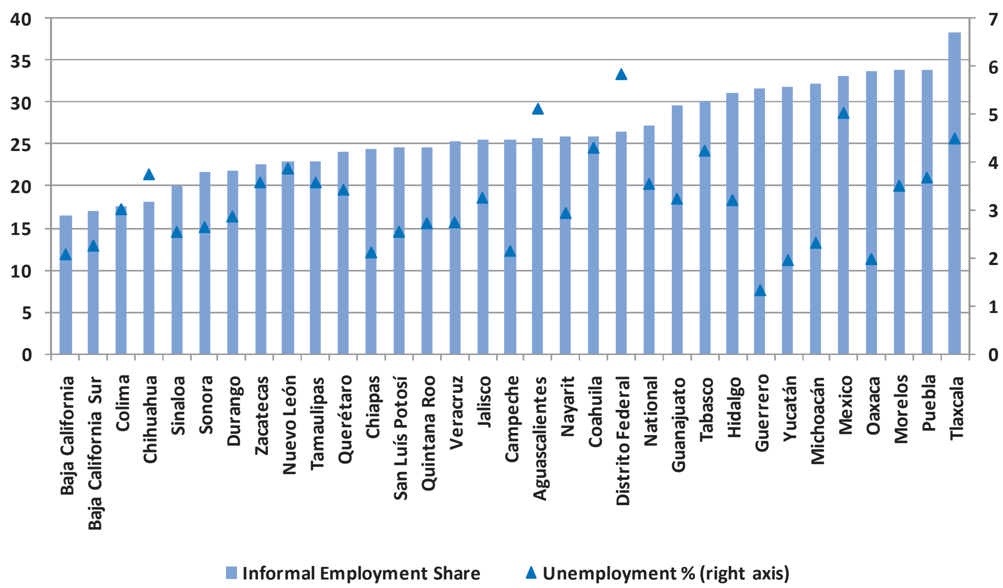
in turn limit their possibilities of new investments or potential expansion. Moreover, and although the financing of innovation is a rather complex matter that shall be discussed later on, being informal will eliminate most opportunities to finance innovative projects (through channels other than own resources) and will exclude firms in Mexico from receiving government support for such purpose.

Although some changes (particularly in the pensions system) have been recently undertaken, further reforms will give greater incentives that will lead towards higher shares of formal employment. These changes include: improving the benefits derived from taxation and contributions, particularly the quality and efficiency of social security services; addressing the rigidities in the labour market through lowering the associated costs of hiring and dismissing workers; and easing legislation for contracts of shorter duration and part-time work (OECD, 2007h). From a more regional perspective, improving the business environment (which will be further explored in the next section) and particularly the “ease of doing business” including registration, licenses, local tax compliance and labour obligations will play a key role in making formality more attractive (and less expensive) for firms, especially small ones. In other words, as the benefits of formality become more tangible and its costs less of a burden, both workers and firms will have more incentives to leave informality.

Empirical evidence shows significant variations across states in terms of informal employment and unemployment (Figure 1.32). While there is not a very strong correlation between higher productivity (defined as GDP per worker) and lower shares of informal employment (+0.41), it is observed that better performing states have, in general terms, levels of informal activity below the national average. However, it is also true that some less developed regions such as Zacatecas, Chiapas and San Luis Potosi have proven that lower overall levels of income and productivity do not necessarily imply above average shares of informal employment.

Figure 1.32. Informality and unemployment rates

Percents (2007)



Source: INEGI, *Encuesta Nacional de Ocupación y Empleo* (ENOE).

The regional competitiveness quest

As Mexico has moved away from the historical model of a closed economy, the challenge of remaining competitive internationally is at the centre of national debate. Ultimately, countries and regions seek to improve competitiveness so as to increase their productivity and raise the population's income levels. From a more dynamic standpoint, recent research concludes that improving productivity levels of any geographical location will increase the rate of return of investments in such place, hence increasing the potential growth rate, since the former largely determines the latter (World Economic Forum, 2008).

A number of competitiveness ranking systems have evolved to help compare this concept of competitiveness across countries. These rankings are derived from a battery of indicators that, based on different theories of the determinants of economic growth, are perceived to play a role in determining the competitiveness of a given place. Many of the component indicators used are interconnected and complementary of one another. The World Economic Forum's country competitiveness ranking (one of the most cited internationally) places Mexico in 57th place, with similar levels as those observed in Poland and Turkey, but several notches down from other emerging economies such as Chile (26), the Czech Republic (33) or China (34).

Of course caution should be used when interpreting such indices. These indicators are the result of weighted averages of different data sets which could be "like adding apples and oranges". Furthermore, the rankings are highly sensitive to the weighting of components of the index (OECD, 2006a). In spite of this, it is recognised that the indicators can be useful (especially for investors) and that they contain valuable information (Lall, 2001).

Within Mexico, several organisations have developed competitiveness rankings for sub-national entities that state and local authorities actively track (Table 1.6). The Mexican Institute for Competitiveness (IMCO) and *aregional.com* are two private institutions which periodically evaluate regions (and more recently metropolitan areas) on the basis of several determinants of competitiveness based on their respective definitions. Two other indices focus on particular elements that may increase the competitiveness of a region. The World Bank's *Doing Business* ranking analyzes, at the regional level, the overall business environment and the "ease of doing business" in Mexican states with an emphasis on the regulatory framework. This more regulatory framework-oriented report has been the focus of many state and local governments looking to improve on this front. The second one is produced by *Fundación Este País* and bases its methodology on previous work by the World Bank. It is aimed at analysing the readiness of the different regions (and the country as a whole) to compete in the knowledge economy based on several innovation-related attributes.

Matters of innovation are not generally considered at the core of competitiveness in these indices, with the exception of the Knowledge Economy Index. Although both IMCO and *aregional.com* consider, to a certain extent, elements necessary to compete through increased innovative capacity, it is not their main emphasis and may be hard to distinguish when looking into aggregated components of their indicators. This may be in part the result of insufficient data at the regional level (which will be further discussed in the next section), but could also reflect the fact that, in general terms, the importance of knowledge and innovation has not been fully perceived at the core of the competitiveness agenda as drivers of economic activity and performance. Recent studies show that the sources behind prosperity tend to be created rather than inherited; coming from productivity based on the way a region competes and not on the industries it specialises in. In this sense, such prosperity will be closely linked to the overall productivity of a region's range of industries, where innovation will be a key driver for its long-term sustained growth (Porter, 2003b).

Regional performance on the two overall competitiveness indicators is generally similar for a given state (Table 1.7). The results are very consistent between IMCO and *aregional.com*, showing a very strong and positive correlation with a couple of major exceptions. Better performing states include the Federal District, Nuevo Leon, Baja California, Aguascalientes, Chihuahua and Coahuila, where the former four states rank in the top five in both classifications, while the latter two possess a top five in one of the two studies. These states are coincidentally (or not) also performing well above average in other variables considered earlier and are mostly among the richest regions. On the other hand, lagging regions in terms of GDP per capita (especially in the poorer south) also seem to lack competitiveness as defined by the indices produced by both IMCO and *aregional.com*.

However, when considering specific elements of competitiveness, relative performance can be very different. With respect to the regulatory framework that facilitates entrepreneurial activity (as measured by the World Bank's *Doing Business*), it can be observed that less advanced regions may have implemented important reforms conducive to improving state level conditions. While some of the best performing states in terms of overall competitiveness (namely Aguascalientes and to a lesser extent Coahuila Chihuahua and Nuevo Leon) also rank high in the *Doing Business* evaluation, states with lower rankings in the first two indicators such as Chiapas, Zacatecas, San Luis Potosi, Sinaloa and Colima (with the exception of Sinaloa and Colima, generally in the bottom half of other indices) have emerged as interesting examples of best practices in the field.

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Table 1.6. Regional competitiveness indices

Source	Focus	Definition	Index Pillars/Components	State Index	City Index
IMCO	Overall Competitiveness	Competitiveness is the capacity of a country, state, city, municipality or region to attract and retain investments	Rule of law Environmental management Human capital Stable economy Political system Factor markets World-class sectors Efficient government International relations utilisation Competitive economic sectors	√	√
aregional.com	Systemic competitiveness	Competitiveness is the set of attributes that a country, (region, state, municipality or city) possesses which allows firms to minimise operating and locating costs, in a way that will let them place their products with competitive quality and prices in foreign and domestic markets	Entrepreneurial activity Firms Sectoral and regional policies Fiscal, commercial, financial and public goods Social values Response to international competition	√	√
Doing Business (WB)	Regulatory (Ease of Doing Business)	Measures the way in which government regulations enhance business activity or restrain it.	Starting a business Registering property Dealing with licences Enforcing contracts	√	n/a
Fundación Este País	Knowledge economy readiness	Knowledge based economies rest on the support of three pillars: a dynamic innovation system, an educated population with skilled human resources and access to ICT infrastructure.	Economic performance Institutional framework and trade openness Dynamic innovation system Education and human resources ICT infrastructure	√	n/a

Notes: n/a = not available.

Source: Aregional.com (2007) *Índice de competitividad sistémica de las entidades federativas* (ICSar 2007), available at aregional.com; *Fundación Este País* (2008) *Resultados nacionales y por entidad federativa del Índice de Economía del Conocimiento,* Mexico, DF: *Fundación Este País*; IMCO (2007) *Competitividad Urbana 2007: Ciudades piedra angular en el desarrollo del país*, Mexico, DF: Instituto Mexicano de Competitividad; IMCO (2008) *Competitividad Estatal de México 2008: Aspiraciones y realidad: las agendas del futuro*, Mexico, DF: *Instituto Mexicano de Competitividad*; World Bank (2008) Doing Business in Mexico 2007, Washington, DC.

The inconsistency between a state's competitiveness rankings and that of its leading cities reveals one of the pitfalls of these indices. Although states as geographical locations for evaluating competitiveness are very important, often what is even more important is a specific location, and it may or may not cross state barriers. Concretely, the relevance of metropolitan spaces or urban areas cannot be overlooked, as it is within these that the core of economic activity occurs and where investments are materialised. Albeit the fact that metropolitan areas are highly influenced by the overall state or even national conditions, one may find highly competitive settlements in less-performing larger regions and vice versa. The economic activity happening occurring in these spaces may of course benefit wider regions or even countries as a whole. This is particularly important for states that possess one or two cities that encompass the vast majority of economic activity and population of a region. There are important contrasts between how the states perform in terms of competitiveness and how its most important cities rank in a national context (see Table 1.7). As such, states that are very important economically such as Jalisco, which ranks 14th in the IMCO state level ranking, has the third most competitive city in the country (Guadalajara). Other important examples include Chihuahua which ranks fourth in the IMCO classification (but 12th in the *aregional.com* ranking) but has, according to IMCO, the second and fourth most competitive metropolitan areas (Chihuahua City and Ciudad Juarez); or Yucatan which despite being ranked 20th as a state, has its capital and main city, Merida, as one of the most competitive within the country (ranking sixth).

Table 1.7. State rankings on regional competitiveness indices

State	IMCO	aregional.com	Doing Business	Knowledge Economy	IMCO (City)
Aguascalientes	5	4	1	6	Aguascalientes (1)
Baja California	3	3	27	5	Mexicali (18); Tijuana (23)
Baja California Sur	8	7	31	3	La Paz (5); Los Cabos (15)
Campeche	17	18	7	16	Carmen (11)
Coahuila	6	5	10	7	La Laguna (13); Piedras Negras (38); Saltillo (41)
Colima	12	10	6	15	Colima (12); Manzanillo (16)
Chiapas	30	30	2	32	Tuxtla Gutierrez (24); Reforma (40)
Chihuahua	4	12	11	9	Chihuahua (2); Juarez (4)
Distrito Federal	1	1	32	1	Mexico City (25)
Durango	21	19	18	20	La Laguna (13); Durango (29)
Guanajuato	16	15	9	21	Leon (14); Irapuato, Celaya, Salamanca (31)
Guerrero	29	31	25	31	Jose Azueta/Ixtapa Zihuatanejo (32); Acapulco (48)
Hidalgo	28	26	16	24	Pachuca (19); Valle de Mexico (25); Tula (57)
Jalisco	14	11	29	13	Guadalajara (3); Puerto Vallarta (39)
Mexico	25	22	28	27	Valle de Mexico (25); Toluca (56)
Michoacan	23	29	14	28	Morelia (34); Zamora (59)
Morelos	19	16	30	10	Cuernavaca (52); Cuautla (63)
Nayarit	13	23	15	26	Metropolitan Puerto Vallarta (39); Tepic (45)
Nuevo Leon	2	2	12	2	Monterrey (7); Cadereyta Jimenez (27)
Oaxaca	32	32	20	30	Oaxaca (36); Salina Cruz (55)
Puebla	26	27	19	25	Puebla (20)
Queretaro	7	6	17	8	Queretaro (21); San Juan del Rio (42)
Quintana Roo	11	13	22	12	Cancun (10)
San Luis Potosi	18	21	4	18	San Luis Potosi (43); Rioverde (69)
Sinaloa	15	14	5	22	Culiacan (28); Mazatlan (33)
Sonora	10	8	13	4	Cajeme (9); Hermosillo (30); Guaymas (64)
Tabasco	24	20	8	17	Villahermosa (37); Comalcalco (50)
Tamaulipas	9	9	21	11	Reynosa (8); Matamoros (17); Tampico (22)
Tlaxcala	31	25	23	14	Metropolitan Puebla (20); Tlaxcala (49)
Veracruz	22	28	24	29	Metropolitan Tampico (22); Veracruz (46); Xalapa (47)
Yucatan	20	17	26	23	Merida (6)
Zacatecas	27	24	3	19	Zacatecas (26)

Note: IMCO city rating for 71 cities.

Source: Aregional.com (2007) *Índice de competitividad sistémica de las entidades federativas* (ICSar 2007), available at aregional.com; *Fundación Este País* (2008) *Resultados nacionales y por entidad federativa del Índice de Economía del Conocimiento,* Mexico, DF: *Fundación Este País*; IMCO (2007) *Competitividad Urbana 2007: Ciudades piedra angular en el desarrollo del país*, Mexico, DF: Instituto Mexicano de Competitividad; IMCO (2008) *Competitividad Estatal de México 2008: Aspiraciones y realidad: las agendas del futuro*, Mexico, DF: *Instituto Mexicano de Competitividad*; World Bank (2008) Doing Business in Mexico 2007, Washington, DC.

The regional innovation dimension

Innovation performance plays a central role in determining a country’s ability to compete, albeit a country’s stage of development determines in part its relative importance. As firms face an increasing number of competitors through globalisation, they need to upgrade by further innovating and creating more value added through new products, processes and organisational arrangements. However, at the core of the previous statement lies the question of where innovation occurs, and if at all, the innovative process can be limited or related to a certain location or geographical space. This question of the place-based dimension of innovation is being studied from different perspectives (Box 1.5).

Box 1.5. **Innovation's spatial dimension**

The level of innovation in a country is influenced by the generation and diffusion of new technology and knowledge, which is in turn a function of investment in basic and applied R&D, the technology transfer effort made by the government (and others) and the success of the education system in producing science and engineering graduates. The absorptive capacity of firms is also crucial for innovative ideas to be translated into productivity gains by firms that are not themselves technology generators. Absorptive capacity, in turn, is closely linked to the level of technical and general education of the workforce, as well as cultural traits relating to entrepreneurship and inter-firm collaboration.

Technology and innovation are not usually created in isolated organisations but, rather, where competent organisations and skilled individuals interact in a constructive and complementary way. First, innovation depends on the scientific capacity of actors and institutions (their ability to acquire existing knowledge and concepts, their openness to new knowledge and their ability to assimilate, etc.). But the technological and entrepreneurial capacity of actors (their capacity to perceive usefulness and applicability of knowledge) is also important. And, finally, industrial capacity plays a role (the capacity of actors to transform concepts and ideas into useful, commercially viable products). The focus of policy makers on the concept of innovation “systems” is an example of how the issue of spillovers and inter-linkages is now central to understanding how innovation is generated. The application of concepts of social capital to innovation is another example.

In this context, the importance of place (innovation’s spatial dimension) becomes clear. The idea that productivity gains are generated on the back of region-level interaction is supported by a large body of literature. Research into the sources of productivity advantages in successful regions has focused principally on the circulation of people and knowledge, the generation of innovative ideas and the development of new products and technologies. In the past, academic work considered knowledge as a public good and technological progress as an exogenous factor to the economic system that affects all companies, regions and countries in the same way. However, more recent “evolutionary” theories have challenged this basic view, recognising that the generation, adoption and diffusion of new technologies is a complex process and therefore endogenous to growth models (Romer, 1990). This change in thinking is visible in the range of public policies in the science and technology field that have developed a strong geographical and relation-building focus into policy strategies.

Box 1.5. **Innovation's spatial dimension** (continued)

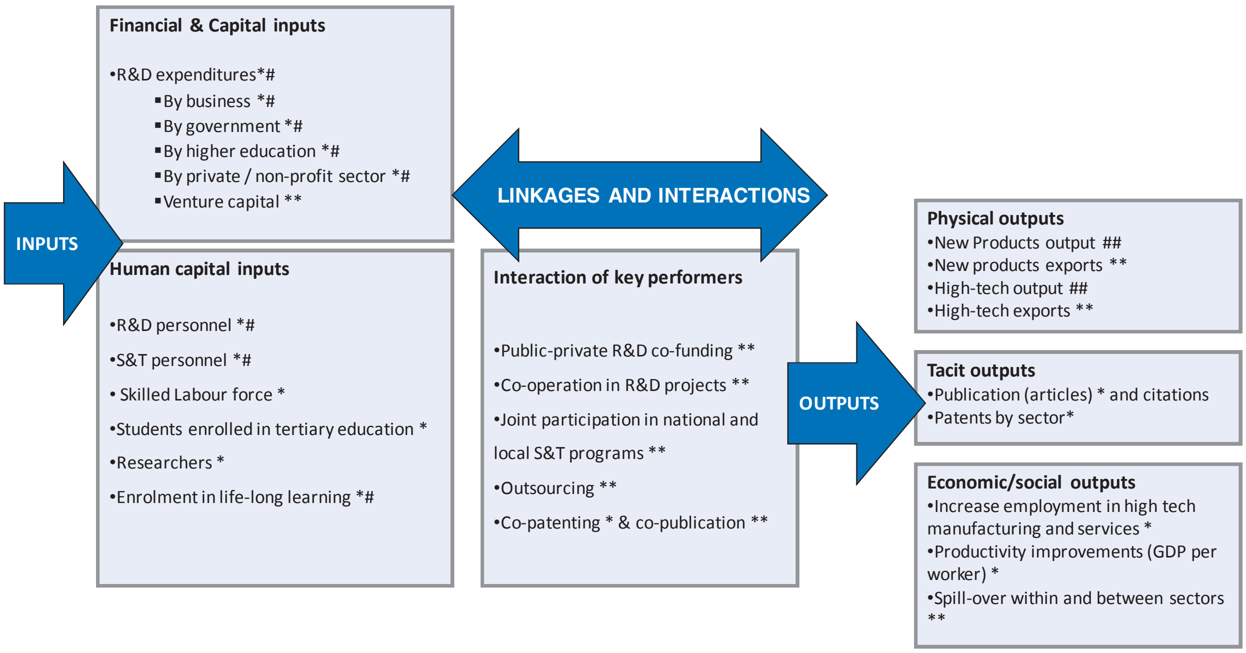
The emphasis on effective institutional management of the resources that generate innovation focuses its attention on *where these interactions take place* – the *spatial* origin of information and technology used by firms to increase their productivity. Does innovation derive from spillovers and diffusion processes that are national in scope, international or even virtual? Or does it arise from processes that are localised in regions or cities? There is strong evidence that the latter is often decisive (though obviously all spatial dimensions contribute). Firms derive added value from their regional environment. The question is how (and if the processes that generate innovation in firms can be strengthened or, if inadequate, "created" or replicated).

Source: OECD (2008), OECD Reviews of Regional Innovation: North of England, UK, OECD Publishing, Paris.

The importance of knowledge accumulation and innovation also holds true for regions around Mexico, where disparities and productivity differentials are particularly marked. As is the case nationally, fostering innovation in regions will allow them to face international and domestic competition. Increasing their innovative capacity will also ensure that firms (located in different regions) will be able to benefit the most from international economic integration by either increasing their absorptive capacity for adapting new technologies or by raising their ability to compete globally through the introduction of new products, processes and organisational schemes (OECD, 2009b). Despite the fact that Mexico's innovation performance and knowledge accumulation lags behind that of most of the OECD's countries, it is also true that there are important contrasts within the country. Regional disparities (as in many of the aforementioned indicators) prevail also in terms of innovation, which in turn contributes to further deepening differences (among regions) in terms of competitiveness and hence economic performance.

For the purpose of innovation, regions contain certain assets (or inputs) which they may, or may not, employ to produce innovations (or outputs). The extent to which a region may transform inputs into outputs will be highly dependent not only on the stock of its assets, but also on existing linkages and the efficiency with which these are used. In this sense, the main innovation indicators can be classified into three parts of the innovative process (Figure 1.33). The first refers to input indicators which include the resources (human and financial) that a region possesses. The second are linkage and interaction indicators which relate to the degree and efficiency with which economic actors and institutions engage with the purpose of innovating. Output indicators constitute the last group and measure potential innovations and created knowledge, as well as their effect on the overall economy. However, for the case of Mexican regions, it is particularly difficult to measure the different elements of the innovative process due to severe data limitations on the measurement of regional innovation-related variables. Consequently, this section will try to present a landscape of the innovative potential and performance of regions with the available existing information.

Figure 1.33. Innovation indicators



Notes:

*   Available for most OECD countries at the regional level.

\# Not available for Mexico at the regional level.

\## Available for Mexico at the regional level (not for other countries).

** Not available at the regional level.

Inputs for innovation

Financial and capital inputs

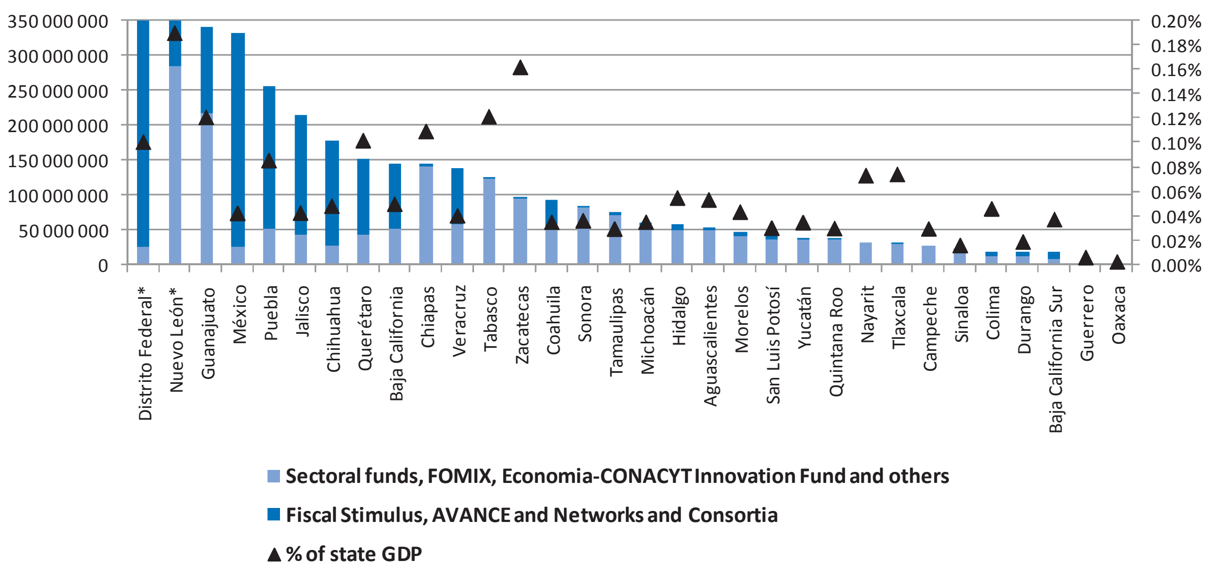
Financing innovation is by no means an easy subject. In fact, the innovation concept embodies some of the most fundamental problems in economics. Concretely, innovations usually imply high levels of uncertainty about both the time and financial resources a project will require, and uncertainty of the probability of success of such projects, with variations being usually quite large, hence making such projects difficult to evaluate (Bergemann and Hege, 2005). Other problems of investing in innovation come from asymmetric information between the owner of the idea and the investor. However, innovative projects also come with a potentially big economic gain for investors and inventors if the project were to succeed, if property rights are well protected and defined. Even more, as highlighted by Arrow, R&D investments usually have a greater social rate of return than the private return due to the positive externalities they generate.

All these problems (or market failures) have made the financing of innovation a particularly difficult matter. Despite the existence of venture capital funds, angel capital and government programmes (among others), financing innovation still shows an important gap beyond what is financed by the inventor. In this sense Mexico is no exception and most innovative projects are financed with intra-firm resources (for further detail, refer to linkages section below). This problem usually comes from the high rates of return required by external investors, which will in turn imply high costs of capital for entrepreneurs hence making their projects non-profitable even though they would have been privately profitable at a nominal exchange rate (Hall, 2005). In Mexico this has been a particularly important problem, that has been exacerbated by the virtual inexistence of venture and angel capital markets and where government programmes are insufficient to fund the required investments in R&D.

No sub-national data exists on public or private R&D expenditures (see previous Figure 1.6 for national figures). The closest available proxy for public expenditure is state-level funding from the National S&T Council (CONACYT) and other ministries aimed at promoting S&T&I activities (Figure 1.34). This funding is through a number of instruments to promote scientific research, innovation and technology development (see later chapters for further description). There are a handful of states that are able to capture the bulk of national level programme funds. The results are not entirely correlated with state size in terms of GDP, as for example Guanajuato receives a high share in absolute dollar (or Mexican Pesos) terms despite being a much smaller economy than, for example, the State of Mexico which received fewer (although fourth most) funds in absolute amounts. There are a number of factors that determine a state's ability to capture these national resources (see later chapters) so these amounts do not necessarily represent the absorption capacity of a state for public R&D spending. In terms of financial resources from the private sector, no data is available at the regional level; hence as a way to show a measurement of how developed or deep financial markets are at the state level, the amount of loans relative to deposits is used as a proxy for access to credit (see Figure 1.35).

Figure 1.34. Regional expenditure of national S&T&I programmes

2006, MXN

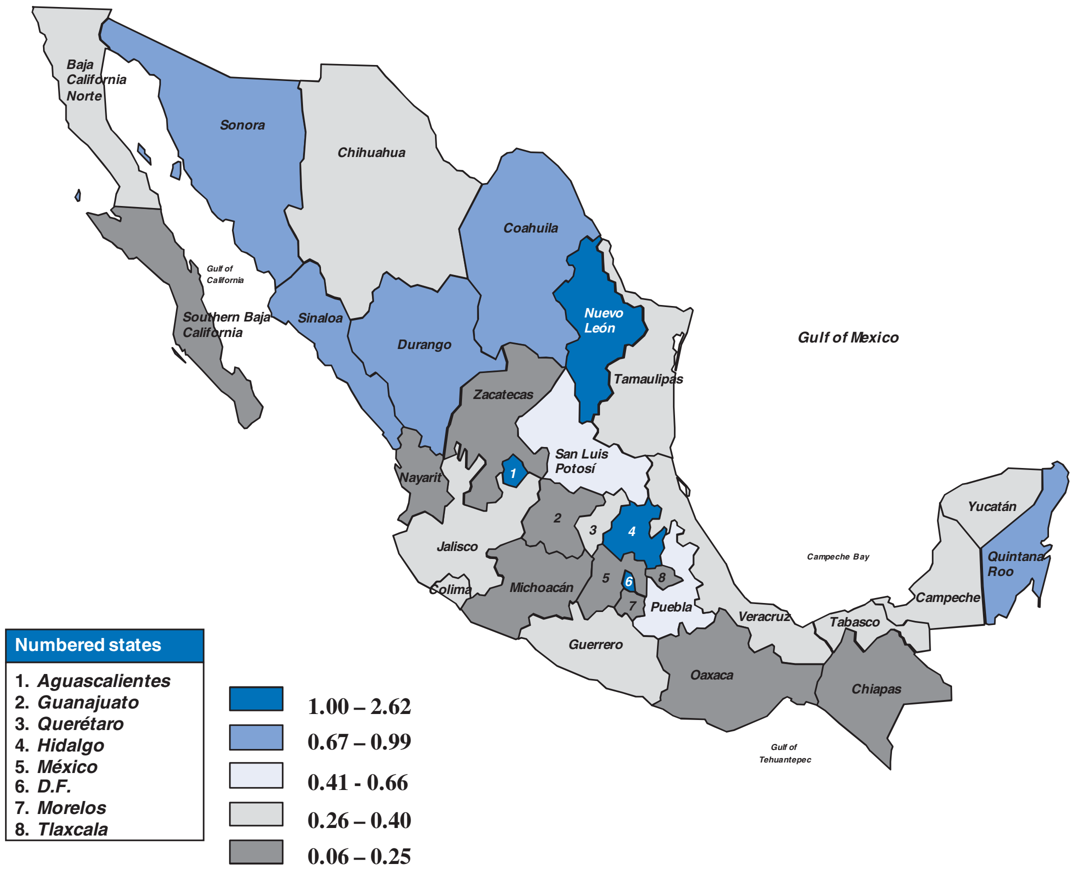


Notes: *i*) Values for the Federal District and Nuevo Leon are MXN 1.77 billion and MXN 1.17 billion respectively. *ii*) Monetary values expressed in MXN. *iii*) FOMIX data corresponds to the total for the period 2001-06 Resources may also come from entities others than CONACYT such as the Ministry of Economy for the Economia-CONACYT Innovation Fund and different Ministries (Sectoral Funds), including the Ministry of Finance (Tax Incentive).

Source: CONACYT (2006), "*La actividad del CONACYT por entidad federativa*", Mexico D.F.: National Council of Science and Technology, and INEGI.

Figure 1.35. Access to credit by state

Loans relative to deposits



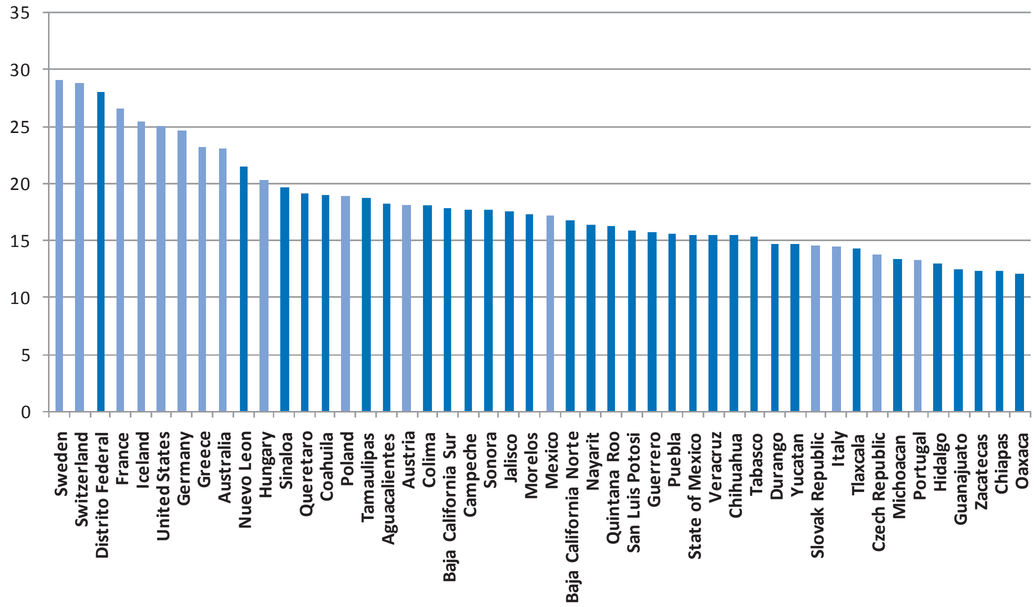
Source: *Comisión Nacional Bancaria y de Valores* (2006), *Boletín Estadístico Banca Múltiple*.

Human capital inputs

Higher education attainment is one of the most important factors explaining a country's or region's ability to innovate, and hence is an important determinant for long-term economic growth. The stock and the ability to produce new graduates (Figures 1.36 and 1.37) will be key in determining the potential of regions, but will also negatively impact disparities if resources are unevenly distributed among territories. In general terms, Mexico's tertiary attainment of the labour force compares well to similar economies in the OECD such as Portugal, the Slovak Republic and the Czech Republic. However, it has already been stated that regional performance in terms of tertiary attainment of the labour force shows marked variations between regions. OECD data shows that it is again Mexico City and several Northern States that show the highest rates (with good results also in other regions such as Queretaro, Aguascalientes, Colima, Morelos and Jalisco), while the poorer regions also lag in terms of highly trained human capital.

Figure 1.36. Tertiary education

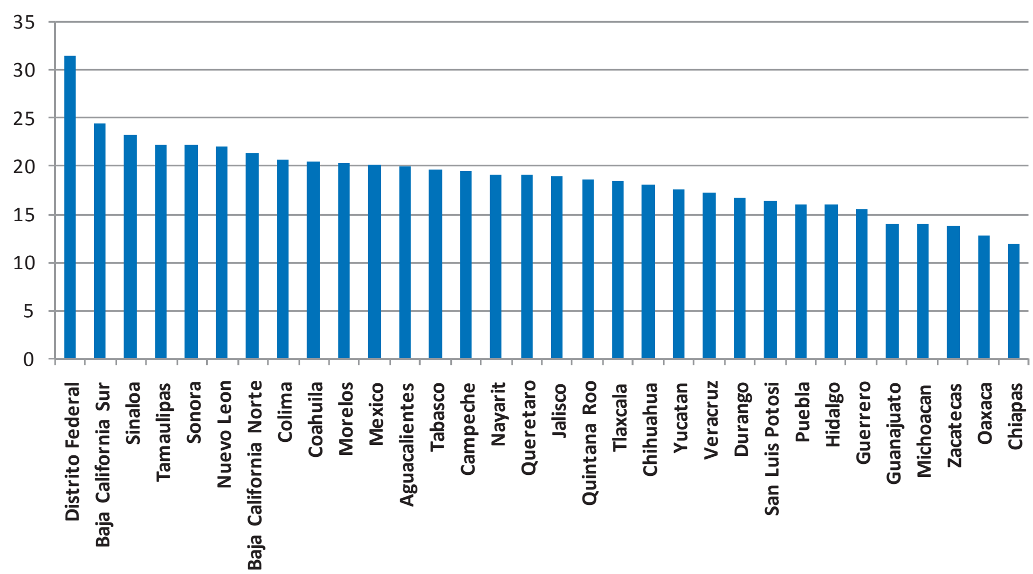
% of the labour force, 2005



Source: OECD Regional Database, 2008.

Figure 1.37. Enrolment at tertiary level

As % of population, 2005



Source: OECD Regional Database, 2008.

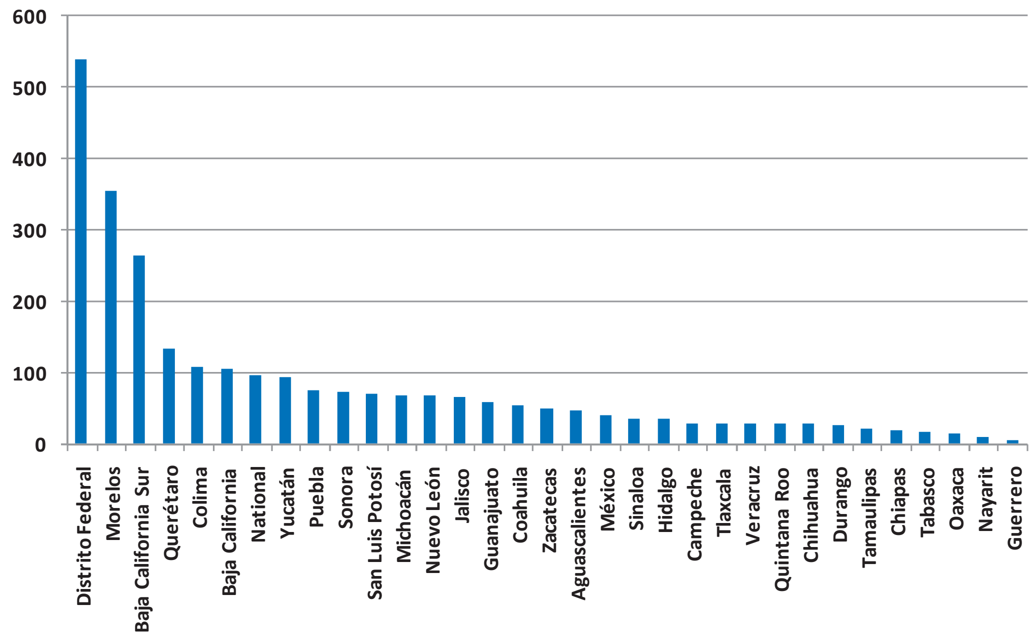
However, it is not enough to have a highly educated workforce if those qualifications don’t match the economic needs of the region. When considering human capital factors in the innovation equation, the answer cannot be exclusively related to the amount of resources, but must rather be seen in terms of the innovative outcomes they may be able to generate. One important indicator for innovation is the level of human resources in S&T related activities. Unfortunately this data is not available in Mexico. On the other hand, the potential success of investments in human capital innovation inputs will be determined by the extent to which they are able to create links, most importantly with the productive (or private) sector, to respond to labour market requirements.

The number of researchers is another central input indicator for the innovative capacity of regions, and is viewed as the key element of the R&D system. Through their capacity to generate knowledge, their ability to address specific social and productive needs and their potential linkage with local industries, researchers may (but not always) contribute to enhance economic activity of regions. In Mexico, however, the researcher system presents two problems. The first (from a national perspective) is the low number of researchers as a fraction of total employment (Figure 1.7), especially when considering that Mexico, similarly to countries such as Turkey, Portugal, Greece, Poland and the Slovak Republic, also exhibits a low intensity of business researchers (OECD, 2007m); and secondly, there is a high degree of concentration of researchers in particular states (while others present very low researcher intensity).

At sub-national level, there is no exact metric of the number of researchers by state. The closest proxy available is the number of members of the National System of Researchers (SNI).[15] These researchers are considered to be of the highest quality within Mexico and receive systematic monetary incentives from the government if they fulfil certain yearly criteria. This subset of the total number of researchers by state (Figure 1.38) reveals that certain states such as the Federal District, Morelos (close to Mexico City) and relatively small (in terms of population) Southern Baja California show by far the highest levels of researcher intensity, all above 250 SNI researchers per 1 million population. Other states performing relatively well on this indicator include Querétaro, Baja California, Colima, Yucatan and Puebla, where the latter three are not among the richest regions, but show interesting opportunities to boost their knowledge generation potential. On the other side of the story, the poorer south again shows well below average results in terms of research intensity, but it is more surprising that certain industrialised or rich states such as Tamaulipas, Chihuahua or Quintana Roo rank among the lowest states in terms of SNI researchers and hence may be limited to further enhance more advanced or innovative economic activities.

Figure 1.38. SNI researchers by state

Per million population (2005)



Notes: Includes all levels (I, II and III) SNI researchers by state.

Source: INEGI.

Linkages and interactions for innovation

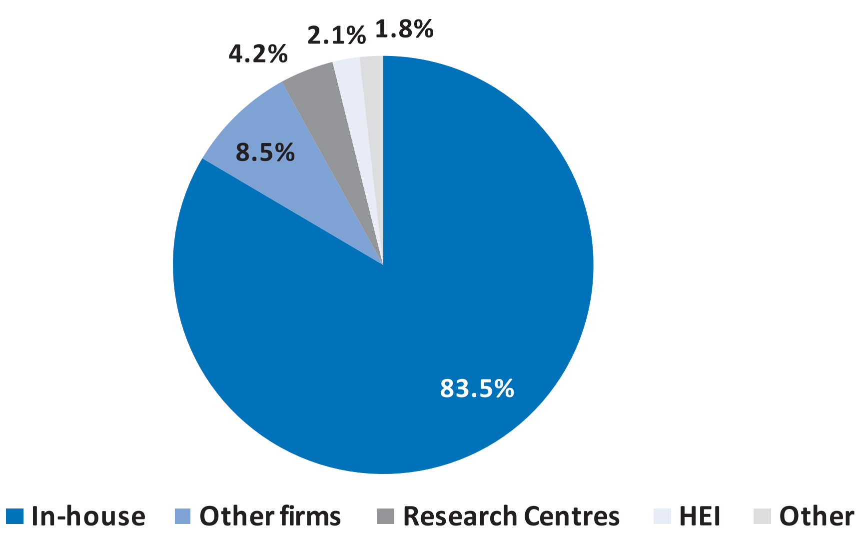
An essential element of the innovation process rests upon the ability of actors to link and interact. Extensive literature can be found on such interactions within a regional innovation system. Such linkages between a group of firms, or between firms and HEI or research centres, often occur within the context of a determined geographical space which many times may refer to a specific region or group of regions. Among the many benefits that interactions in the innovation process may produce, positive externalities, potential synergies between engaging parties and the possibility of addressing common problems are particularly important in the context of this study.

The availability of indicators for measuring the degree and strength of linkages and interactions is one of the toughest challenges for analysing this dimension of the innovation process. The problem is exacerbated at the sub-national level and particularly for Mexico. Additionally, when indicators of this sort exist, the challenge of making them comparable across countries must be taken into consideration. Information for Mexico can only be obtained at the national level mainly through the two existing innovation surveys (CONACYT, 2001 and 2006b), which could potentially be expanded to include a sub-national dimension. Two additional interesting possibilities can be envisioned for the near future, which would allow for regional comparisons. The first refers to a new programme designed by CONACY that would promote states to participate jointly in S&T projects and hence participation rates could provide information regarding linkages. The other would be the elaboration of cluster mapping studies by regions, as groups of firms lie in the core of the regional innovation system concept. Consequently, a tentative way of evaluating the existence and strength of interactions is by looking into agglomeration of firms (or clusters) and their inter-linkages within a given geographical location.

One measure to assess the degree of linkages between economic actors for innovation is the percentage of collaborative efforts in innovation projects. Although no sub-national data is available, national data (Figure 1.39) shows that for 2006, the majority of firms (at over 83%) that conducted innovative projects did it with no collaboration at all, while a small percentage (8.5%) engaged for such purpose with other firms. This implies that a low proportion of firms collaborated with knowledge-generating institutions (only 4.2% of firms collaborated with research centres while 2.1% did so with HEI), showing that interaction between these two types of actors is strongly limited and hence policies aimed at enhancing regional collaboration are needed to integrate innovations systems. Additionally, the latest survey shows that almost two out of every three firms develop innovative projects exclusively with in-house resources; in turn 19% do it with funds coming from government programs and only 12% using private banking institutions.

A similar analysis was conducted to evaluate to what extent innovation projects in manufacturing (by sub-sectors) were performed with institutions outside the firm (Figure 1.40) (CONACYT, 2006b). This data reveals that sub-sectors such as basic metals, non-metallic minerals and clothing, textile and leather, are those that engage the most with research centres, while the carbon, oil, nuclear and chemical, and basic and other metals sectors are more likely to collaborate with HEIs. Further analysis (including that at the regional level) could allow for the identification of factors determining the lack of collaborative efforts. In the following chapters barriers for collaboration and potential policies to eliminate them are further discussed.

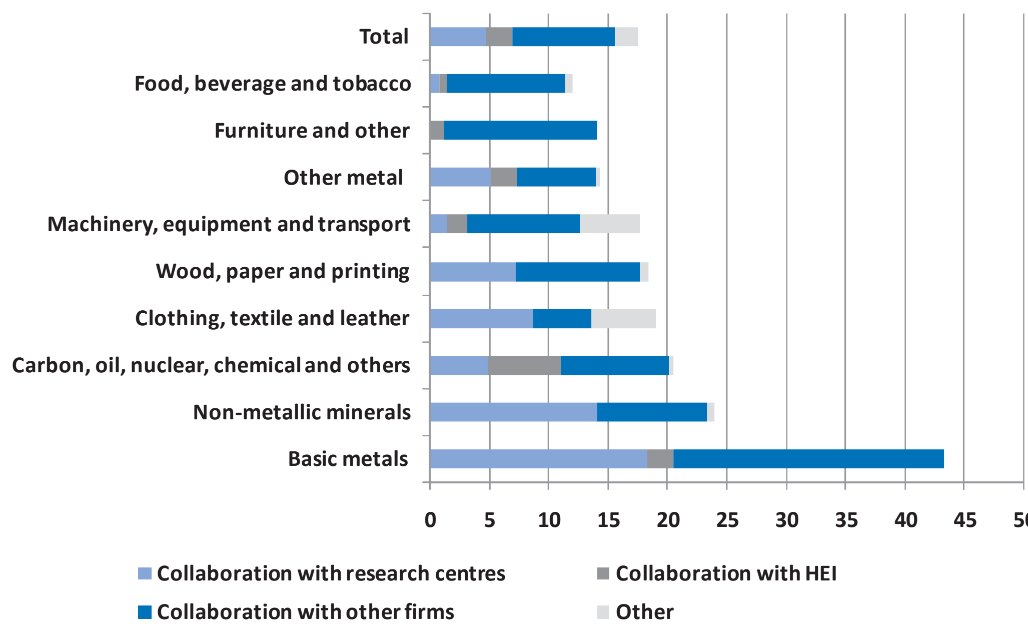
Figure 1.39. Collaboration in innovative projects



Source: CONACYT (2006), *Encuesta nacional de Innovación 2006*, Mexico D.F.: National Council of Science and Technology.

Figure 1.40. Firm collaboration in innovative projects with external institutions

By sub-sector in manufacturing

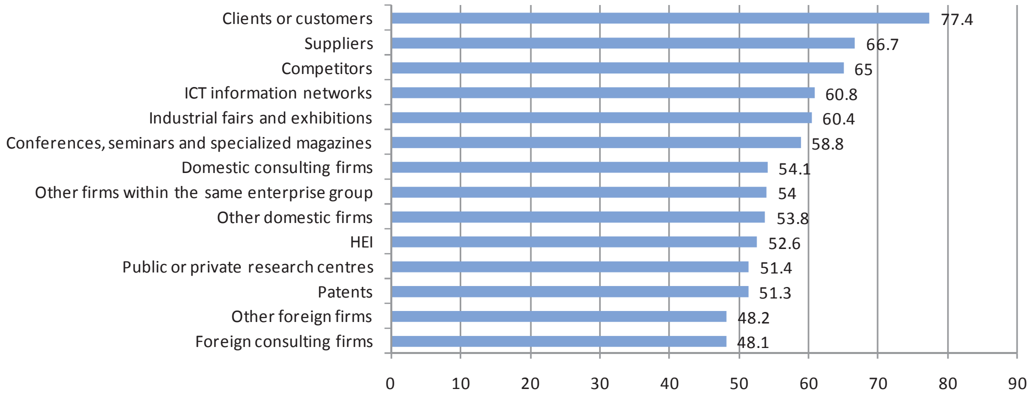


Notes: Percentages do not add to 100% because innovative projects performed in-house are not presented.

Source: CONACYT (2006), *Encuesta nacional de Innovación 2006*, Mexico D.F.: National Council of Science and Technology.

In terms of external sources for innovation used by firms, it is clear that the strongest sources are coming from the most direct forms of interactions (customers and suppliers) in the production process, with competing firms also playing an important role (Figure 1.41). On the other side, firms seem to be less driven by sources such as private/public research centres or HEIs, further reinforcing the relative weakness of linkages between actors in the productive sector and those oriented towards the generation of knowledge. It is also interesting to see that in an increasingly integrated global economy and with the important presence of big multinational firms and FDI in Mexico (generally coming from countries which perform better in terms of innovative production), Mexican firms seem to turn a bit less (at least in terms of innovation) to other foreign firms and foreign consulting groups.

Figure 1.41. External sources for innovation

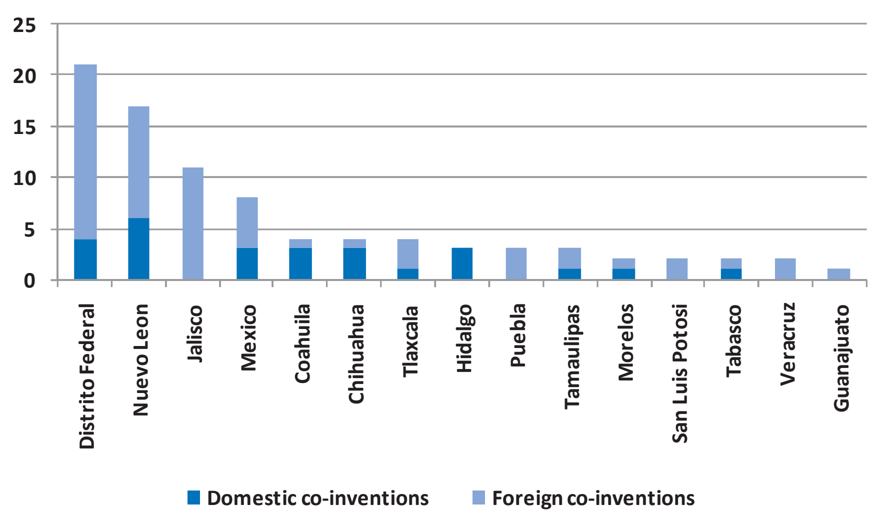


Source: CONACYT (2006), *Encuesta nacional de Innovación 2006*, Mexico D.F.: National Council of Science and Technology.

Although patenting activity is very low in Mexico and compares unfavourably to other OECD countries, co-patenting (which is consequently even smaller), may serve as an indicator of collaborative efforts for innovation. Less than half of all Mexican states have registered co-patented inventions (Figure 1.42) with either domestic (other regions in Mexico) or foreign partners, with 17 of the 32 states registering no co-inventions (with partners outside the state border). In general terms, there are two marked trends in terms of this measurement: the majority (70%) of co-patented inventions are done with partners in foreign regions, while of all co-inventions, almost two thirds have involved the largest regional economies in the country (Mexico City, Nuevo Leon, Jalisco and the State of Mexico). These results indicate that actors in Mexican regions are not currently collaborating strongly in innovative projects and are not likely to engage in co-patenting activities.

Figure 1.42. Co-patenting in Mexican regions

2005



Notes: Includes only co-patents with other states or other countries. Excludes co-patents within the same state.

Source: OECD Regionalised Patent Database, 2008.

Output indicators

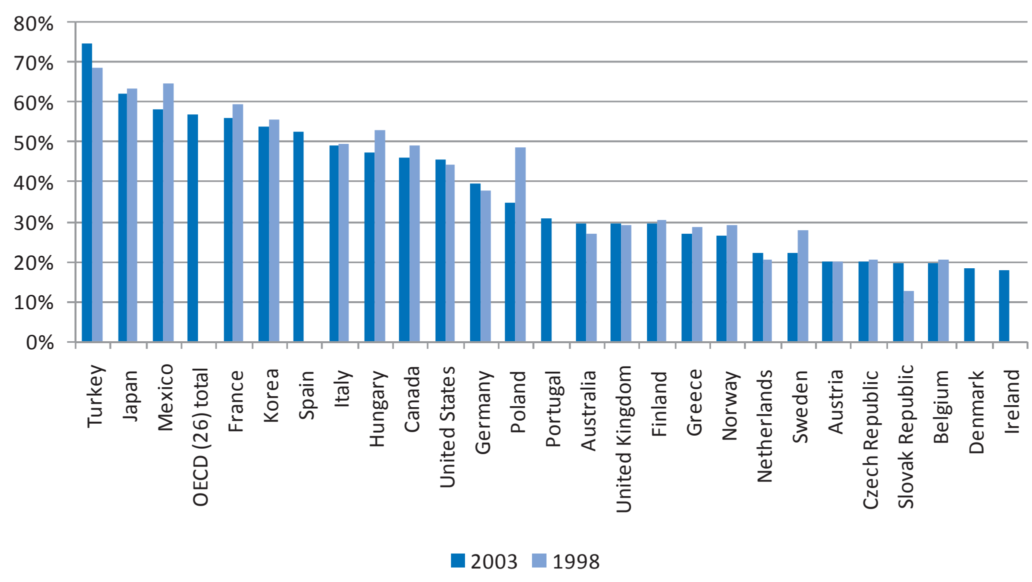
Patents and scientific publications

Data on patents is the most common indicator used for benchmarking innovation outputs, with the obvious caveats in interpreting this indicator.[16] Overall, Mexico shows a far below average propensity to patent when compared to other OECD economies (see Figure 1.8). But patenting activity, which reflects how well actors transform inputs into new knowledge and inventions, also presents an important spatial dimension. A common characteristic of OECD countries is that patents tend to be concentrated in a small fraction of high performing regions. In fact, in 2003 around 57% of all patents in OECD member countries were registered in 10% of the regions (Figure 1.43) (OECD, 2007j). Mexico, at 58% of the patents concentrated in 10% of the regions (a decrease from 65% in 1998), is just slightly above the OECD average but is third highest only to Turkey and Japan among member countries.

Another common measure for innovation outputs is the number of scientific publications. This indicator shows how researchers produce new knowledge and in turn make it available information.[17] As can be seen for patents and published articles, both are more regionally concentrated than population. However, it is interesting to see that these two output indicators do not mirror one another. In terms of patents, the two richest regions (Mexico City and Nuevo Leon) stand out as clear frontrunners, but some states have made important progress such as Queretaro, Colima, Coahuila, Jalisco and Chihuahua, all above the national average. However, in terms of scientific and technical publications, best performers include Mexico City, Morelos, Queretaro, both states in the Baja California Peninsula and slightly below the national mean Yucatan and Puebla (see Figure 1.44). Only two regions rank atop of both of these indicators, which reveals that high innovative activity (measured through patents) and scientific publications are not necessarily linked and may respond to different factors.

Figure 1.43. Regional concentration of national patent applications

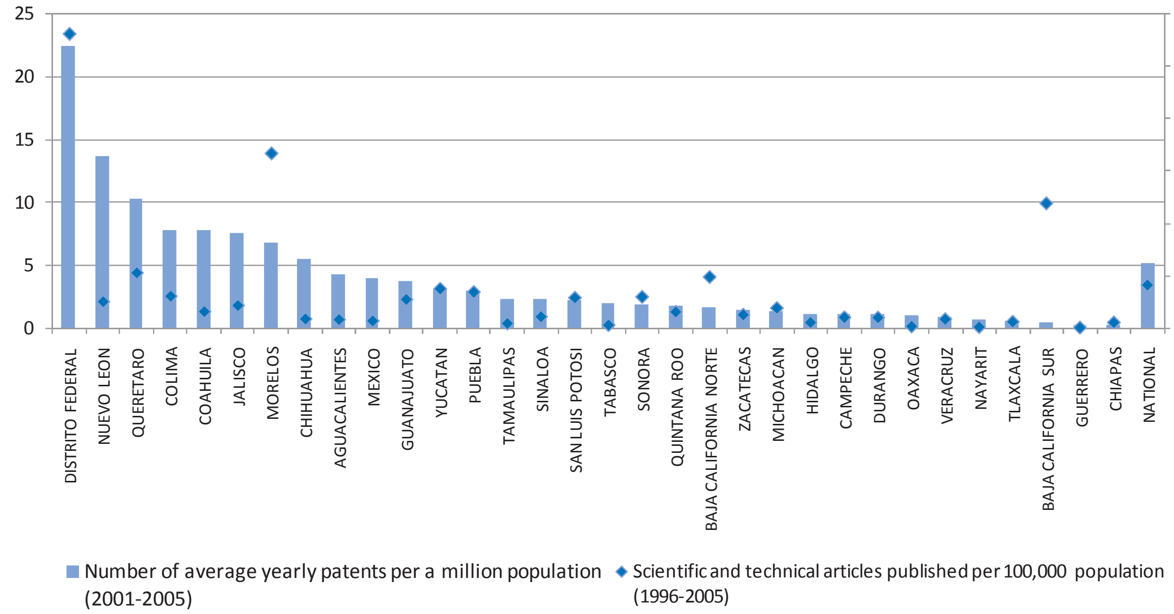
Percent of patents in the 10% of regions with the highest concentration of patents



Source: OECD (2007), *OECD Regions at a Glance*, OECD Publishing, Paris.

Figure 1.44. Tacit innovation outputs

Average yearly patents (2001-2005) and total publications (1996-2005)



Source: OECD Regional Database, 2008 and *Fundación Este País*, 2008.

High-tech output and regional innovation performance

Another way to evaluate innovation performance is in terms of the goods and services a given economy produces. More advanced and innovative economies tend to move towards higher-technology level production. However, it should be noted that an industry categorisation as high or low technology does not necessarily mean that the activities in that industry are all of the same technology level. For example, important high-technology innovations can be found in agriculture, which is classified as a low-technology sector, and the low-technology activity of assembly (or other low value added processes) could be classified as high technology if in electronics. Nevertheless, higher-technological levels tend to go in hand with more sophisticated levels of innovation. In Mexico, manufacturing diversification has taken place during the last fifty years, moving from a narrow base in the 1950s to a more sophisticated manufacturing sector at the turn of the this century. Based on this technology profile, intermediate technology and low-technology industries have dominated the manufacturing industry; however, the latter has increasingly lost ground to higher-technology industries (Table 1.8) (Ruiz-Duran, 2008c).

Table 1.8. Industries, technology and innovation

Type	Industries	Sources of innovation
Low technology industries	Foods, wood, tobacco, textiles, footwear, apparel	Mainly from suppliers and quality standards
Medium-low technology industries	Basic metal industries, metallic, oil, coal and its derivatives	Centred in inputs and production modes with an increasing focus on design
Medium-high technology industries	Auto, transport equipment, chemicals, machinery and equipment	Design, process, complex production systems, value chain, firm R&D
High technology industries	Electronics, pharmaceuticals, computer science, ICT, precision equipment and aerospace	High degree of R&D, interaction with HEI and research centres

Source: Ruiz Duran for the OECD using the OECD classification of industries by technology level.

The regional perspective of physical innovation outputs in Mexico also shows a marked pattern. In terms of the composition of manufacturing industries by region and technological level (Table 1.9), measured in terms of gross value added, it is clear that a few states concentrate in high-tech manufacturing activities. In this sense, Morelos (at close to 50% of its manufacturing sector), the Federal District and Baja California (both at over one third of their manufacturing sector) are the most specialised states in terms of high-tech industries. Other regions with a high percentage of manufacturing industries in high-technology sectors include Chihuahua, Aguascalientes, Sonora, Jalisco and Tamaulipas, all above the national average. In contrast, nearly half of all Mexican regions (15 out of 32 states) have a share of less than 1% in high-tech sectors. Although this does not mean that innovation is not happening at all, it does indicate that it is either less intense, or applied in lower-technology industries or in non-manufacturing sectors. However, the majority (but not all) of these states either rank poorly in other innovation indicators, fall within the group of lagging regions, or have economies based on natural resources or tourism.

One final measurement of the regional innovation performance in Mexico can be obtained from a survey of firms exclusively in the manufacturing sector. Although this is not the same innovation survey as the previously cited study performed by CONACYT, it does allow for comparisons of how active manufacturing firms in different states are in pursuing innovation and hence making investments that may lead to it. This database presents the percentage of firms in each state that responded affirmatively to several questions related to new or improved products or processes, certifications and R&D investments. In this sense, the number of interviewed firms that reported to have invested in process technological R&D serves as an interesting proxy of where innovations are more likely to occur (Figure 1.45). In this particular indicator, the Federal District is not within the best performing regions and ranks towards the middle of Mexican regions. However, Queretaro (16.2%), Guanajuato (13%), Nuevo Leon (12.4%) and the State of Mexico (12%) show percentages well above the national average of 8.8%. These results at least give us a sense of states where innovation is regarded as an important part of the production process or where market and economic conditions have made innovations an important element.

Table 1.9. Gross value added by technology level

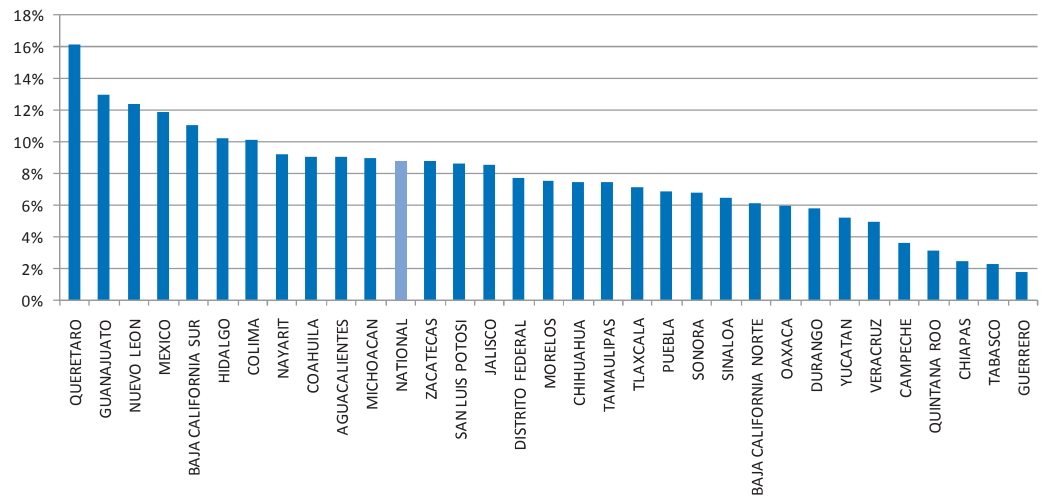
% of state manufacturing industries

State	Technology classification (OECD)			
	Low Tech	Mid-Low Tech	Mid-High Tech	High Tech
Morelos	12.4	14.8	23.2	49.6
Distrito Federal	35.7	10.4	16.8	37.1
Baja California	23.6	30.0	11.1	35.3
Chihuahua	10.3	13.7	53.4	22.5
Aguascalientes	26.6	11.7	43.1	18.6
Sonora	43.4	23.5	18.0	15.1
Jalisco	51.1	21.1	12.7	15.1
Tamaulipas	12.3	26.2	46.5	15.0
National	32.1	24.7	31.6	11.6
México	41.9	23.3	25.9	8.8
Querétaro	35.2	14.2	45.5	5.1
Coahuila	25.2	24.7	45.3	4.9
Durango	69.8	14.9	10.7	4.6
Nuevo León	20.8	43.2	33.5	2.5
Puebla	29.0	11.9	56.6	2.4
Tlaxcala	59.2	22.7	16.2	1.8
Yucatán	68.1	27.4	3.2	1.3
Veracruz	39.6	26.1	33.1	1.2
Michoacán	60.0	35.0	4.3	0.7
San Luis Potosí	31.7	33.7	34.2	0.4
Sinaloa	77.6	13.4	8.6	0.4
Guanajuato	34.4	20.9	44.5	0.2
Nayarit	87.1	10.1	2.7	0.1
Hidalgo	24.6	69.7	5.5	0.1
Guerrero	60.7	38.7	0.5	0.1
Baja California Sur	70.9	28.8	0.3	0.0
Oaxaca	17.1	83.2	-0.3	0.0
Zacatecas	82.5	12.2	5.3	0.0
Colima	33.7	62.2	4.1	0.0
Quintana Roo	68.4	29.5	2.1	0.0
Chiapas	20.5	2.0	77.4	0.0
Campeche	77.7	12.3	10.0	0.0
Tabasco	14.6	7.1	78.3	0.0

Source: Ruiz-Duran 2008 based on INEGI Economic Census 2004.

Figure 1.45. Percent of firms that invest in process technological R&D

Manufacturing sector only (2003)



Source: INEGI, 2003 available at *www.inegi.org.mx*.

Notes

1. These productivity gains oscillate between 50% and 95% of those induced at home.

2. As per the OECD Manual "Measuring Productivity", MFP shows the time profile of how productively combined inputs are used to generate gross output, and captures disembodied technical change. MFP relates a change in output to several types of inputs. It is often measured residually as that change in output that cannot be accounted for by the change in combined inputs.

3. The importance of innovation has been recognized by the OECD as one of the crucial elements in its growth strategy (OECD, 2007d). Most of the public policy agendas of its member (and even some non-member) countries place specific focus on innovation, setting clear goals and strategies to be followed in this matter.

4. In this case performance is measured in terms of the Mathematics PISA results for 2003.

5. Many of these expansions were led by the belief that, with the knowledge economy, an increased number of highly skilled workers would be needed, which was confirmed by evidence suggesting no crowding out effect (for less skilled workers) was observed for countries that have increased their average tertiary attainment (*OECD Education at a Glance*, 2007). Nevertheless, some equity issues must be considered, as expenditure in the upper educational levels is not only comparatively more costly, but also tends to benefit a relatively small share of the population which is usually from the higher income groups.

6. See OECD (2003) *OECD Territorial Reviews: Mexico*, OECD (2004) *OECD Territorial Reviews: Mexico City*, OECD (2007) *OECD Territorial Review Monitoring: Mexico* (unpublished), OECD (2007) *OECD Territorial Reviews: Yucatan, Mexico*, and OECD (2007) *OECD Rural Policy Reviews: Mexico*.

7. The Mexican government classifies poverty levels into three main definitions (corresponding to different thresholds in terms of income): *i*) Food poverty: minimum income needed to ensure the basic basket of food; *ii*) Capacity poverty: minimum income necessary to ensure basic consumption of food, health and education; *iii*) Patrimonial poverty: minimum income necessary to ensure basic consumption of food, clothing, housing, health, public transportation and education.

8. The Marginalisation Index considers illiteracy rates, education levels, access to basic services, living conditions, percentage of population living in micro-communities and income.

9. The authors find that this TFP measure is the sole most important determinant of labour productivity at any point in time, and has actually become an even more important explanatory variable. While it explained around 62% of productivity differences in 1960, it accounted for approximately 86% of the productivity differential.

10. Educational attainment is measured in terms of the percentage of the relevant age cohort (25-64) with tertiary education.

11. Percentage of adult population with tertiary attainment is a common proxy for measuring the skill levels of the labour force.

12. See Annex 1 for explanation of the manufacturing specialisation index. Note that a higher level of concentration on this index does not necessarily mean that the overall economy is not diversified, but rather that among different manufacturing branches, there is a higher degree of specialisation relative to other states.

13. For a full conceptual discussion, see: Dussel Peters *et al.* (2003, 2007); Görg and Strobl (2002); Padilla-Pérez (2008); and Romo Murillo (2005).

14. INEGI conducted a survey of big manufacturing firms in 2003 defined as *i*) having more than 50 workers, *ii*) annual income above MXN 5 million (around USD 500 000) or c) firms that presented establishments in at least two states in Mexico. The sample of 40 004 firms answered a survey of more than 250 questions.

15. The number of SNIs in a state is also linked to historical trajectories as some public universities have a long history.

16. The propensity to patent varies by sector. Furthermore, there are headquarters effects due to the application of patents being linked to where the headquarters of the firm is located. Using data by inventor offers a clearer picture of the region that is the source of innovation activity. However, the location of the inventor reveals less clearly where commercial benefits to the use of the patent, if used, may accrue.

17. Scientific publications are measured on indexes for publications in English. Scientists in social sciences like sociology, history, and anthropology tend to publish more in Spanish.

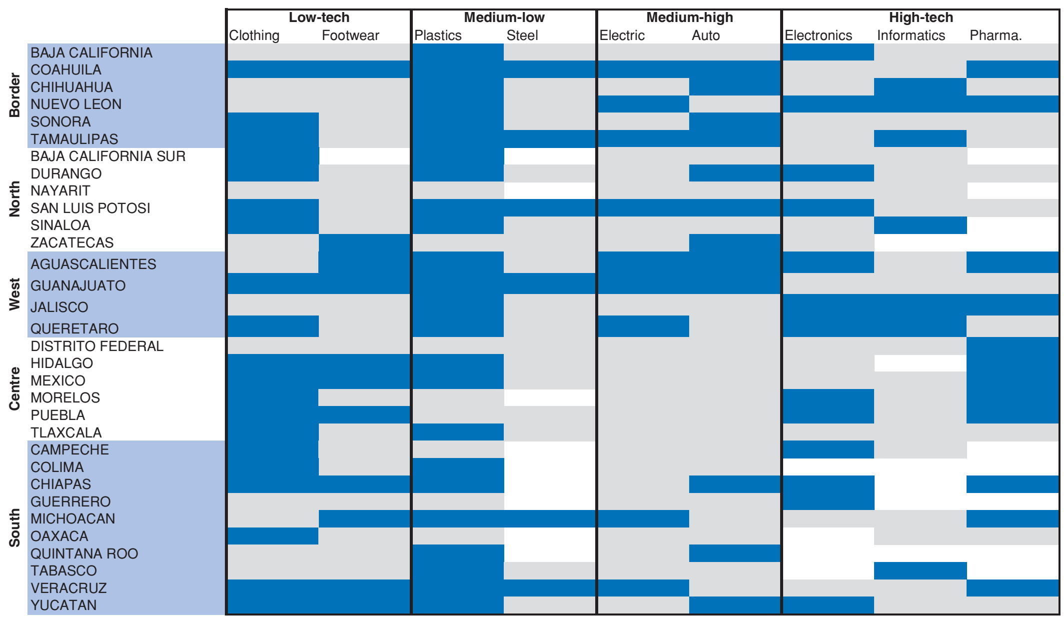
Annex 1.A1

Manufacturing industry specialisation

Trends by industry

Figure 1.A1.1. Changes in specialisation: specific manufacturing industries

By technology level (1980-2003)

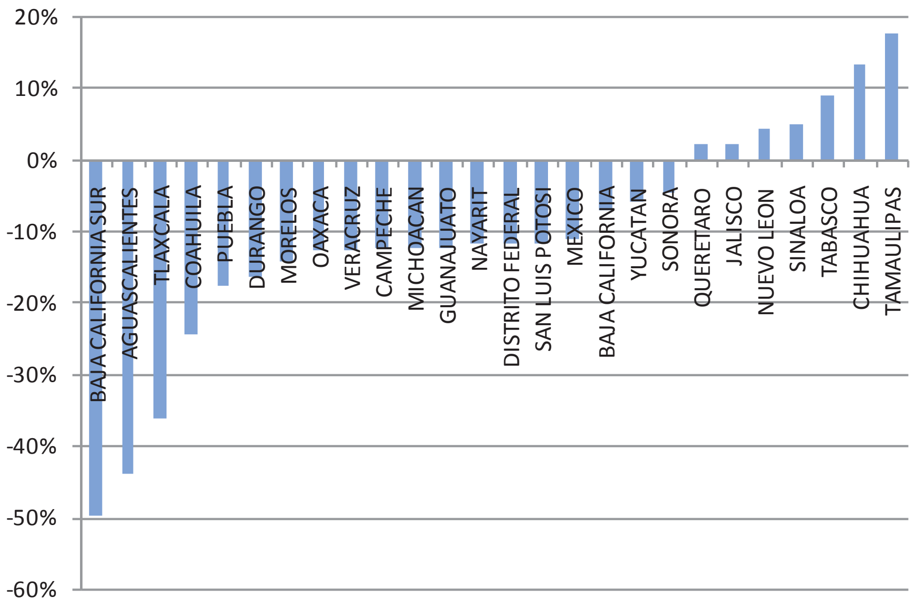


Notes: When no specialisation was found in 1980, the changes correspond to 1993-2003. Blue indicates a positive change in specialisation in a specific manufacturing industry (*i.e.*, an increase in the degree of specialisation). Gray indicates a negative change in specialisation in a specific manufacturing industry (*i.e.*, a decrease in the degree of specialisation). White indicates no specialisation in a specific manufacturing industry.

Source: OECD calculations based on data from INEGI.

Figure 1.A1.2. Changes in specialisation: computer industry

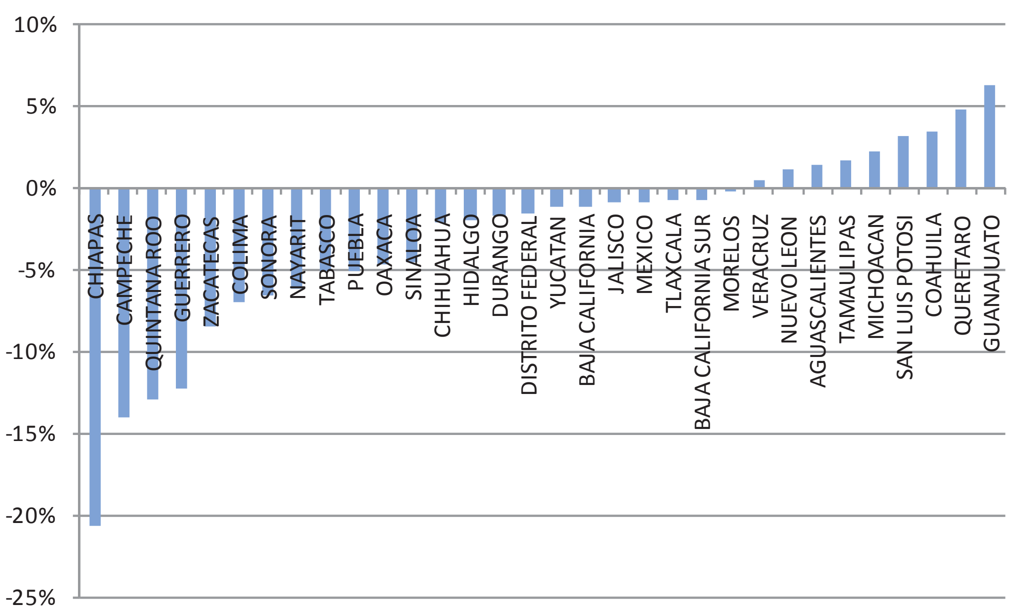
Average Annual Growth Rate 1980-2003



Source: OECD calculations based on data from INEGI.

Figure 1.A1.3. Changes in specialisation: electric machinery and equipment industry

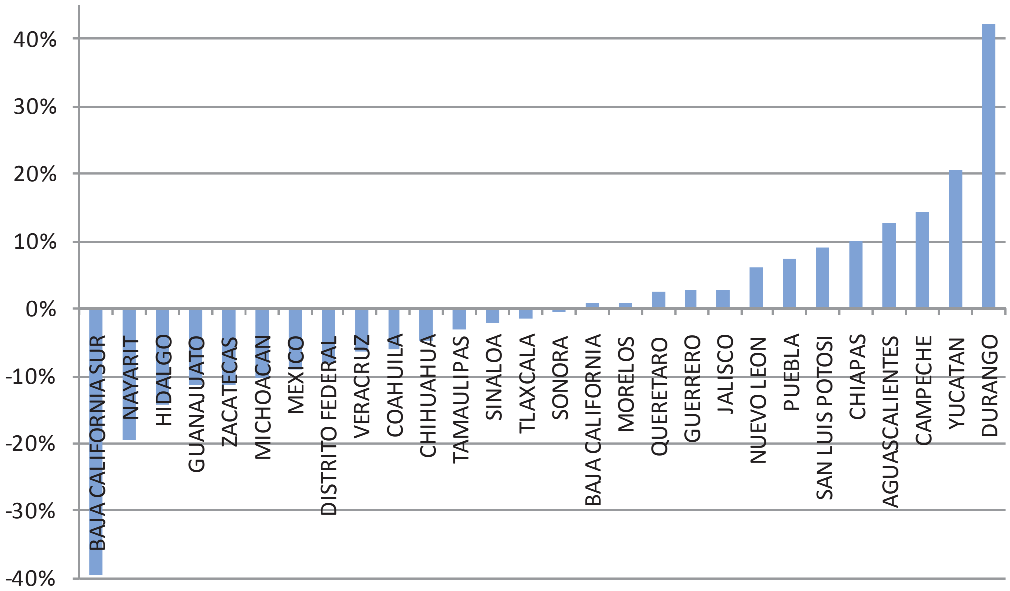
Average Annual Growth Rate 1980-2003



Source: OECD calculations based on data from INEGI.

Figure 1.A1.4. Changes in specialisation: electronic equipment

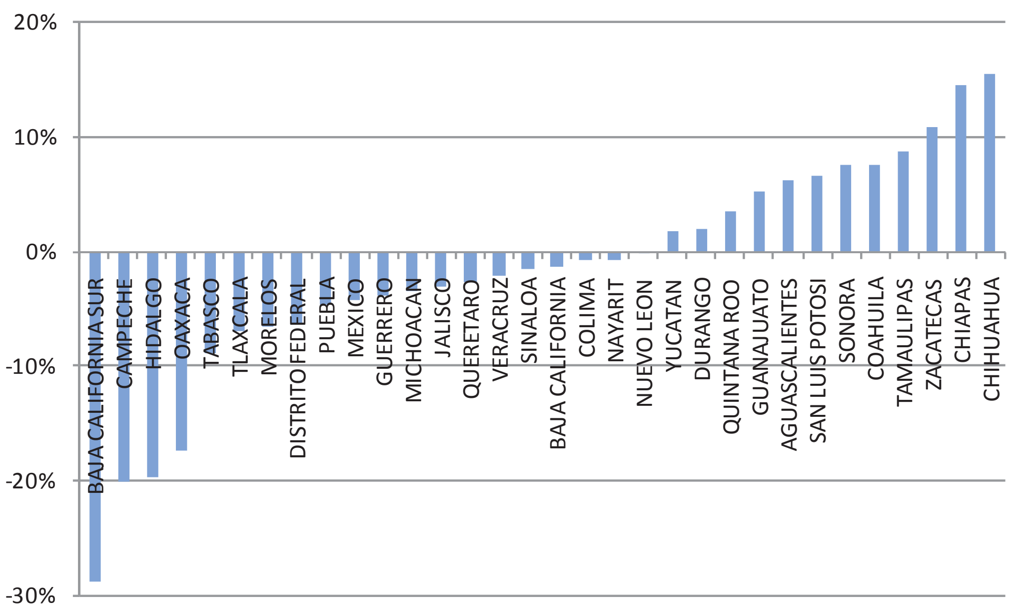
Average Annual Growth Rate 1980-2003



Source: OECD calculations based on data from INEGI.

Figure 1.A1.5. Changes in specialisation: auto

Average Annual Growth Rate 1980-2003



Source: OECD calculations based on data from INEGI.

Manufacturing specialisation index

The general manufacturing specialisation index produced by the OECD is derived from common measures of specialisation. It measures the degree of specialisation in manufacturing in a given state in a given year, in comparison to the country as a whole, based on employment. The individual index of specialisation looks at the share of employment in a given manufacturing industry in a state and compares it to the national share in this same activity. A value of the index above one shows greater specialisation than in the country as a whole and a value below one shows less specialisation. A region's (or in this case a state's) general manufacturing specialisation index measures the average of all the square values of individual branch manufacturing indices in the particular state. For the purpose of this study (and given its particular focus on manufacturing) the index was constructed as follows:

An individual index of specialisation was calculated for each manufacturing branch according to the formula:

$S_{iet} = (E_{jet}/E_{et})/(E_{jNt}/E_{Nt})$

Where:

S_{iet} = Specialisation index of manufacturing branch *j* of state *e* in year *t*

E_{jet} = Employment in manufacturing branch *j* in state *e* in year *t*

E_{et} = Employment in all manufacturing branches in state *e* in year *t*

E_{jNt} = Employment in manufacturing branch *j* for the country in year *t*

E_{Nt} = Employment in all manufacturing branches, for the country, in year *t*

The general index of specialisation in manufacturing for each state was then calculated using the following formula:

$$G_{et} = (1/J) \sum_{j=1,\dots J} (S_{jet})^2$$

Where:

G_{et} = General manufacturing specialisation index of state *e* in year *t*

S_{jet} = Specialisation index of manufacturing branch *j* of state *e* in year *t*

J = Number of manufacturing branches

A regional perspective on FDI in Mexico

The following is based on input provided to the OECD by Enrique Dussel-Peters, Professor at the Graduate School of Economics, Universidad Nacional Autónoma de México *with support from Professor Miguel Angel Mendoza in the econometric analysis, and Cristina Vázquez and Alejandro Pérez in the statistics components. Parts of this analysis are based on a special data set provided for this analysis by the Instituto Nacional de Estadística y Geografía (INEGI).*

Branch-level specialisation patterns

There is increasing polarisation of Mexico's economy and the territorial concentration of S&T indicators and FDI in Mexico since the 1990s. Tables 1.A1.1 and 1.A1.2 also reflect that a few branches (Mexico's FDI information is divided into 127 branches) account for the largest share in Mexico's FDI inflows for 1999-2007. According to their weight in 1999-2007, the main ten branches accounted for 60.29% of total FDI during the period. Of these branches, four were part of services (particularly in banking, telecommunications and trade), while the rest were manufacturing (such as automobiles, basic industries of iron and steel, beverages, fabrication of electronic accessories, and chemical products).

Table 1.A1.1. Share of national FDI of 10 main economic branches

	1999	2001	2002	2007	1999-2007
	Share over national total (%)				
811 000 Servicios de instituciones crediticias, bancarias y auxiliares de crédito.	2.21	51.22	22.37	19.61	20.59
384 100 Industria automotriz.	15.83	4.77	5.67	7.84	8.19
720 000 Comunicaciones.	1.58	8.90	14.26	2.49	5.36
612 000 Comercio de productos no alimenticios al por mayor. Incluye alimentos para animales.	6.99	3.97	5.19	2.99	4.75
951 000 Prestación de servicios profesionales, técnicos y especializados. Excluye los agropecuarios.	5.61	3.48	2.43	2.03	4.67
371 000 Industria básica del hierro y del acero.	1.74	1.44	1.25	15.74	4.08
313 000 Industria de las bebidas	0.81	1.65	8.08	3.53	3.37
383 100 Fabricación y/o ensamble de maquinaria, equipo y accesorios eléctricos. Incluso para la generación de energía eléctrica.	5.35	1.99	1.80	3.18	3.23
352 200 Fabricación de otras sustancias y productos químicos.	3.68	1.87	2.23	1.16	3.17
390 000 Otras industrias manufactureras.	4.15	1.83	2.20	1.87	2.88
Other	52.05	18.87	34.52	39.57	39.71
TOTAL	**100**	**100**	**100**	**100**	**100**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.A1.2. National FDI by main 10 economic branches

1997-2007

	1999	2000	2001	2002	2003	2004	2005	2006	2007	1999-2007
					USD million					
811 000 Servicios de instituciones crediticias, bancarias y auxiliares de crédito.	306	2 229	15 129	5 155	2 568	5 085	306	3 448	4 487	38 712
384 100 Industria automotriz.	2 195	1 612	1 410	1 306	1 157	2 467	2 039	1 421	1 794	15 400
720 000 Comunicaciones.	219	-1 968	2 629	3 285	2 209	1 193	1 142	792	570	10 070
612 000 Comercio de productos no alimenticios al por mayor. Incluye alimentos para animales.	969	1 049	1 172	1 195	746	562	1 781	776	684	8 934
951 000 Prestación de servicios profesionales, técnicos y especializados. Excluye los agropecuarios.	777	1 241	1 029	561	932	195	1 688	1 903	464	8 790
371 000 Industria básica del hierro y del acero.	242	241	426	288	26	-137	2 733	260	3 601	7 680
313 000 Industria de las bebidas	112	222	488	1 863	471	316	845	1 208	807	6 332
383 100 Fabricación y/o ensamble de maquinaria, equipo y accesorios eléctricos. Incluso para la generación de energía eléctrica.	741	840	588	414	537	883	734	604	728	6 068
352 200 Fabricación de otras sustancias y productos químicos.	511	506	552	514	369	1 201	462	1 577	266	5 958
390 000 Otras industrias manufactureras.	575	1 313	540	508	391	461	558	637	428	5 411
Other	7 216	11 215	5 572	7 956	7 240	10 676	9 220	6 527	9 054	74 675
TOTAL	**13 863**	**18 501**	**29 536**	**23 044**	**16 645**	**22 902**	**21 508**	**19 152**	**22 882**	**188 031**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Considering this branch-level examination and the already analyzed state-level specialisation, the remaining questions seems to be: Which have been the main state-level specialisation patterns at the branch level in terms of FDI? For this analysis we have included an index that allows for highlighting state-level specialisation in reference to national specialisation, based on the respective share over total FDI, *i.e.*:

$FDI_{\text{specialisation index}} = (FDI_{Si} / FDI_{Stot}) / FDI_{Nati} / FDI_{Nat\text{-}tot})$

Where:

FDI_{Si} = Foreign direct investment of a particular state in branch i

$FDI_{Stot\,=}$ Total foreign direct investment of a particular state

$FDI_{Nati\,=}$ National foreign direct investment in branch i

$FDI_{Nat\text{-}tot\,=}$ Total national foreign direct investment

As a result, the coefficient can take both negative (when FDI is negative either in the respective state or at the national level) and positive values. In general, however, the coefficient will vary between zero and a positive value. Values between zero and one imply that the respective state presents a lower specialisation pattern than national FDI in that particular branch, while coefficients above one reflect a higher territorial specialisation for the branch. One of the shortcomings of the index is that the more disaggregated the data set is, the higher the probability for very high values of the index in specific items where no other state receives FDI, independently of its absolute value and relevance. Additionally, and as a result of important annual changes, the index might vary significantly from year to year, consequently making sense to calculate the index for a longer period of time.

Which are the main regional (according to the prior definition of regions within Mexico) specialisation patterns of FDI at the branch-level between 1999 and 2007? Several issues stand out, in the context of the already discussed regional and state-level patterns of FDI in Mexico (See Tables 1.A1.3. through 1.A1.8.):

- The Northern Border region presents high coefficients in manufacturing, and three branches related to transport equipment and automobile, as well as in services related to these processes.
- The Centre region has also specialised in infrastructure, in the auto parts-automobiles value chain as well as manufacturing and trade-related activities in food and beverage branches; six out of the main ten branches are related to manufacturing.
- The Centre-North region is highly specialised in agro-industry activities such as wood and food products, as well as in services for these activities.
- The rest of the regions –in particular the Southern, Pacific and Gulf and Caribbean regions– present high specialisation patterns in services and agriculture. Fishery, construction and tourism play an important role in the Gulf and Caribbean region.

Table 1.A1.3. Regional FDI specialisation patterns: Northern Border region

Main 10 branches (1999-2007)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	**1999-2007**
384 200 Fabricación, reparación y/o ensamble de equipo de transporte y sus partes. Excluye automóviles y camiones.	1.22	0.40	0.95	-0.23	0.64	0.14	-0.71	357.5	-0.15	**14.03**
961 200 Servicio de reparación y mantenimiento automotriz.	-4.68	0.00	8.99	0.00	0.00	0.00	0.00	0.00	0.00	**11.14**
381 200 Fabricación de estructuras metálicas, tanques y calderas industriales. Incluye trabajos de herrería.	2.03	0.41	6.97	1.77	1.63	-0.70	0.17	4.12	3.72	**4.91**
941 200 Servicios de esparcimiento relacionados con la cinematografía, teatro, radio y televisión prestados por el sector público.	--	--	6.48	--	4.88	--	--	--	--	**3.99**
210 000 Extracción y/o beneficio de carbón mineral	--	--	--	--	--	--	--	--	3.22	**3.99**
925 000 Servicios de asociaciones comerciales, profesionales y laborales.	--	--	--	--	--	--	--	3.66	--	**3.99**
220 000 Extracción de petróleo y gas natural	3.28	3.21	--	--	--	--	--	0.00	--	**3.97**
314000 Industria del tabaco	3.04	3.49	-5.24	0.00	4.88	0.00	2.54	3.66	3.22	**3.82**
625 000 Comercio al por menor de automóviles. Incluye llantas y refacciones.	0.00	0.00	0.00	--	0.00	0.00	--	3.66	--	**3.76**
372 000 Industrias básicas de metales no ferrosos. Incluye el tratamiento de combustibles nucleares.	3.29	2.61	6.03	4.97	2.13	5.80	2.21	5.04	3.13	**3.71**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.A1.4. Regional FDI specialisation patterns: Southern region

Main 10 branches (1999-2007)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	**1999-2007**
922 100 Servicios de investigación científica prestados por el sector privado.	334.77	1491.99	1767.09	1047.44	197.75	-341.49	616.50	1450.89	-1430.09	**1963.81**
311 700 Fabricación de aceites y grasas comestibles	350.96	--	0.00	--	293.56	62.72	66.98	0.00	-925.35	**116.67**
971 000 Servicios para la agricultura y la ganadería. Incluye distribución de agua en obras de riego.	--	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	**110.81**
501 100 Edificación.	0.00	0.00	452.29	0.00	0.00	0.00	0.00	92.73	-10.91	**44.82**
611 000 Compra-venta de material de desecho.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-290.18	0.00	**32.78**
932 000 Hoteles y otros servicios de alojamiento temporal.	45.22	18.59	32.41	25.67	22.43	20.89	34.80	4.85	-2.53	**25.53**
614 000 Comercio de productos alimenticios, bebidas y tabaco al por mayor.	6.26	-0.74	0.00	16.02	21.03	115.18	2.04	3.69	0.00	**17.73**
821 200 Otros servicios inmobiliarios.	0.95	1.41	6.49	3.60	10.71	9.59	1.23	4.17	-2.20	**3.53**
369100 Fabricación de cemento, cal, yeso y otros productos a base de minerales no metálicos.	0.00	0.00	708.29	0.00	0.00	0.00	0.00	0.00	0.00	**2.88**
621 000 Comercio de productos alimenticios, bebidas y tabaco al por menor en establecimientos especializados.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.26	**1.80**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.A1.5. Regional FDI specialisation patterns: Pacific region

Main 10 branches (1999-2007)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	**1999-2007**
973 200 Servicios relacionados con el transporte por agua.	5.59	0.00	0.00	0.00	39.20	31.37	14.77	19.75	11.82	**19.65**
971 000 Servicios para la agricultura y la ganadería. Incluye distribución de agua en obras de riego.	--	10.23	34.20	--	-2.92	19.79	0.00	-3.29	0.00	**19.40**
311 800 Industria azucarera	22.37	0.00	0.00	--	40.84	--	--	19.75	0.00	**19.04**
111 100 Agricultura	21.18	7.16	16.83	-50.86	4.63	11.20	0.94	20.54	10.60	**17.31**
972 000 Servicios relacionados con la construcción.	22.37	15.43	47.63	--	0.00	0.00	0.00	0.00	--	**13.16**
382 300 Fabricación y/o ensamble de máquinas de oficina, cálculo y procesamiento informático.	12.27	5.10	14.20	-27.82	14.63	10.77	12.63	12.53	7.62	**11.17**
311 100 Industria de la carne	4.18	0.00	7.84	-28.16	40.84	32.06	14.63	19.75	11.30	**10.64**
712 000 Transporte por agua.	--	14.33	--	55.16	40.84	35.62	27.75	3.70	11.30	**9.94**
611 000 Compra-venta de material de desecho.	0.00	0.00	0.00	-2.42	-25.52	7.12	1.38	-23.70	0.00	**9.56**
711 200 Autotransporte de carga.	0.00	--	48.09	62.57	0.00	11.17	0.00	0.00	0.00	**9.10**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.A1.6. Regional FDI specialisation patterns: Centre-north region

Main 10 branches (1999-2007)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	**1999-2007**
331 100 Fabricación de productos de aserradero y carpintería. Excluye muebles.	0.00	-2.63	-67.93	61.12	0.00	0.00	0.00	1.82	-3.78	**213.59**
331 200 Fabricación de envases y otros productos de madera y corcho. Excluye muebles.	48.57	41.49	46.83	-1.87	16.22	110.59	46.21	0.00	0.00	**183.71**
311 300 Elaboración de conservas alimenticias. incluye concentrados para caldos. Excluye las de carne y leche exclusivamente.	16.21	25.22	26.73	29.60	-8.35	-34.09	19.70	-3.32	-9.30	**36.12**
923 200 Servicios médicos, odontológicos y veterinarios prestados por el sector público.	--	--	--	--	0.00	--	16.58	63.78	--	**23.16**
502 000 Instalaciones.	0.00	0.00	0.00	0.00	14.74	32.61	0.00	0.00	0.00	**20.07**
111 200 Ganadería y caza.	1.92	1.79	32.39	43.46	14.74	49.52	0.00	0.00	--	**19.46**
971 000 Servicios para la agricultura y la ganadería. Incluye distribución de agua en obras de riego.	--	2.63	0.00	--	0.00	16.31	36.48	74.40	30.23	**19.02**
292 000 Extracción y/o beneficio de otros minerales no metálicos	-0.98	3.19	-8.61	0.00	0.00	0.00	28.75	56.86	4.22	**17.49**
323 000 Industria del cuero, pieles y sus productos. Incluye los productos de materiales sucedáneos. Excluye calzado y prendas de vestir de cuero, piel y materiales sucedáneos.	-3.72	2.21	16.79	1.30	22.11	0.00	4.05	57.30	6.05	**15.99**
621 000 Comercio de productos alimenticios, bebidas y tabaco al por menor en establecimientos especializados.	0.00	0.33	6.85	28.49	23.88	57.07	25.39	4.78	44.29	**8.49**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.A1.7. Regional FDI specialisation patterns: Centre region

Main 10 branches (1999-2007)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	**1999-2007**
502 000 Instalaciones.	1.59	1.75	1.27	1.33	0.69	0.43	2.04	1.56	-0.18	**27.13**
384 200 Fabricación, reparación y/o ensamble de equipo de transporte y sus partes. Excluye automóviles y camiones.	0.48	0.10	0.01	-0.02	0.86	0.83	0.00	8.42	-0.03	**5.87**
711 200 Autotransporte de carga.	1.68	--	0.08	0.22	0.00	2.16	5.24	1.28	1.80	**4.19**
942 100 Servicios culturales prestados por el sector privado.	1.68	--	1.27	--	--	--	--	--	0.00	**3.42**
624 000 Comercio de productos no alimenticios al por menor, en tiendas de departamentos y almacenes.	-0.69	-0.05	0.00	1.33	1.38	--	--	--	--	**2.56**
311 200 Elaboración de productos lácteos	-1.63	1.84	1.21	1.21	1.38	1.29	2.03	1.56	1.78	**1.58**
351 300 Industria de las fibras artificiales y/o sintéticas.	1.91	1.78	9.09	1.03	1.45	1.55	1.04	1.56	1.80	**1.53**
975 000 Servicios de intermediarios de comercio.	1.68	1.75	1.27	1.33	1.38	1.29	1.99	1.56	0.00	**1.51**
353 000 Refinación de petróleo.	--	--	--	--	--	--	--	--	1.80	**1.51**
711 100 transporte ferroviario, metro, tranvías y trolebuses.	1.68	1.75	1.27	1.33	1.38	1.29	2.04	1.56	1.80	**1.51**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.A1.8. Regional FDI specialisation patterns: Gulf and Caribbean region

Main 10 branches (1999-2007)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	**1999-2007**
Gulf and Caribbean										
922 100 Servicios de investigación científica prestados por el sector privado.	0.00	0.00	5.11	0.00	25.34	0.00	0.00	0.00	0.00	**91.29**
130 000 Pesca.	151.76	44.92	0.00	0.00	97.05	0.00	0.00	0.00	0.00	**62.25**
501 400 Otras construcciones.	0.00	0.00	75.96	67.33	93.92	90.46	0.00	10.73	40.75	**50.57**
503 000 Trabajos especiales.	103.44	77.02	0.00	62.10	0.00	45.85	20.76	18.92	0.00	**38.22**
501 200 Construcción de obras de urbanización.	46.78	42.62	0.00	0.00	184.95	59.35	31.66	33.48	4.46	**37.35**
979 000 Servicios de agencias de viajes y almacenaje.	16.93	1.03	90.33	21.15	8.82	9.85	0.37	14.31	2.99	**33.64**
384 200 Fabricación, reparación y/o ensamble de equipo de transporte y sus partes. Excluye automóviles y camiones.	0.00	-2.12	11.66	0.00	-1.24	5.19	0.00	0.00	-0.28	**27.89**
501 100 Edificación.	-110.26	-65.89	0.00	0.11	26.47	6.98	9.49	22.77	49.06	**24.41**
923 100 Servicios médicos, odontológicos y veterinarios prestados por el sector privado.	0.00	0.00	0.00	9.97	74.36	0.00	0.00	0.00	0.00	**15.18**
932000 Hoteles y otros servicios de alojamiento temporal.	17.44	15.73	30.83	2.45	8.85	12.54	7.98	10.77	15.80	**13.28**

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Tables 1.A1.9. and 1.A1.10. account for the branch-level specialisation of FDI in Mexican states, in particular for the auto-parts-automobile value-added chain, as well as for electronics.[1] This rich information highlights that:

- In the auto parts-automobile chain, which accounted for more than USD 15 billion in FDI inflows from 1999 to 2007, FDI does not take part in the Southern and Gulf and Caribbean regions. In monetary amounts it is mostly concentrated in the Centre and Northern Border regions. However, the Centre-North region is the only one –out of the six regions– that presents a specialisation coefficient above one (or above Mexico's average), while being the third region in terms of importance of FDI inflows. At the state level, Hidalgo, Guanajuato and Aguascalientes present the highest specialisation patterns in the chain.
- In the electronics value chain, again, the Southern and Gulf and Caribbean regions do not present any significant FDI, as is the case for the Centre-North region. Very clearly the Pacific region is the mostly specialised in this branch, and in particular Jalisco, with an FDI of USD 2.3 billion and a specialisation coefficient of 7.99 for 1999-2007. The Northern Border region with almost USD 6.0 billion and the centre region at close to USD 1.5 billion in FDI flows from 1999 to 2007, while not so specialised, are relevant in absolute terms.

This broad specialisation pattern can be observed at the state level. In addition, this specialisation index will allow us to calculate the territorial relevance of the auto parts-automobile and electronics value chains in Mexico according to this criteria. Tamaulipas, Baja California, Sonora and Chihuahua are the other three important states with a substantial specialisation in electronics, while in the rest of Mexico FDI is minor.

Table 1.A1.9. Regional FDI specialisation patterns: Auto-parts and automobiles

1999-2007

	Automobiles				Auto-parts			
		Specialisation Index				Specialisation Index		
	FDI for 1999-2007 (in millions of USD)	1999	2007	1999-2007	FDI for 1999-2007 (in millions of USD)	1999	2007	1999-2007
Northern Border	4 745	0.11	0.38	0.28	104	0.4	-0.06	4.2
Southern Region	-	-	-	-	-	-	-	-
Pacific Region	289	-0.03	0.11	0.43	-207	7.3	12.1	-157.9
Centre-North Region	2 052	1.06	7.74	4.73	5	0.4	0.00	6.5
Centre-Region	8 314	1.37	0.63	0.82	116	0.5	-0.03	5.9
Gulf and Caribbean	0	0.00	0.01	0.00	12	0.0	-0.3	27.9

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

Table 1.A1.10. Regional FDI specialisation patterns: Auto/auto-parts and electronics

1999-2007

	Auto-parts and Automobiles				Electronics			
		Specialisation Index				Specialisation Index		
	FDI for 1999-2007 (in millions of USD)	1999	2007	1999-2007	FDI for 1999-2007 (in millions of USD)	1999	2007	1999-2007
Northern Border	4 849	0.11	0.44	0.29	5 980	0.22	0.38	0.35
Southern Region	-	-	-	-	0	0.00	0.00	0.00
Pacific Region	82	0.06	-1.18	0.12	2 245	3.70	2.28	5.19
Centre-North Region	2 058	1.05	8.57	4.73	79	0.33	0.51	0.29
Centre-Region	8 429	1.35	0.70	0.83	1 466	0.75	0.24	0.23
Gulf and Caribbean	12	0.00	0.04	0.06	13	0.12	0.09	0.10

Source: Dussel Peters for the OECD based on *Reporte trimestral de la IED a junio de 2008*, Ministry of Economy.

FDI and science and technology expenditures

This section will discuss the relationship between FDI and science and technology expenditures, among other variables, to understand the effects of FDI on innovation, but also on other variables such as trade, employment and wages. The data source for this analysis is Mexico's Economic Census of 2004. This section will introduce the national and territorial performance of Mexico based on the branch-level science and technology expenditures (S&T). This general performance will allow for discussion of the characteristics of this unique data set and present a typology of Mexico's manufacturing big firms divided in three groups: *i*) those with FDI from 0.1% to 49%; *ii*) those with no FDI; and *iii*) those with an FDI share above 50% of its capital. These three groups of Big Manufacturing Firms (BMF) will prove to be very significant for understanding their respective performance in terms of science and technology expenditures and their overall socioeconomic performance.

It is important to highlight that the specific universe of firms considered, BMF, is biased considering that the manufacturing sector is the most dynamic in terms of FDI and S&T activities, in addition to high levels of trade and productivity compared to the rest of Mexico's economy and other segments of smaller firms (Dussel Peters *et al.*, 2007).

It is also relevant to briefly discuss the source of the data presented below, since it is the first time it has been used to analyse this specific topic in Mexico. Mexico's Economic Census –which is published every five years and for the last time in 2004 with information for 2003– represents the most complete socioeconomic information in Mexico, based on more than 3 million firms and a vast number of variables. In this case, INEGI gave access to a part of the branch and state-level data from Mexico's Economic Census of 2004 based on the percentage of FDI over social capital (question D312 of the Economic Census questionnaire). Based on this criteria, information was obtained from INEGI for all Mexican states and their respective economic branches for the BMFs (the only ones for which this specific questionnaire was done). INEGI's criteria for selecting in 2003 BMF were: *i*) more than 50 workers; *ii*) annual income above 5 million pesos (or around USD 500 000); or *iii*) firms that presented establishments in at least two states in Mexico. As a result, the total universe of BMFs accounts for 40 004 companies that answered to more than 250 questions.

The data set obtained from INEGI was additionally disaggregated according to the answer of the BMFs on their FDI/social capital share, (those with no FDI, those with a share below 50% and those with a share above 50%.). The aforementioned structure allows differentiation according to such criteria and to associate branch and state-level information with other variables such as S&T depending on the stake of FDI by branch and state in Mexico.

Overall Productive Specialisation Patterns

Table 1.A1.11 presents the main characteristics of Mexico's BMF, depending on the share of FDI on total social capital of the respective firm. Several issues stand out:

- A relatively low coefficient of Science and Technology (S&T) expenditure over total GDP (understood as the Census value-added) of 4.32% for all BMF. Surprisingly, branches with no FDI at all present the highest coefficient (of 6% of GDP), while branches with FDI present significantly lower coefficients (of 0.51% and 2.82% for branches with less and more than 50% of FDI over the respective social capital).

- Figure 1.31 (see Chapter 1) also presents the main results when comparing the three groups of firms according to their share over their respective social capital, in addition to their S&T performance. BMF branches with no FDI account for 56% of total employment and the lowest productivity levels (but only slightly below those branches with more than 50% of FDI); this same group of branches also presents the highest levels of investments / GDP (of 15.8%) and a positive trade balance.
- Firms with a controlling stake of FDI in BMF present a much higher export-orientation than the rest of the firms (of 148% of their GDP and thus reflecting a high share of processes based on temporary imports to be re-exported), but the lowest rate in terms of investments and below those with no FDI when considering S&T coefficients.
- Rather surprisingly, firms with an FDI share over total social capital below 50% present the highest results in terms of productivity and wages; in both cases results are significantly above firms with no FDI and those with a controlling stake of FDI.
- Additional analysis can offer a very detailed picture of the main branches and their conditions in terms of productivity, wages, trade, investment and S&T. In general, it stands out that some branches present S&T / GDP coefficients above 100%, mostly in branches related to navigational equipment, telecommunications, and electrical equipment. In addition, out of the total 86 branches, only nine present S&T coefficients above the BMF average. On the opposite side, (*i.e.* branches with the low S&T / GDP coefficient), 20 branches or almost 25% of all BMF branches, present coefficients showing practically no S&T at all.

Table 1.A1.11. Main characteristics of Mexico's BMFs

2003

	All Big Manufacturing Firms						
Branch	*Employment*	*Productivity*	*Wages*	*Imports / GDP*	*Exports / GDP*	*Investment / GDP*	*S&T / GDP*
	(total = 100)	(total=100)	(total=100)	%	%	%	%
TOTAL	**100.00**	**100.00**	**100.00**	**62.94**	**101.21**	**13.18**	**4.32**
Ten Branches with highest S&T / GDP coefficient (for all Big Manufacturing Firms)							
Rama 3345 Fabricación de instrumentos de navegación, medición, médicos y de control	0.26	47.30	71.14	58.00	210.45	5.39	186.45
Rama 3342 Fabricación de equipo de comunicación	0.87	57.40	71.87	61.78	187.62	2.52	93.38
Rama 3314 Industrias de metales no ferrosos, excepto aluminio	0.31	228.16	125.96	108.55	243.07	24.09	83.27
Rama 3359 Fabricación de otros equipos y accesorios eléctricos	1.34	83.35	89.65	47.63	119.35	6.50	70.96
Rama 3341 Fabricación de computadoras y equipo periférico	1.36	76.30	91.93	459.22	564.74	3.01	34.85
Rama 3399 Otras industrias manufactureras	1.74	50.91	70.00	29.94	89.68	6.64	20.92
Rama 3231 Impresión e industrias conexas	1.40	65.29	87.37	16.04	15.73	10.66	12.77
Rama 3222 Fabricación de productos de papel y cartón	1.73	98.84	93.57	61.06	34.90	19.44	10.31
Rama 3132 Fabricación de telas	1.53	64.01	86.62	52.87	69.45	7.59	8.52
Rama 3363 Fabricación de partes para vehículos automotores	12.92	88.86	94.84	52.29	142.09	13.20	3.20
Ten Branches with lowest S&T / GDP coefficient (for all Big Manufacturing Firms)							
Rama 3328 Recubrimientos y terminados metálicos	0.44	173.79	112.72	26.76	70.01	4.02	0.03
Rama 3211 Aserrado y conservación de la madera	0.12	32.57	41.35	1.45	7.45	2.12	0.03
Rama 3151 Tejido de prendas de vestir de punto	0.45	40.55	52.00	13.96	68.72	6.15	0.02
Rama 3336 Fabricación de motores de combustión interna, turbinas y transmisiones	0.31	162.09	135.10	113.74	238.87	9.87	0.02
Rama 3159 Confección de accesorios de vestir	0.04	42.81	53.49	42.89	124.98	3.19	0.02
Rama 3325 Fabricación de herrajes y cerraduras	0.31	72.06	80.69	12.24	97.99	1.41	0.01
Rama 3131 Preparación e hilado de fibras textiles y fabricación de hilos	0.38	60.92	56.99	60.64	55.66	11.90	0.01
Rama 3364 Fabricación de equipo aeroespacial	0.18	67.44	108.63	4.67	206.84	2.28	0.00
Rama 3366 Fabricación de embarcaciones	0.03	46.91	85.68	3.03	89.15	-0.74	0.00
Rama 3241 Fabricación de productos derivados del petróleo y del carbón	5.92	-484.47	418.93	-43.74	-19.35	-34.32	-0.01

Note: Wages are per employee.

Source: Dussel Peters for the OECD based on INEGI.

Table 1.A1.12. Main characteristics of Mexico's BMFs with no FDI

2003

Branch	All Big Manufacturing Firms (No FDI)						
	Employment	*Productivity*	*Wages*	*Imports / GDP*	*Exports / GDP*	*Investment / GDP*	*S&T / GDP*
	(total = 100)	(total=100)	(total=100)	%	%	%	%
TOTAL	57.96	90.98	96.56	56.92	72.86	15.75	6.00
Ten Branches with highest S&T / GDP coefficient (for all Big Manufacturing Firms)							
Rama 3345 Fabricación de instrumentos de navegación, medición, médicos y de control	0.16	32.82	50.85	93.85	146.63	11.50	622.64
Rama 3342 Fabricación de equipo de comunicación	0.11	97.01	91.09	49.23	97.30	1.76	185.03
Rama 3314 Industrias de metales no ferrosos, excepto aluminio	1.30	231.59	128.85	109.72	242.88	24.14	84.56
Rama 3359 Fabricación de otros equipos y accesorios eléctricos	0.51	79.93	86.54	90.77	115.99	8.46	210.51
Rama 3341 Fabricación de computadoras y equipo periférico	0.14	172.83	128.60	1085.88	1161.03	-18.52	0.60
Rama 3399 Otras industrias manufactureras	1.30	43.97	64.82	29.42	41.51	8.22	45.93
Rama 3231 Impresión e industrias conexas	1.33	65.38	87.69	12.07	4.24	11.37	15.34
Rama 3222 Fabricación de productos de papel y cartón	1.33	78.16	88.45	36.20	12.43	19.92	17.97
Rama 3132 Fabricación de telas	1.56	56.82	87.87	44.56	41.65	-0.39	10.81
Rama 3363 Fabricación de partes para vehículos automotores	2.94	116.21	101.30	48.58	129.86	12.09	6.83
Ten Branches with lowest S&T / GDP coefficient (for all Big Manufacturing Firms)							
Rama 3328 Recubrimientos y terminados metálicos	0.32	196.43	116.16	28.63	65.72	4.28	0.03
Rama 3211 Aserrado y conservación de la madera	0.29	31.99	40.68	1.49	4.38	2.19	0.03
Rama 3151 Tejido de prendas de vestir de punto	0.66	43.56	53.03	8.02	52.68	7.31	0.02
Rama 3336 Fabricación de motores de combustión interna, turbinas y transmisiones	0.10	205.21	83.54	151.63	253.23	15.62	0.01
Rama 3159 Confección de accesorios de vestir	0.05	51.08	46.93	60.48	122.21	4.38	0.03
Rama 3325 Fabricación de herrajes y cerraduras	0.12	58.43	61.42	2.96	4.28	4.62	0.00
Rama 3131 Preparación e hilado de fibras textiles y fabricación de hilos	0.57	53.84	55.43	54.41	53.23	13.49	0.01
Rama 3364 Fabricación de equipo aeroespacial	0.05	78.98	134.80	8.60	137.55	1.56	0.00
Rama 3366 Fabricación de embarcaciones	0.01	40.74	107.05	2.40	5.40	-2.83	0.00
Rama 3241 Fabricación de productos derivados del petróleo y del carbón	1.37	-508.72	428.13	-41.96	-18.68	-33.46	-0.01

Note: Wages are per employee.

Source: Dussel Peters for the OECD based on INEGI.

Table 1.A1.13. Main characteristics of Mexico's BMFs with FDI stake above 50%

2003

Branch	All Big Manufacturing Firms (FDI above 50%)						
	Employment	*Productivity*	*Wages*	*Imports / GDP*	*Exports / GDP*	*Investment / GDP*	*S&T / GDP*
	(total = 100)	(total=100)	(total=100)	%	%	%	%
TOTAL	39.53	102.78	102.51	72.59	148.00	9.91	2.82
Ten Branches with highest S&T / GDP coefficient (for all Big Manufacturing Firms)							
Rama 3345 Fabricación de instrumentos de navegación, medición, médicos y de control	0.18	59.64	87.62	43.45	242.34	2.52	0.14
Rama 3342 Fabricación de equipo de comunicación	0.76	51.15	70.07	66.15	215.98	0.69	44.19
Rama 3314 Industrias de metales no ferrosos, excepto aluminio	0.00	0.00	0.00	0.00	0.00	--	0.00
Rama 3359 Fabricación de otros equipos y accesorios eléctricos	0.76	75.78	86.79	20.60	123.47	5.03	0.42
Rama 3341 Fabricación de computadoras y equipo periférico	1.18	66.25	88.11	288.33	402.14	8.88	0.29
Rama 3399 Otras industrias manufactureras	0.84	58.34	74.71	28.12	132.59	4.97	0.27
Rama 3231 Impresión e industrias conexas	0.22	63.84	82.56	28.61	74.12	5.94	0.22
Rama 3222 Fabricación de productos de papel y cartón	0.41	174.28	101.26	70.85	65.30	15.01	0.51
Rama 3132 Fabricación de telas	0.13	114.17	85.02	61.52	126.64	49.61	0.00
Rama 3363 Fabricación de partes para vehículos automotores	9.48	79.47	92.37	46.27	148.17	13.29	0.06
Ten Branches with lowest S&T / GDP coefficient (for all Big Manufacturing Firms)							
Rama 3328 Recubrimientos y terminados metálicos	0.05	56.10	91.10	0.92	140.79	0.42	0.11
Rama 3211 Aserrado y conservación de la madera	0.00	74.35	89.13	0.00	102.74	0.00	1.17
Rama 3151 Tejido de prendas de vestir de punto	0.09	31.14	46.54	41.52	136.05	4.36	0.00
Rama 3336 Fabricación de motores de combustión interna, turbinas y transmisiones	0.22	135.87	174.27	69.93	226.88	2.26	0.18
Rama 3159 Confección de accesorios de vestir	0.02	31.06	62.82	1.75	131.44	0.42	0.05
Rama 3325 Fabricación de herrajes y cerraduras	0.19	86.22	89.56	17.28	126.83	0.25	0.13
Rama 3131 Preparación e hilado de fibras textiles y fabricación de hilos	0.05	124.31	71.98	81.18	52.80	7.46	0.15
Rama 3364 Fabricación de equipo aeroespacial	0.11	62.11	96.54	2.37	247.53	2.70	1.88
Rama 3366 Fabricación de embarcaciones	0.01	51.77	68.86	3.41	141.02	0.56	0.00
Rama 3241 Fabricación de productos derivados del petróleo y del carbón	0.02	324.64	74.02	42.70	2.47	9.12	0.48

Note: 1) Per employee.

Source: Dussel Peters for the OECD based on INEGI.

Table 1.A1.14 and Figure 1.A1.6 present similar information, but now for all Mexican states and the Federal District. First, the Northern Border and Centre states account for more than two thirds of BMF employment, while the Southern and Gulf and Caribbean regions play a minor role in this data set. Second, the two main regions (the Northern Border and the Centre) present similar patterns in terms of their weight over employment, productivity and even wages, with some differences. The main differences, however, refer to the better performance of the Northern Border states in contrast to the Centre region in terms of S&T coefficients, more concretely, the Northern Border's S&T coefficient is more than twice as high 6.86% *versus* 2.66%, and more than three times as high for BMF with no FDI; similarly the investment/GDP ratio calculated is also almost 30% higher in the Northern Border than in the Centre region. It is also notable that the export/GDP ratio in the northern border is more than twofold that of the Centre Region. This is probably one of the most relevant results in terms of the North-South cleavage within Mexico and a substantial association between trade, export-orientation, investments and S&T, when compared to Mexico's Centre, but also to the rest of the country.

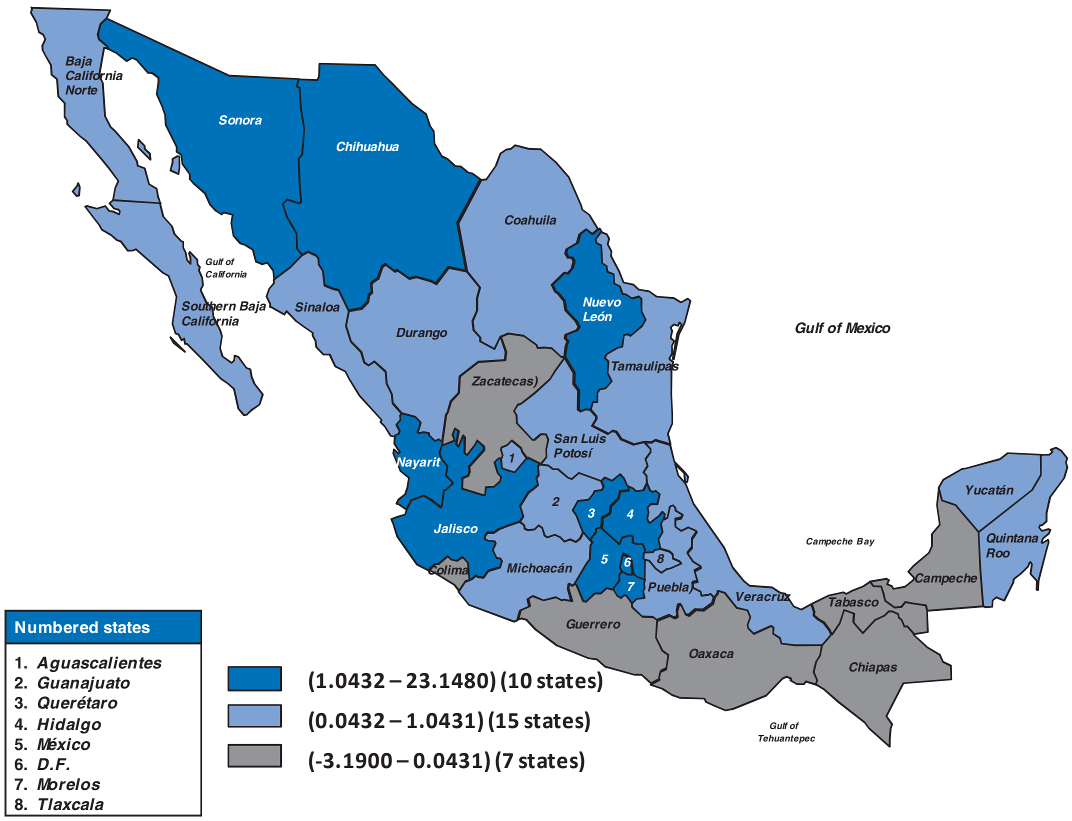
Table 1.A1.14. Main characteristics of Mexico's BMFs by region: 2003

	Total	Northern Border	Southern	Pacific	Center-North	Centre	Gulf and Caribbean
All Big Manufacturing Firms							
Employment (total=100)	100.00	35.79	1.29	9.97	14.17	33.51	5.26
Productivity (total=100)	100.00	88.15	150.15	101.78	103.53	102.74	137.99
Wages (per worker, total=100)	100.00	99.63	146.31	83.95	82.91	105.82	130.57
Imports / GDP	62.94	66.09	56.42	79.81	75.89	54.30	28.22
Exports / GDP	101.21	145.39	59.17	75.89	129.56	57.56	47.62
Investment / GDP	13.18	13.74	37.38	11.72	11.72	10.97	22.57
S&T / GDP	4.32	6.86	0.67	5.67	3.38	2.66	0.12
Big Manufacturing Firms, no FDI							
Employment (total=100)	35.90	8.80	0.62	4.23	5.72	14.36	2.18
Productivity (total=100)	90.98	93.18	149.12	97.66	96.99	76.21	134.23
Wages (per worker, total=100)	96.56	100.29	149.02	80.78	82.98	95.72	138.37
Imports / GDP	56.92	93.24	58.70	55.16	65.94	35.39	20.50
Exports / GDP	72.86	109.85	62.01	62.83	137.90	27.96	31.44
Investment / GDP	15.75	21.72	39.76	10.16	12.03	10.74	25.18
S&T / GDP	6.00	14.28	0.72	1.46	3.66	4.71	0.11
Big Manufacturing Firms, FDI less than 50%							
Employment (total=100)	3.48	1.51	0.00	0.17	0.54	1.14	0.12
Productivity (total=100)	219.54	176.55	1113.70	117.61	187.01	279.30	458.95
Wages (per worker, total=100)	129.55	131.21	103.98	141.81	61.84	157.64	127.76
Imports / GDP	54.39	41.47	6.87	29.31	83.92	60.10	41.91
Exports / GDP	54.08	69.26	10.64	47.10	48.68	48.45	28.33
Investment / GDP	12.34	14.12	0.93	22.21	11.25	10.80	11.78
S&T / GDP	0.51	0.51	0.00	0.47	0.04	0.74	0.00
Big Manufacturing Firms, FDI more than 50%							
Employment (total=100)	38.57	26.35	0.08	2.12	3.35	5.25	1.23
Productivity (total=100)	102.78	72.13	80.37	123.83	110.96	251.55	95.60
Wages (per worker, total=100)	102.51	98.05	143.11	84.86	83.35	111.20	124.38
Imports / GDP	72.59	50.62	32.00	146.32	97.67	78.21	52.90
Exports / GDP	148.00	180.82	20.70	163.22	132.39	99.38	121.48
Investment / GDP	9.91	8.13	2.62	8.83	11.11	11.32	17.08
S&T / GDP	2.81	2.57	0.00	16.74	3.59	0.39	0.21

Source: Dussel Peters for the OECD based on INEGI.

Figure 1.A1.6. S&T by state for big manufacturing firms

2003, as a percent of GDP



Source: Dussel-Peters for the OECD based on data from INEGI.

Further analysis for the auto parts-automobile and electronics chains in particular show the following main results:

- The auto parts-automobile chain accounts for very low levels of S&T/GDP (of 2.03% for the chain and compared with a 4.3% for all the sample of BMF). By far, branches with no FDI account for the highest coefficient of S&T, of 3.42%, while branches with a share of FDI over 50% only accounted for 1.33%. The same chain accounts for very high exports/GDP (of 219%), and in particular for those branches with a share of over 50% of FDI over its respective social capital. In both cases in which FDI has a stake in social capital of the BMFs, the investment/GDP ratio is higher than for those branches without FDI. It is also significant to mention that 72% of total employment in the chain is represented by firms with a controlling stake by FDI.
- In the electronics chain, similar features are observed: in contrast to the rest of the economy, the S&T /GDP coefficient is extremely high, 14.64%, but in particular for the non-FDI branches, with a coefficient of 39.93%, while it is only of 0.02% and 7.60% for branches with FDI levels below and above 50% of social capital respectively.

Notes

1. The respective chains were defined as follows, and based on Mexico's national accounting system: Electronics (sum of branches 2823, 2832, 3833 and 3850), automobiles (3841) and auto parts (3842).

Chapter 2

National Policies to Support Regional Clusters and Innovation Systems

Introduction

As the data reveals, there is an imperative to improve both labour productivity and multi-factor productivity growth to ensure Mexico's future competitiveness. Mexico's competitive advantages in low-cost labour are slipping with respect to emerging market competitors, yet there is insufficient investment to ensure an effective transition to the knowledge economy. Furthermore, as innovation investment is pro-cyclical, there is a need to ensure continued public and private sector investment in innovation despite the financial and economic crisis so as to ensure sustainable growth in the long term.

Strengthened governance and appropriate policies to improve the linkages among actors in clusters and regional innovation systems are also needed. A number of OECD reviews have outlined the importance of greater investment in human capital, improved business environment conditions, regulatory reform, a strengthened innovation support framework and other factors that have an impact on competitiveness. However, the regional dimension in terms of cluster development and regional innovation systems (RIS) has received less attention. The ability to support regional competitiveness is not only vital for national policy objectives, it is the only sustainable way to address the considerable income and productivity disparities.

This chapter focuses on the role of certain national policies to support the development of regional clusters and innovation systems. It reviews policy trends in regional policy, science and technology policy, enterprise-related policies and higher education policies. It finds that policy efforts in Mexico in these four policy areas would benefit from a greater emphasis on the spatial dimension in supporting national innovation and economic development policy goals.

- ***Regional development policy*** does not exist per se in Mexico, however there have been some attempts to focus on different region types, mainly to address areas of socioeconomic disadvantage. While regional development is a stated part of the national development plan as a vehicle to achieve national competitiveness, in practice there are no clear strategies.
- In terms of ***enterprise policy***, most sectoral policies are spatially blind, but there are some examples of cluster development. FDI policy has no territorial approach despite a highly territorial distribution of FDI flows, with technology spillovers under-developed. SME policy does include some instruments that address firm groups, and these efforts would benefit from greater linkages to other cluster/RIS development policies.

- ***Science and technology policy*** has begun taking the regional innovation system (RIS) concept approach into some instruments, but the bulk of resources are still highly concentrated spatially and, for direct programmes, mainly project based. There is a need for greater capacity building and system support for the different RIS types and stages of development across the country.
- ***Higher education policy*** does not provide direct incentives for engagement in regional innovation systems, albeit many HEI-led initiatives are noted throughout the country. Some CONACYT and Ministry of Economy programmes are seeking to increase HEI-firm collaboration. Another major challenge, particularly with large public universities, is meeting the needs of a region's labour demand.

Trends in OECD countries

In many OECD countries there is a convergence of national policies that contribute to regional competitiveness through active support to clusters and regional innovation systems. These policy families include: regional development policy, science and technology (S&T)/innovation policy, higher education policy and enterprise-related policies (see Table 2.1). While many other policies affecting framework conditions can impact the development of specific clusters, here we are referring to policies that play a more direct role in supporting the linkages among actors within a cluster or regional innovation system.

The orientation of the policy family (in other words, which ministry is funding the programme, or which sectoral "plan" it is part of) serves to frame the objectives, targets and scope of the policy. The new approaches in these policy areas imply greater fluidity across what used to be more segmented sectoral ministry boundaries. The overlapping of objectives requires new ways of cross-sectoral (horizontal) governance arrangements. Clarity and co-ordination at the central level serves to prevent the problems resulting from the classic "silos" of individual sectoral policies (see Chapter 4). At the regional level, it is typically easier to join-up across these policy streams when the central level has already done so. Regardless of the policy stream, in Mexico there is generally a lack of planning for technology and innovation that further complicates efforts to support clusters and regional innovation systems.

Table 2.1. Policy trends supporting clusters and regional innovation systems

Policy Stream	Old Approach	New Approach	Cluster/ regional innovation Focus
Regional development policy	Redistribution from leading to lagging regions	Building competitive regions by bringing local actors and assets together	• Target or often include lagging regions • Focus on smaller firms as opposed to larger firms, if not explicitly than *de facto* • Broad approach to sector and innovation targets • Emphasis on engagement of actors, public and private
Science and technology policy	Financing of individual, single sector projects in basic research	Financing of collaborative research involving networks with industry and links with commercialisation	• Usually high-technology focus • Both take advantage of and reinforce the spatial impacts of R&D investment • Promote collaborative R&D instruments to support commercialisation • Include both large and small firms; can emphasise support for spin-off start ups
Higher education policy	Focus on teaching role of HEI and basic research	Promoting closer links with industry and joint research; more specialisation among HEI	• Usually high-technology focus (following research budgets) • Increasing emphasis on commercialisation (*e.g.*, support for spin offs in some HEI) • Joint work with large firms; HEI-SME links increasingly a goal • Regional HEI are increasingly core partners for regional policy-led innovation programmes.
Enterprise-related policies	Subsidies to firms; national champions	Supporting common needs of firm groups and technology absorption (especially SMEs); promoting FDI spillovers	Programmes often adopt one of the following approaches: • Target the "drivers" of national growth • Support industries undergoing transition and thus shedding jobs • Help small firms overcome obstacles to technology absorption and growth • Create competitive advantages to attract inward investment with spillovers and brand for exports

Notes: HEI=higher education institution; FDI=foreign direct investment; SME=small and medium-sized enterprises.

Source: OECD (2007), *Competitive Regional Clusters: National Policy Approaches*, OECD Publishing, Paris with modifications.

Regional development policy: need for national approach with competitiveness focus

Mexico does not have an explicit regional development policy, or a tracking of federal expenditures that are targeted to regional development. The term region may refer to many different territorial sizes, but in the case of Mexico, for comparison purposes, the term region refers to a Mexican state unless otherwise noted. Explicit regional or regional development policy exists in many OECD countries. There are clear arguments for why one is needed across the OECD and particularly in Mexico (OECD 2003, 2007l, 2007o):

- ***Regional development policies support growth in all regions.*** The place-based dimension of factors that can support firm productivity are recognised in the literature to operate on several fronts, including the new economic geography and regional innovation systems research. In Mexico, 41% of GDP is concentrated in 10% of its regions (11 OECD countries have at least 40% of GDP in the top 10% of regions).

- ***There are "neighbourhood effects" with respect to economic growth*** and innovation whereby strong performance in one region can have positive spillovers in a neighbouring region. The reverse is also true, as weak performance in one region can have negative spillovers for a neighbouring region.
- ***Regional development policies can partially alleviate the disparities*** across Mexico to address equity and efficiency concerns, as severely lagging regions are a problem for national growth. Labour productivity differentials across states is higher in Mexico than any other OECD country (with the exception of three-region Belgium). The disparities among types of regions are also very notable, with the GDP per capita in predominantly urban regions approximately twice that of rural regions.

Mexico's rural development policy approach does include programmes that support local public goods and productive activities that indirectly support rural clusters. The Ministry of Economy's credit programme (FONAES) and the Rural Development Programme of the Ministry of Agriculture and Rural Development (SAGARPA) support productive activities in rural areas. The Ministry of Social Development (SEDESOL) has a programme for poverty alleviation (*Oportunidades*) that contributes to human capital investment in rural areas via programme requirements for child school attendance and periodic medical checkups.[1] One of the success drivers of this programme has been the effective co-ordination across three ministries: social development, education and health. OECD recommendations for improvement of these programmes, in addition to increasing their scale, are to better link them with regional development plans (OECD, 2007l, 2007o). Another innovative programme, 3X1, capitalises on remittances for place-based development with matching public investment at a rate of three to one.[2]

One programme with a truly territorial approach is that of the well-conceived Micro-Regions programme that involves a multi-sector, multi-tier strategy. Based on a mapping of a marginalisation index, the policy targets 263 micro-regions with 99 000 localities containing a total population of 20 million. The deficit-oriented approach of the programme operates with a system of white flags that recognises when a micro-region has reached an adequate level of basic infrastructure or services on different elements. The interesting multi-level governance lesson from this programme is the multiple tiers of councils to oversee the strategy at federal, state and municipal levels. Recommendations suggested for the programme include greater funding and expansion to more areas given the importance of having basic public services as a pre-condition for economic development as well as for equity reasons (OECD, 2007l).

Another regional-type policy for wider multi-state groupings was introduced in the 2000-2006 National Development Plan. Regional development was identified as one of the four core criteria for national development. The approach divided the country into five meso-regions whereby states voluntarily engage in joint agreements for projects (Figure 2.1). The concept was accompanied by a Regional Trust Fund for each region, with a rotating Trust Fund president from the constituent states. The incentives from the Regional Trust Funds remain very limited in scale but have served as one vehicle for inter-state dialogue (OECD, 2003; OECD, 2007o). Other challenges in addition to financing include the lack of a legal basis for these meso-regions, an inability for states on the border to participate in different regional groups, the large size of the regions for all states to see the benefit of joint action, and continuity issues for leadership. The northern border states have also been engaged in inter-state and cross-national collaboration with the US through the Border Governors Conference (*Conferencia de Gobernadores Fronterizos*) that includes six Mexican and four US states.

Figure 2.1. Meso-regions in Mexico

Name	GDP billions MXN (% national total)	Population in millions (% national total)
Centre	372.8 (38.1%)	33.1 (32.1%)
Centre-West	182.9 (18.7%)	23.6 (22.8%)
North-East	180.6 (18.5%)	12.9 (12.6%)
North-West	98.8 (10.1%)	9.9 (9.6%)
South-Southeast	142.9 (14.6%)	23.7 (23.0%)

Notes: The regional designations are per the 2001-2006 National Development Plan. Puebla is also included in the South-Southeast region. Chihuahua and Durango are included in both the North-East and North-West regions. Queretaro is also included in the centre region. GDP presented are at Purchasing Power Parity for 2004.

Proposed reforms to the planning law introduced in 2005 sought to reinforce the legal basis and governance structures of meso-regions. These proposals included the development of Regional Development Agencies (akin to the Canadian model) corresponding to the meso-regions and the possibility to establish metropolitan regions across state lines with corresponding development agencies. The proposed reforms, which would have provided more formal tools for meso-regions, have not passed. The lack of legal basis for cross-state municipal co-operation also remains a barrier for certain forms of regional action.

Meso-regions have mainly focused on infrastructure planning and overall economic development with only initial efforts made at joint action to support common sectors or clusters. Given the large scale of the meso-regions, this emphasis on infrastructure would be expected. The South-Southeast meso-region has actually gone the farthest in terms of acting "regionally" within this meso-region approach. The constituent states have established a larger Trust Fund than the other meso-regions. They chose to work with the Ministry of Communications and Transport as a group of states, rather than individually, presenting a common list of regional priorities. They were also able to use their regional priorities list to negotiate with the Ministry of Finance (SHCP). This meso-region created a special commission within the Chamber of Deputies in Congress. It has also gone the farthest among meso-regions in promoting joint strategies, including cluster mappings and specific cluster studies in several agricultural sectors (honey and forestry among others). Other bottom-up multi-state approaches exist outside of the meso-region approach as well.

There are several OECD examples of pan-regional action to support innovation systems and clusters with varying degrees of intensity (see Table 2.2). The term pan-regional implies that there is action across more than one administrative region, and in the case of Mexico this would mean states. As with any collaboration, there needs to be a clear rationale for the participants to see the value in working together. Common rationales for such collaboration include: increasing the critical mass of firms or innovation inputs (for greater productivity and to capture more national resources), addressing a functional economic area that crosses regional boundaries, solving common problems, obtaining larger benefits from investments due to potential positive externalities, making large common investments (that would be individually unaffordable) or increasing specialisation/complementarity within a larger area. Ultimately the benefits of such collaboration need to outweigh the transactions costs for co-ordination.

The spatial scale of the area and the existing or potential linkages among the cluster/RIS actors will determine, in part, the nature of the collaboration. In the North of England, for instance, the focus of pan-regional collaboration (for the three regions that comprise it) includes building critical mass in common areas of technology expertise and strengthening the links across universities in these areas. The US Southern Technology Council covers a vast territory (13 US states) and therefore is focused on lighter forms of collaboration for information sharing, investment promotion and image/culture change. In China, one of the drivers of collaboration has been to make more convincing proposals to national government for S&T funds. The depth of such pan-regional collaboration is limited if there is no pre-existing pan-regional strategy within which these areas for collaboration fit, as it is then more likely to be ad-hoc project-based collaboration.

Table 2.2. Rationale for pan-regional RIS collaboration

Name	Scale	Focus	Instruments
Greater South East (UK)	Spans three regions of London, East England, and Southeast England	• Building on strong connectivity and critical mass	• Joint innovation programmes (University business fellows and technology transfer programme • Innovation research map • Research excellence directory • Joint business support and knowledge networks in area of common strengths
Southern Technology Council (US)	Southern US states Alabama – Arkansas – Georgia – Kentucky – Louisiana – Mississippi – Missouri – North Carolina – Oklahoma – South Carolina – Tennessee – Virginia – West Virginia	• Information sharing • Investment promotion • Image/culture change	• Publications such as "Innovation with a Southern Accent" to highlight facts about the South and areas of technical competency • Periodic theme meetings
Brainport – Eindhoven area (Netherlands)	21 municipalities that span parts of two Dutch provinces	• Promoting the region as a knowledge hub internationally • Advocating to central government the importance of this region • Supporting business and technology efforts	• Promotes the region as an attractive location to bring in high skilled labour • Support of High Tech campus with open innovation model • Knowledge transfer activities
Shanghai area Bureaus of Science and Technology (China)	Shanghai municipality with neighbouring provinces of Zheijang and Jiangsu	• Supporting science and technology projects jointly for a large economic zone • Mobilising greater national funds for research projects of joint interest	• Harmonisation of policies for actors to engage across administrative boundaries

Source: OECD (2008), *OECD Reviews of Regional Innovation: North of England, UK*, OECD Publishing, Paris.

While the meso-region Trust Funds are still in place, the 2007-2012 National Development Plan (PND for its acronym in Spanish) does not reference meso-regions explicitly. Alternatively, it presents an "integral" strategy for regional development. The rationale for promoting such a strategy is to address existing regional disparities across the country and allow for lagging regions to benefit from international integration and structural changes in Mexico. The main mechanism through which this regional development strategy is conceived corresponds to the new approach brought forward by the OECD framework (see Table 2.1 above) of increasing competitiveness in each region, while making clear that this must be done considering regional vocations, specificities and competitive advantages. Additionally, the six-year plan depicts the need for role sharing across levels of government as well as vertical and horizontal co-ordination. Finally, it highlights the importance of innovation for increasing living standards in the regions. To overcome the existing regional cleavages, the PND envisions the following strategies:

- The promotion of co-ordination (vertical and horizontal) mechanisms between levels of government, while increasing responsibilities and competencies at the sub-national level;
- Institutional capacity building at the state and municipal level;
- Enhancing the competitiveness of all regions, emphasising in lagging regions SMEs and sectors with potentially high regional impact;
- Financial deepening in regions;
- Considering the spatial dimension and specificities of regions in the design of public policies; and
- Ensuring the existence (and the required efficient investments) of necessary infrastructure to increase regional competitiveness.

While this is a very appropriate diagnosis on the rationale and the measures to address regional development, it is not clear that there are any mechanisms in place to achieve these goals. There are no new clear national directives or policies to address regional development issues. Additionally, in terms of defining regional vocations, specificities, sectors or competitive advantages, no definitions (or indicators) have yet been outlined at the national level so as to envision an "integral" regional development strategy. There is a need for greater collaboration both across levels of government and among ministries. Finally, at the state and municipal levels, increasing competencies, responsibilities and resources are also needed to realise this agenda (see Chapter 4 for a more detailed discussion of governance issues).

A notable trend in the transition of regional development policy approaches in many other OECD countries is the increasing accent on innovation for regional competitiveness (see Table 2.3). National policy approaches have also required that regions develop clear priorities for cluster support and the development of regional innovation systems, both to support regional economic development and to establish priorities for national/regional alignment of resources.

This increasing regional development policy focus on competitiveness has implied that economics and enterprise-related ministries are focusing on the spatial dimension of economic activity. The regional level is considered important both for its influence on economic activity and for its role in achieving national economic goals. For example, in England the Regional Development Agencies (RDAs), while funded by several government departments, are overseen by the Department for Business Enterprise and Regulatory Reform. The UK government has also recently funded the creation of a Spatial Economics

Research Centre and a series of regional observatories to support this regional development approach. In the Netherlands, the Ministry of Economy's Directorate General for Enterprise and Innovation has a Spatial and Regional Economic Policy Department in recognition of the importance of the spatial dimension.

Table 2.3. New regional development policy frameworks: regional competitiveness

Select OECD countries

Denmark	• *Regional Growth Strategy White Paper, 2003* • *Business Development Act, 2005* The 2005 Business Development Act follows a growth-oriented agenda. Two of the six priority areas relate to innovation and ICT.
Finland	• *Regional Development Acts, 2002, 2007* • *Government Decision, 2004* The Centres of Expertise programme is a key component of regional policy. More generally there is a strong emphasis on regional innovation within Finnish regional policy.
France	• *Law on National, Regional and Sustainable Development Policy, 1999* • *New Spatial Development Policy, DATAR, 2002* The *Pôles de competitivité* programme launched in 2005 is the main initiative to make French regions more competitive; closely linked to new regional development structures.
Italy	• Community Support Framework (CSF) 2000-06 • Unitary regional policy under the National Strategic Reference Framework (NSRF) 2007-13 The NSRF suggests that the role of innovation support within regional policy will increase. Current focus is on the innovation component of regional aid.
Netherlands	• Spatial Policy Memorandum, 2000 • Peaks in the Delta Memorandum, 2004 Peaks in the Delta has a strong innovation orientation. Four of the six Peak programmes focus on innovation as a regional strength.
Norway	• Policy statement to parliament, 2002 • Regional Policy White Papers, 2005, 2006 The 2005 White Paper had a strong innovation orientation, with a proposed new Centre of Expertise programme. Although the 2006 White Paper shifted the emphasis back towards traditional problem regions, the Centre of Expertise programme is now operational.
Sweden	• *Government Bill: A Policy for Growth and Viability throughout Sweden, 2001 (Regional Growth Programmes)* There is a strong innovation component to the Regional Growth Programmes.

Source: Adapted from Yuill, Douglas (Editor) (2006), *Regional Policy Developments in the Member States and Norway: Country Reviews 2005-06*, EoRPA Paper 06/2 prepared for the twenty-seventh meeting of the EoRPA Consortium, Ross Priory.

Enterprise policies

Sectoral policies: place-blind and place-based examples

There are several sectoral programmes promoted by the Ministry of Economy as part of the national competitiveness approach as outlined in the 2001-06 National Development Plan, but rarely is there a spatial dimension. Many of these programmes are still in place, however under the new administration these programmes and sectoral choices are being reviewed. The purpose of this Review is not to evaluate the merits or effectiveness of these sectoral programmes per se; but rather to show how they do or do not incorporate a spatial dimension in terms of specific clusters around the country so as to increase the linkages among firms and other supporting institutions (universities, research centres, sub-national government, etc.).

Ten sectors were initially selected for sectoral support in the 2001-06 Plan. The five that have direct programmes include IT, leather and footwear, textile and clothing, automotive and the electronics industry (see Table 2.4). These sectors were selected in some cases because of the significant levels of employment but diminishing competitiveness and in others because of the sector's transversal nature that could have many positive spillovers for other sectors (such as logistics and IT). Other sectors in process (chemicals, tourism, *maquiladora* and aerospace) or pending (agriculture, commerce and construction) have not resulted in specific programmes. Another general programme, PROSEC, seeks to increase the local content of manufactured goods in 22 sectors through a preferential ad-valorem tariff, regardless of the final destination of the goods. The sectoral priorities going forward are currently under discussion, but the ten-point plan to increase productivity by the Under-Secretariat for Industry and Commerce also mentions additional sectors from those above. For example there are feasibility studies on four sectors for potential future action: nanotech, mechatronics (mechanical and electronics engineering), auto (already part of one programme) and metal.

While there is some acknowledgement of the spatial dimension of the sectors being supported, the links with actions taken at regional level are not clear. This is even more important considering that in some cases a few states account for most of the national output in those sectors. For example, the leather and footwear industry is concentred in a band across the middle of the country: Guanajuato (46.1%), Jalisco (11.7%), the state of Mexico (5.3%) and the Federal District (3.4%). The electronics industry is notable across all but one US border state as well as a band from the state of Mexico through Jalisco with some presence of key firms in Queretaro, Aguascalientes and Puebla.[3]

One programme with a focus specifically on cluster development and innovation is Prosoft. The budget for the programme increased from USD 12.4 million in 2002 to over USD 40 million in 2007 (more than a three-fold increase). There has also been a strong multiplier effect. For every peso of federal funds in 2007, the multiplier effect resulted in a total of between 2.7 and 6.1 pesos by state (3.9 on average), with state, private, academic sector and other funds contributing (Ruiz Duran, 2008a). The programme has been evaluated by several entities.

Prosoft was reported in state visits to have played an active role in supporting local projects to develop software clusters with SMEs. Programme rules have also been reported by states to be relatively easy to work with. It has been recommended that to further support the growth of technology clusters around Mexico and to improve national innovation performance, that the Prosoft model be used as an example (OECD, 2009b). Several cluster organisations have been created around the country as a result of this initiative, either with a firm, government, or mixed approach. As of 2007, the total number of actors involved in the 22 cluster organisations is 707, ranging from four to 80 in a given cluster. The number of participating states has since increased to approximately 30.

Table 2.4. Sectoral support programmes

Sector (Programme)	Rationale	Key programme goals and strategies
Information Technologies Service Sector (PROSOFT)	- IT are capable of increasing the GDP up to 5% (The Economist Intelligence Unit) -Positive (92%) correlation between the adoption of IT and country competitiveness (IMCO) -Driver of growth in several other competing economies	GOALS -To increase the production level of IT -To increase the number of people employed in the IT sector -To increase IT expenditure as a percentage of GDP -Making Mexico the undisputed Latin American leader in high-quality IT solutions and services STRATEGIES -Promote exports and investment attraction -Increase the quantity and quality of the talent pool in the IT sector -Promote the adoption of a legal framework that encourages the use and production of IT -Promote the growth of the domestic market through the diffusion of IT -Increase competitiveness of IT sector and promote business groups -Achieve international process capability levels -Increase options and possibilities to access financial resources
Leather and footware	-Important sector in manufacturing (GDP, employment) but declining -Currency generation via exports -Global industry	-Create intelligent, organised, flexible and sharp companies to increase value added -Develop clusters with horizontal and vertical collaborations (includes supplier development and innovation system of industrial districts) -Reduce transaction costs and increase access to financing -Reactivate local demand and promote exports
Electronics	-Main generator of annual exports (supported by *maquila* mechanisms) -Large generator of direct employment -Loss of competitiveness in this sector	-Develop local suppliers in electrical components, metal and plastic parts, and complementary materials and services -Develop own technologies (Created in Mexico, not Made in Mexico) -Promote sector competitiveness (tariff structure, foreign trade processes, standardising and regulatory framework, supply chain development) -Strengthen sector (fiscal policies, promote technology development, human capital, infrastructure, competitive macroeconomic environment)
Textile and clothing	-4th most important manufacturing activity -Sector in decline -More assembly than total package (fiber-textile-clothing)	-Recover domestic market (employing national materials) -Increase export sale -Increase investments -Generate more employment -Counteract illegal commerce -Administrative standards and legal framework -Promote comprehensive solutions to clients
Automotive	-One of the largest manufacturing industries in Mexico -Source of strong flows of FDI -International importance of Mexico as automobile exporter	-Encourage new entrants to increase production -Supporting competitiveness of terminal auto industry -Promote the development of the internal market -Subject to certain requirements such as type of automobiles produced, size of production, investment and registered trademarks -Customs and customs law benefits -0% (or very low) rate in input import taxes and tariffs -Possibility to participate in public tender offers/concessions for vehicles -Import vehicles with zero tax regardless of existence FTAs
Logistics (PROLOGYCA)	-Importance of logistics costs as % of GDP -Essential element of competitiveness -Low international position of Mexico in terms of logistics performance (56/150)[1]	GOALS -Subsidies to projects that promote creation, improvements, efficiency, lowering of costs and increased competitiveness of firms in Mexico -Introduction of best practices in terms of logistics -Human capital formation in logistics STRATEGIES -Encourage the creation of better logistical services providers in Mexico -Promote better logistics management in enterprises. -International positioning of Mexico as a World Class logistics hub -Promote trade facilitations -Promote the relevant certification -To encourage human resources training in order to increase logistics abilities -Improve the co-ordination among local and federal government with the private sector in order to establish a national perspective -Restructuring and relocation of wholesale markets infrastructure -Distribution process improvement for agro food products -Development of distribution channels for traditional retail market
Interactive digital media (PROMEDIA)	-High value of world market -Potential market niche for Mexico	-Promote and consolidate the interactive digital media industry -Raising international competitiveness of the industry -Raising production and generating employment in the sector -Positioning the sector domestically and internationally -Strengthening the sector through human capital, increased availability of financial resources, promotion of innovation and exports, enhancing quality standards and strengthening of the rule of law (including intellectual property)

Note: 1. Logistics Performance Index published by the World Bank.
Source: Summary based on information from the Ministry of Economy, Mexico.

While the transversal nature of IT is a benefit, many of the clusters supported are not likely to be sustainable in the long term. As the programme continues to expand to even more clusters, the question needs to be asked as to whether the goal is to increase the number of clusters within the country for perhaps equity reasons or whether the goal is to support a limited number of strong clusters. A cluster initiative with four associated members, even if it does not cover the entire range of possible members, is of limited potential. These cluster initiatives are dispersed in most states of the country (see Figure 2.2). Another possibility would be to promote the grouping of these "clusters" in pan-state initiatives or clusters that can complement one another and build the necessary size and viability if there is sufficient proximity and useful linkages to develop.

Figure 2.2. Location of IT cluster initiatives

Source: Adapted from Ministry of Economy, Mexico at *http://www.edigital.economia.gob.mx/mapa/*.

FDI policy: need to seek regional spillovers

FDI policy is important for the development of particular clusters as well as the promotion of technological spillovers. The sectoral priorities of industrial policy do not appear directly linked with FDI attraction. The auto sector policy does have a strong fiscal incentive for new car production investment, however this appears to be an exception relative to the other prioritised sectors and the associated instruments. Mexico has been outperformed in FDI by countries such as Argentina, Brazil and Chile in Latin America and even China in specific sectors as well as other FDI driven OECD economies (Koyama and Golub, 2006; OECD, 2007f).

There are different types of FDI spillovers that Mexico can gain from, each implying a different set of policy strategies. Some of these spillovers are related to forward and backward linkages in supply chains. Such linkages may vary by type and sector. For example, backward linkages (from a domestic firm's customers) with productivity-enhancing effects were found to be stronger in services industries. Knowledge-related spillovers through forward linkages (from a domestic firm's suppliers) were noted in agriculture, land transport and mining and certain service sector activities (Lesher and Miroudot, 2008). Other spillover channels may include skills, exports and infrastructure improvements, imitation and competition (see Table 2.5) (Gorg and Greeaway, 2003). The absorptive capacity of domestic firms is another important determinant for technology-related spillovers.

Table 2.5. FDI spillover channels

Type	Explanation
Skills via labour mobility	Workers gain new skills through explicit and implicit training. In particular, training in foreign firms may be of a higher quality given that only the most productive firms trade. Workers take these skills with them when they re-enter the domestic labour market.
Exports and infrastructure improvements	Because multinationals by definition trade, they lay the groundwork for domestic firms to benefit from distribution networks, logistics services and infrastructure improvements. Domestic firms can also learn about the regulatory frameworks with which exporters must comply.
Imitation	This very obvious form of spillover often takes the form of reverse engineering, whereby a domestic firm creates a similar product based on the design of a good or service that a foreign affiliate produces. Imitation is only successful if the domestic firm has the technical capacity and ability to source the necessary inputs to produce a similar product.
Competition	If the foreign firm is not a monopoly provider and it sells in the domestic economy, then it competes directly with domestic firms in the market. Since multinationals are often more productive – they have to be to trade – this forces domestic providers to become more productive to successfully compete for business.
Vertical linkages	Backward and forward linkages are another way in which spillovers are transmitted in an economy. As foreign firms set up vertical production networks, they include domestic firms in their production chain. Since these suppliers must meet certain quality standards, they benefit from the experience and knowledge of the foreign firm.

Source: Lesher, Molly and Sébastien Miroudot (2008), "Foreign Direct Investment Spillovers and their Inter-relationships with Trade" in *OECD Investment Policy Perspectives 2008*, OECD Publishing, Paris using Görg, Holgar and David Greenaway (2003) "Much Ado About Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?", IZA Discussion Paper, No. 944, November.

Micro-level analysis on territorial clusters highlight that FDI is not necessarily the source of backward and forward linkages in Mexico. In specific regional clusters such as the leather-shoes commodity chain (Rabelloti 1995, 1997; Romo Murillo, 2005), electronics (Dussel Peters *et al.*, 2007; Padilla Pérez, 2008) and *maquiladoras* (Carrillo and Hualde Alfaro, 1998; Hualde Alfaro 2001), among others (Botzman 1999; Flores Méndez 2008), there is evidence of barriers to these linkages. They include: the lack of standardisation in the new measurement system, the vertical integration of original equipment manufacturers (OEMs) with clients and intra-firm standards. These barriers present strong limitations on these forms of industrial organisation in order to allow for learning and innovation processes from FDI and to integrate local and national suppliers to chains led by transnational corporations.

The Foreign Investment Law of December 1993, based on changes to a prior 1973 law, sets the stage for current FDI policy in Mexico. FDI was classified at the time into four categories: reserved to the State; reserved to Mexicans; those with specific sectoral regulations; and all other activities where FDI may not exceed 49%. Furthermore, there are specific criteria in the law to allow FDI that have positive impact for Mexico, such as employment and training, technical contributions and the general competitiveness of Mexico, however it is only in the last year that the criteria are becoming part of effective policy-making. (For an expanded discussion of FDI policy history, see Box 2.1).

Box 2.1. **FDI policy evolution in Mexico**

Mexico's national policies regarding FDI have gone through at least two important phases since the 1970s. The first was a result of import-substitution until the end of the 1970s and the Law to Enhance National Investment and to Regulate Foreign Investment of 1973. While the law was an important policy instrument to regulate FDI according to import-substitution (and in many cases policy decisions were arbitrary), four types of activities for FDI were established: *i*) those reserved to the State (such as oil, basic petrochemicals, electricity and railways, among others), *ii*) those reserved to Mexicans (such as forestry, radio and television), *iii*) those with specific sectoral regulations (such as secondary petrochemicals and telecommunications), and *iv*) all other activities in which FDI was not allowed to be above 49%. In general, these laws –and including several changes until the beginning of the 1990s – were to enhance technological development, exports, employment generation, import substitution, as well as decentralising FDI beyond the largest states (Gurría Treviño, 1994; Dussel Peters *et al.* 2003, 2007; Peres Nuñes, 1990).

The FDI law of 1973 was modified several times until the beginning of the 1990s through different reforms and regulations, and these changes were formally introduced in the Foreign Investment Law of December 1993. This new federal law has to be understood in the context of the implementation of the new overall macroeconomic strategy since the end of the 1990s (Aspe Armella, 1993; Dussel Peters, 2000) and is consistent with the chapter of the North American Free Trade Agreement (NAFTA) on investments, providing national and non-discriminatory treatment for regional foreign investment. NAFTA also established a socio-economic divide for Mexico and overall regulation from a sectoral perspective, in addition to raising cross-sectoral issues such as trade, investment, transportation and temporary imports, among others (DOF, 1993).

In general, FDI norms (also through sectoral regulations since 1993 in the financial sector, for example) were deeply deregulated and procedures were simplified for FDI and the Foreign Investment National Commission (FINC) of the Ministry of Economy. The new law kept the prior four types of activities of Mexico's economy for FDI, but reduced substantially sectors reserved to Mexicans and to the State, while abolishing all performance requirements that existed historically (for example regarding exports and minimum domestic value-added in particular sectors such as automobiles). Within this framework, only very few activities were reserved to the State (such as oil, basic petrochemicals, electricity and the control and supervision of airports and ports) and to Mexicans (such as passenger, tourism and cargo transportation). The *affirmativa ficta* regulation was also significant, since FINC had to resolve applications within 45 days or applications were approved automatically; foreign investments requiring applications and not exceeding USD 165 million were also automatically approved, unless the law restricted the specific activity. Most relevant for the current law is that Article 29 established four criteria for allowing FDI: *i*) impact on employment and training of workers, *ii*) its technological contribution, *iii*) compliance with ecological dispositions, and *iv*) in general, its support for Mexico's competitiveness. These criteria, however, were not implemented in effective policy-making until 2008. In addition, the concept of "neutral investment" allows for foreign investments in all sectors, which includes all legal rights, with the exception of voting rights.

Since the implementation of the Law in 1993 (and through the end of 2008) several items of the law have been discussed, including: *i*) the possibility of abolishing "neutral investments", since they are highly confusing and allow for misconduct according to the law; *ii*) the liberalisation of the oil sector, which has been publicly discussed since 2007 under the heading of the privatisation and liberalisation of the property of specific activities of the main state-owned oil firm, PEMEX, including the possibility of retail sales of gasoline and liquid petroleum

Box 2.1. **FDI policy evolution in Mexico** (continued)

gas for foreigners; and *iii*) the liberalisation of the electricity sector, allowing FDI in the production and distribution of electricity to the public. Finally, other sectoral regulations – such as in the financial sector, but in particular in trade – have affected FDI incentives. Mexico has signed 35 Agreements for the Reciprocal Promotion and Protection of Investments (ARPPI), the last one signed with China in 2008 affecting FDI with 48 countries. In addition, 12 free trade agreements with 44 countries, such as NAFTA, have also involved changes in FDI regulation**.**

In Mexico, national FDI policy has so far not allowed for a harmonisation of FDI incentives and benefits at the state level. Considering that until 2007 states could not grant direct fiscal incentives in real terms – with the notable exception of the recent 2% state payroll tax – most of the benefits that states offer concern particular expenditures of the respective transnational firm, (*i.e.*, in terms of reducing costs of real estate, infrastructure, water, electricity, training and other specific costs). As a result of an increasing decentralisation of economic policies, most of Mexico's states since the 1990s have started to develop industrial, micro enteprise, SME, and R&D and technological policies (OECD, 2003). Jalisco, Mexico City, Chihuahua and Sonora, among others, have led this process.

In some specific cases, competition for attracting FDI of specific firms has led to a "race to the bottom". Given the arbitrary legislative process in the respective states, many offer free real estate and infrastructure costs incurring high economic costs that in some cases can even increase the uncertainty of the respective multinational firm. While competition can lead to major efficiency gains and further efforts of states to improve quality of services, levels of human capital, living conditions, security, administrative simplification and infrastructure (among many others), it can also produce avoidable negative consequences (such as the aforementioned "race to the bottom").

At the same time, no major co-ordination efforts (neither among states nor from the federal government) can be identified in terms of a FDI strategy. In this sense, FDI could bring more benefits if different regions co-ordinated to make investments in Mexico and its regions more attractive (such as through integration of suppliers, logistics, distribution and other services located in neighbouring states). As such, co-operative efforts to offer investing firms an attractive regional location may bring positive effects for several states and not be seen as a zero-sum-game in which materialised investments in one state are seen as failure for others.

There is a lack of co-ordination of federal and state-level policies to attract FDI, in addition to a missing long-term strategy at both levels. This challenge has been acknowledged by several public and academic actors with respective policy proposals. So far, however, these have not been implemented (Dussel Peters *et al.,* 2007; PEF, 2007; SE, 2008a and 2008b). More complex policies to link FDI with innovation, R&D, and also micro and small firms have proposed by these authors and institutions. There is no evidence that such co-ordination and long-term strategy will be implemented and funded.

The lack of co-ordination is also reflected even at the statistical level. State-level and federal statistics on FDI differ substantially. State governments do not have access to firm-level statistics of their own state; only federal agencies have access to this information. In several cases, and according to different methodologies to register FDI, statistics differ from 15%-160% of those presented by the Ministry of Economy (Dussel Peters *et al.,* 2007). In order to share this kind of information, each of the respective states and the

Ministry of Economy formally require specific agreements that most of the states do not have. In addition, FDI statistics in Mexico, as in other countries, present a serious limitation for territorial analysis, since the final destination of FDI (the place where FDI is actually pursued) can't be tracked by current statistics. As a result, current FDI statistics overvalue the main states and cities where firms establish their fiscal address and undervalue the rest of the country where FDI is actually invested.

Despite these statistics barriers, the existing information allows for a deep understanding of FDI in Mexico and for a battery of instruments to improve FDI-promotion. For example, the auto parts-automobile and electronic chains are highly concentrated in a few states within Mexico, which should be the focus of related innovation policies. Similar instruments should be co-ordinated at the federal and state levels for other clusters. In addition, several theoretical frameworks and the effects of globalisation increasingly show that policies and instruments are more effective and useful from a territorial-sectoral perspective. These policies are strongly needed, as Mexico has already received several hundred billion USD since 1994 and there is uncertainty regarding future FDI-inflows.

Policy measures are needed to address the lack of a positive association between FDI, S&T and productivity links. This rather surprising result, in which Big Manufacturing Firms (BMF) with no FDI present the highest levels of S&T expenditure (compared to the rest of BMFs), implies a need for specific instruments to strengthen trade-intensive FDI activities in Mexico and in particular their backward and forward linkages with the rest of Mexico's economy (see Chapter 1). There are a number of possible policy strategies (see Table 2.6). It has been found that the use of performance requirements for MNEs as a policy strategy has not produced encouraging results (OECD, 2005c). Given that over 90% of FDI flows to the Northern Border and the Centre regions, both areas could become the short-term priorities of such policies.

The North-South cleavage in FDI flows is likely to continue without additional policy action. In particular, the states in the South, Pacific, Centre-North and Gulf and Caribbean regions have received few FDI flows with even fewer innovation processes. An effective FDI-promotion strategy to decrease FDI concentration, in addition to the aforementioned backward and forward linkages promotion measures, should be considered.

Table 2.6. Policy measures to create and deepen MNE-SME linkages

Type	Policy Measure
Information and matchmaking	*Provision of information* --Handouts and brochures --Constantly updated elecontric databases --Linkage information seminars, exhibitions and missions *Matchmaking* --Acting as honest broker in negotiations --Supporting supplier audits --Providing advice on subcontracting deals --Sponsoring fairs, exhibitions, missions and conferences --Organising meetings, visits to plants
Technology upgrading	--Creating a proper framework for dealing with IPR --Supporting partnerships with foreign affiliates --Incentives for R&D co-operation --Technology arrangements as part of incentive packages
Training	--Promoting supplier associations --Collaboration with the private sector for one-stop service, including training --Support for private sector training programmes
Business interventions	*Risk allevation* --Legal protection against unfair contractual arrangements and other unfair business practices --Encouraging a shortening of payments delays through tax measures --Limiting payments delays through legislation --Guaranteeing the recovery of delayed payments *Subsidies to MNEs* --Indirect financing to suppliers channelled through their buyers --Tax credits or tax reductions and other fiscal benefits to firms providing long-term funds to suppliers --Co-financing development programmes with the private sector *Performance requirements* --Mandatory transfer of funds or benefits from foreign affiliates to local suppliers

Source: OECD (2005), "MNE-Enterprise Development: Encouraging Linkages between Small and Medium-sized Companies and Multinational Enterprises", DAF/INV/WD(2005)12/REV1 based in part on UNCTAD (2001), *World Investment Report 2001: Promoting Linkages*, United Nations Conference on Trade and Development: New York and Geneva.

SME policy: general support and networking

Supporting the upgrading of micro enterprises and SMEs is vital to improving productivity in Mexico, particularly since such firms account for over 70% of employment (over 50% in micro and small firms alone) and the overwhelming majority of firms. These statistics also include a larger share of micro enterprises relative to other OECD countries. Small firms suffer from a number of additional barriers than larger firms in terms of access to finance, access to markets and investments in upgrading. These challenges are even further exacerbated in the Mexican context with high credit costs and a very wide spread in the efficiency ratio of manufacturing output by firm size class. Additionally micro firms present even greater challenges relative to SMEs.

Policy intervention for SMEs is typically justified by a number of market failures or other problems associated with their small size. Access to financing is harder for SMEs, especially given failures in financial markets for financing start-ups (OECD, 2006b). While financial support is an acknowledged need, extensive evidence suggests that SMEs also require public support in areas that can fundamentally improve their capacity and commercial potential, including market information, certifications, bar code registration, links with large firms, training, and access to technology (even the most basic use of IT). The small size of firms therefore implies barriers to investment in human capital and productivity upgrades. The culture of many small firms is often based more on family practices and requires professionalisation in basic management.

For these reasons, and many others, SMEs are offered advisory services and financing schemes across OECD countries. While individual business support is of course valuable, there are also economic and policy justifications for providing collective services to firms. For example, market information and international export promotion are important collective goods and services that an individual SME may not have the resources for individually. There are examples of "economic gardening" in the US that seek to solve the information gap with respect to markets. In Italy, there are many providers of collective services to SMEs in industrial districts.

Several areas of progress in the SME Fund have been noted in prior OECD reports, although many challenges identified have not yet been sufficiently addressed but if resolved could support regional innovation systems. Mexico's SME policy in its own right at the national level began in 2000 and has massively expanded its outreach. There has been an increase in the scope and reach of SME policies with an Entrepreneurial Development Plan. An Under Secretariat for SMEs was created within the Ministry of Economy in 2001, although the title and mission of this position is currently changing to focus more generally on firm development (see below). The initial focus of SME policy on financing expanded to include several new instruments to support technology upgrading. The various funds were then grouped into the SME Fund (*Fondo PYME*) in 2004. Spending as of 2006 was approximately USD 4 per SME in the country and the number of SMEs served had jumped from approximately 13 000 in 2000 to 254 000 in 2006 (6% of the SME population) (OECD, 2007p). Firms benefiting from the programmes are also expected to partially finance certain services received. One of the drivers of this expansion is the strategy of using intermediary organisations to implement the programmes with matching funds from state governments.

The current set of SME programmes fall under four broad categories, some of which encourage firm collaboration and innovation explicitly. Since 2005, there has been a significantly increased accent on innovation in the SME Fund, including "collective process innovation" (OECD, 2007p; OECD, 2008a). The current SME Fund strategic axes are: *i*) creation and strengthening of firms' innovation and technological development; *ii*) financing access; *iii*) regional and sectoral productive articulation; and *iv*) access to foreign markets. Approximately half of the SME Fund budget goes to the category focused on supporting firm networks, the third category of programmes. Innovation and technology development receives approximately 18% of the funds. A non-negligible share of the services in these programmes is basic business support and development, but this could include process innovations (see Table 2.7). Financing of technology parks and SME parks are included in the SME Fund's support for innovation.

Table 2.7. Budget for SME Fund programmes

Programme	Description	2005 (million USD)	2006 (million USD)	Percent of 2006 budget
1. Creation and strengthening of firms' innovation and technological development				
The Programme for Innovation and Technology	Introducing and diffusing innovative technologies/ raising SMEs' absorptive capacity of new knowledge.	15.1	15.3	7.79
The National System of Business Incubators	Creating a national network of incubators, linking academic and entrepreneurial activities.	5.8	6.0	3.06
The Business Development Centres Network	Enhancing the efficiency of micro firms.	2.3	2.4	1.21
Programme for training and strengthening SME capabilities	Improving human capital and fostering entrepreneurial culture. Diffusing efficient entrepreneurial strategies.	14.9	11.6	5.92
2. Financing access				
The National SME Guarantee Programme	Creating more favourable conditions in credit markets.	40.2	27.6	14.06
The National Financial Extension Programme	Reducing formal barriers to SME bank credit.	1.0	2.3	1.16
The Capital for Development Schemes	Enlarging the supply of equity capital for business start ups.	21.1	27.6	14.06
3. Regional and sectoral productive articulation				
The National Network of Productive Articulation	Establishing and expanding regional and sectoral networks on the basis of variable public/private partnerships, so as to strengthen competitiveness.	39.7	58.2	29.70
The National Programme of Supplier Development	Creating links between big firms and micro firms.	4.1	10.5	5.35
The Programme for Strategic Productive Projects	Investment in tangible and intangible infrastructure.	19.8	26.2	13.36
4. Access to foreign markets				
The *Impulsoras* Programme for Exportable Offer	Fostering the internationalisation of SME activities.	4.3	3.8	1.95
The Programme for Commercial Missions	Fostering the internationalisation of SME activities.	0.5	1.2	0.60
The *PYMExporta* Centres' Network	Fostering the internationalisation of SME activities.	1.3	3.5	1.80
Total		170.4	196.0	100.00

Note: 2006 Exchange rate is the simple average of the first two quarters in 2006.

Source: OECD (2007) *SMEs in Mexico: Issues and Policies*, OECD Publishing, Paris using data from the Ministry of Economy, Mexico SME Fund, with modifications.

A number of operational matters for the SME Fund pose challenges for states, intermediary organisations and participating firms whether this be for cluster-related projects or others. They include:

- ***Timing.*** Calls for proposals and procedure manuals are issued relatively late. While the operational rules are made available by December 31st of the prior year, the procedure manual may take up to three months to be issued. This results in projects being approved even later and resources being received by beneficiaries closer to the end of the year with required spending in the same fiscal year (albeit some extension for use of funds into the following year is possible). Another challenge with the timing of the programme reported by sub-national actors is that resources need to be provided all at the same time, instead of allowing funded projects to stagger assistance throughout the year to match programme and firm needs. Finally, the selection process (see below) requires many steps given the joint national-state financing and management of certain programmes in the SME Fund (and many other government programmes outside of the SME Fund as well).

- ***Stability and content of programme rules.*** There are frequent changes to the programme rules that create uncertainty for the intermediaries and final firm beneficiaries. The annual changes to rules and procedures make it difficult to ensure continuous programmes and increase uncertainty and complication for intermediaries and firms. States, through AMSDE (Association of State Economic Development Secretaries), have suggested recommendations to the operations manuals to make them less burdensome.
- ***Selection process and criteria.*** There are some concerns that the selection criteria for programmes is not entirely clear. For many programmes, intermediary organisations (including sub-national governments) apply to a state committee and the approved projects by the state are submitted to a national committee composed of seven members (five from the Ministry of Economy, two from ASMDE). While programme rules and procedures manuals do establish specific criteria for applications, the final decision for the approval of projects (among those pre-approved at sub-national level) is characterised by the centralisation of decision-making with unclear criteria as to why certain projects are not selected as there is no feedback on proposals not accepted.

One of the positive results of the SME Fund strategy, in addition to expansion, is the development of private intermediaries that can provide technical services to SMEs. This is very important for innovation and cluster-related support as there is a need to develop non-governmental institutional capacity to ensure a range of private sector providers in the country. These intermediaries may be business chambers, civil associations, business incubators or technical services providers in addition to state and local governments. Higher Education Institutions (HEI) also serve as intermediary organisations and are engaged in a range of SME Fund programmes (see later section). Within the regional innovation systems in all the participating study states, the need for more skilled intermediaries to provide services was noted.

One set of intermediaries is being supported by the National System of Business Incubators, and the quality of such institutions merits further strengthening. The system has created 423 business incubators from 2003-07 under three variants that serve: *i*) traditional firms (incubation three months to one year); *ii*) intermediate technology firms that require knowledge inputs (incubation from 12 to 18 months); and *iii*) high technology firms (average incubation two years, concentrated in a few types of technology) (see Table 2.8, OECD 2007p, 2008a). A National Council of Business Incubators is being established, which could benefit from international examples that seek to ensure quality, such as the European Business Network (see Box 2.2).

The distinction by type of incubator is relevant, as the different types of incubators will play different roles in a regional innovation system. Start-ups in traditional firms are not likely to play an active role in regional innovation systems, however incubators to support them are an instrument for job creation. While the share of high technology firms is low (approximately 5% in 2007, but increasing over time), presumably their role for the regional innovation system is in particular niche markets (Table 2.8). The majority of firms served each year has been in intermediate technologies, which helps build up firms that can provide benefits to a wider range of clusters. In some states, the rate of increase in the number of incubators is high, while the capacity for supporting quality incubators was not clear. Furthermore, several were not linked with a cluster nor were they targeting firms with a common technology or sector, reducing the potential synergies from being in an incubator with similar types of firms.

Box 2.2. **Certification of EU business innovation centres**

The European Business Network (EBN) is the leading European network gathering 160 business and innovation centres (BICs) and similar organisations such as incubators, innovation centres and entrepreneurship centres. EBN was created about 20 years ago by the European Commission and European industry leaders.

A BIC is one of the following: *i*) support organisation, public or private, for innovative small and medium sized businesses (SMEs) and entrepreneurs; *ii*) incubator/business resource centre dedicated to innovation, officially recognised by the European Commission through a certification scheme; *iii*) contributing to regional and local economic development through the creation of new innovative SMEs and innovative projects in existing SMEs; *iv*) offering a range of integrated strategic guidance for innovative projects; and *v*) grouped together within and benefiting from common services and tools provided by EBN.

EBN manages the EC-BIC Trademark on behalf of the European Commission. The contract confers on EBN the responsibility for granting, renewing and withdrawing licenses. A license enables an organisation to operate an EC-BIC and to use the trademark on its premises and promotional and other material, including websites.

Source: European BIC Network (*www.ebn.be*).

Table 2.8. Business incubators and enterprises

		2004	2005	2006	2007
Incubators	Total (cumulative)	95	196	307	423
of which	Traditional firms	25	63	149	197
	Intermediate technology	64	124	145	210
	High technology	6	9	13	16
Enterprises	Total	2 113	3 144	4 779	5 676
of which	Traditional Firms	588	1 418	2754	1 695
	Intermediate technology	1 482	1 691	1 967	3 498
	High technology	43	35	58	283

Source: OECD (2007), *SMEs in Mexico: Issues and Policies*, OECD Publishing, Paris based on data from the Under Secretariat for Small and Medium Enterprises, Ministry of Economy.

Capacity building and certification of intermediary organisations, in addition to vouchers, are strategies to ensure a higher quality of service delivery. Other OECD countries have had problems with SME service providers who have a conflict of interest. They may do a diagnostic of a firm's needs, but then recommend one of the services they propose, even if it is ill-adapted to firm needs. The greater the level of technical knowledge required to assist the SME, the more likely it is that a general intermediary organisation will not have the required competencies unless there is a clear technology or cluster specialty of the intermediary. Several countries have used a voucher approach for more sophisticated innovation consulting support needs. For firms that are not clear on what their needs are, a diagnostic prior to benefiting from a voucher may be required. For other reasons, vouchers serve as a vehicle for introducing a market mechanism to the service provision of these intermediaries.

COMPITE (National Committee for Productivity and Technological Innovation) and CRECE ("growth" in Spanish) are two intermediaries that provide consulting and training services to SMEs. Both organisations are strongly linked to the Ministry of Economy's SME Fund. The former works directly with both the Ministry of Economy and the business sector through chambers and enterprise associations and has now been constituted as a civil association. It provides a wide variety of services including workshops for management quality certification, training, corporate social responsibility and other types of consulting. The programme has serviced over 70 000 SMEs, albeit given such a large number for firms the intensity of services is likely to be limited. CRECE also supports SMEs through similar services aimed at increasing productivity and value added. Its main services are financial advisory, consulting for strategy and innovation, and general training. It has been able to engage regionally through local offices in 11 Mexican states. In general terms, the objective of these two organisations is to increase SME performance. However, like with many SME support programmes, a lack of relevant indicators makes it difficult to evaluate if their services have been effective in increasing productivity and performance of small firms.

TechBA is one business accelerator programme with an integrated SME support approach for technology based firms, albeit without an explicit spatial dimension. The programme was created by the Ministry of Economy with the United States-Mexico Foundation for Science (FUMEC by its Spanish acronym). The goal of the programme is to help strong technology-based Mexican companies through a battery of services to access international markets. This business acceleration approach provides support with respect to market access, financing, managerial training and technology resources. The programme has links with other high-technology hubs in Madrid, Montreal, Austin and Silicon Valley. There is extensive firm preparation and an annual selection process identifies firms that will move to an accelerator. Therefore the number of firms served remains limited. Often these firms have or will access other public funds for technology support or financing and, in some cases, venture capital.

A joint CONACYT/Ministry of Economy Technology Innovation Fund was developed in 2007 that targets SMEs. This fund has three different vehicles for supporting firms: *i*) development and technological innovation; *ii*) consolidation of groups or centres pursing activities of engineering, design, research and technological development; and *iii*) association-sponsored efforts of technological innovation. In 2007, the two calls for proposals yielded 721 applications, of which 112 were approved—a high rejection rate based in part on budgetary constraints, project quality and relevancy to the call.

The OECD, among others, has noted areas that hinder the effectiveness of the Technology Innovation Fund. The endowment is small relative to demand. The sectoral eligibility requirements limit firm access and complicate management. There is also insufficient public capacity to assess the return on investment ("valuation") of the projects (OECD, 2009b). Another barrier reported by actors in Mexico is the registration criteria. A requirement for the fund, per law for this type of CONACYT funding, is that beneficiary firms be registered in a national S&T registry (RENIECYT) to receive funds. States could help firms in their applications to the registry, understanding that there may be greater barriers for SMEs to register.

The budget that passed November 2008 significantly increases the level of funding for SME support. The increase in funding for the SME Fund from MXN 3.5 to 5.2 billion is very significant. Of that budget, approximately 20% (just over MXN 1 billion) is set aside for a guarantee credit programme. Several other proposals, including the creation of a separate S&T Fund within the SME Fund as well as an increased budget for state strategic projects did not pass. Increased funding is needed in Mexico given the large demand, however greater attention could be given to efficiency of that spending by type of intervention. For example, a rough calculation of average firm spending by the Small Business Administration in the US in 2006 was USD 400, half that of Mexico's SME Fund at USD 800.[4]

There is also a recommendation by the Congressional Commission that covers the Ministry of the Economy, supported by AMSDE, to decentralise 30% of the SME Fund to the states directly. It should be noted that 100% of the fund already involves the states in some way. This is currently a recommendation but its application (or not) would need to be decided in 2009. The allocation mechanism would be based on state size, performance in use of funds and poverty/marginalisation statistics (among others). This decentralisation could help address specific state needs, build greater state level management capacity and potentially address some of the management delay problems described above. The measure would need to be complemented by appropriate reporting and monitoring requirements, which are still not in place at the national level. There are other examples of programme decentralisation with other ministries, therefore it makes sense for the SME Fund to do so for part of the funds. For example, labour training funds are transferred from the federal government to states which then run labour training programmes.

A new classification of firms is being considered as the SME Fund may transition to a broader firm development approach, which if adopted could be considered in terms of a diversified portfolio of instruments. The categories for support would be entrepreneurs as well as micro, SME, gazelle and "tractor" firms. Several reports have already recommended a separate treatment for micro enterprises to both increase their participation in programmes and to meet their more basic firm development needs (*e.g.*, OECD 2007p, *Fundación Idea*/USAID, 2008). The concept of a tractor (anchor) firm being used is not restricted to a large firm, but can also refer to particular clusters of firms. The challenge for the expansion of the SME Fund to larger firms is to identify a true policy need to support large firms directly and to avoid "creaming".

A new programme is under development to support gazelle firms with a goal of more rapid job creation for Mexico. The OECD defines a high-growth SME as "all enterprises with average annualised growth greater than 20% per annum, over a three-year period … growth can be measured by the number of employees or by turnover." Gazelle firms are a subset of that population (EC-OECD, 2007). The caution with respect Mexico's strategy of potentially relying on gazelle firms for the rapid growth is that these growth rates may not be sustainable over many years. The expected goals for job creation based on targeting gazelle firms would need to be based on realistic calculations. Two interesting private-sector initiated programmes in Mexico that target high-impact entrepreneurs and SMEs are Endeavor and Visionaria. Both approaches, which include support from the SME Fund, have some lessons for public programmes targeting high-growth SMEs, including the intensity of services to achieve such strong growth goals (see Box 2.3).

Box 2.3. **Endeavor and Visionaria: supporting high-growth SMEs**

Endeavor is an international non-profit organisation that seeks to transform economies of emerging markets by identifying and supporting high-impact entrepreneurs. Endeavor finds the most promising and innovative entrepreneurs and provides strategic, world-class support to help take their companies to the next level through a network of Board Members of leading Mexican firms; by top consulting firms donating hours pro bono (Boston Consulting Group, ATKearney, Backer & McKenzie, Korn Ferry and many others), and by its Venture Corp Network, or mentors, which includes more than 325 successful businessmen that donate up to three hours of their time every month to provide advice to entrepreneurs.

Since 2002, Endeavor has selected 37 successful entrepreneurs with total accumulated revenue of USD 280 million through 2008, over 4 500 jobs paying an average of 12 times the minimum wage and over 300 patents. Endeavor has also promoted success stories that inspire others to think about entrepreneurship. In 2008, they issued 350 articles in media outlets reaching over 4.5 million Mexicans. Offices in Mexico are located in Mexico City, Monterrey, Tuxtla, Mexicali, Puebla, Guadalajara, Aguascalientes and Celaya, as well as 12 international offices.

Visionaria is another example of a private sector business accelerator in Mexico. Established in 2003, it focuses on providing services that help ensure sustainability and create value added for SMEs in technology-based sectors. Visionaria started providing services to 30 firms in its first year and by 2007 has reached more than 400. The model focuses on providing services that allow firms to better know, control and efficiently exercise their business processes so as to increase sales. The consulting services Visionaria provides have proven successful with participating firms' annual increases in sales estimated between 27% and 45% (14% over the national average reported by Select for firms in this industry). While providing services in several states in the country, recently Visionaria has started its internationalisation process in three countries in Latin America.

Since 2005, Visionaria's Business Accelerator co-ordinates with government policies mainly through the Ministry of Economy in its SME programmes, particularly in software promotion. Between 2006 and 2007, they supported 321 firms through *Fondo PYME* (SME Fund) and 70 through the federal programme PROSOFT, with a more limited use of the joint Ministry of Economy-CONACYT Technology Innovation Fund. Visionaria has also created a specific area aimed at linking large MNEs in the sector (called "tractor" firms) and high-growth SMEs (called *gazelles*).

Source: Endeavor (*www.endeavor.org.mx*); Visionaria.

Many other SME programmes are promoted by other federal bodies, as well as sub-national entities. One analysis noted more than 500 private sector development programmes across ministries and state governments.[5] Given the parallel structures of federal and state governments, the state level economic development secretariats are familiar with the federal level SME Fund (and get most resources for supporting SMEs from it), but not always with the programmes supported by other federal entities. Furthermore, there is no common registry for SME support to ensure that firms are not taking advantage of multiple programmes inappropriately. Therefore, at the state or even municipal level, it is more difficult to map the existing offer. The Business Support Simplification Programme is an example of the UK's attempt to make the offer of business support programmes more transparent to firms and to reduce transaction costs through programme segmentation (see Box 2.4). While many of the states are working on developing one-stop shops, this helps regroup, but not rationalise, the supply of SME support (see Chapter 3).

Box 2.4. **Business Support Simplification Programme, UK**

The Business Support Simplification Programme (BSSP) managed by the Department for Business Enterprise and Regulatory Reform aims to make it easier for companies and entrepreneurs to understand and access government funded grants, subsidies and advice with which to start and grow their businesses. It was estimated that over 3 000 publicly funded business support schemes existed. Businesses said they were confused by the number of schemes which discouraged them from applying. Streamlining will help save them time and money when looking for support. And, better targeted schemes will have more impact for businesses. The Government will also get greater value for money from a leaner system. The 3 000 schemes are being reduced to 100 or less by 2010. Furthermore, the nationally sponsored and regionally administered Business Link gateway will become the primary access route for individuals and businesses seeking support.

Source: www.berr.gov.uk/whatwedo/enterprise/simplifyingbusinesssupport/page44805.html.

While leading academic institutions have performed evaluations of the SME Fund, further improvements could be made for efficiency and programme impact, albeit this is true for many other policies. Given the large size of the SME Fund, an amount could be set aside for greater indicator monitoring and evaluation, where sub-national governments could play a key role, especially if some funds are decentralised. While many programme changes occur, and in many cases could be an improvement, they are not always based on lessons learned from the past or from state input. The changing programmes and implications for data tracking also complicate potential evaluation efforts. The current output measures used include the number of firms supported (along with resources committed) and the number of legally registered jobs created by the firms served (please see Chapter 4 for a more detailed discussion of input, output and outcome indicators generally). The longer-term impacts of intervention on a particular SME are not addressed by the SME Fund and the beneficiary firms have no obligation beyond the period when they received the funds to report back. There are costs and benefits to this kind of information tracking, but an understanding of the longer-term impact of the SME Fund intervention would be valuable. The definition of further outcome-oriented indicators that also track firm development over time, with assistance from state governments, may further enhance programme efficiency and effectiveness while increasing transparency.

The OECD has developed a framework for evaluating SME programmes. There exist examples of national SME policy evaluations for different types of SME support programmes. There are also guidelines for regional and local level programmes that have some additional specificities given the small size of the programmes (and hence potentially lower budgets and capacity for evaluation). Among the potential methodological differences at a sub-national level include the concept of leakages and displacement of activity given a more localised programme than national, or a cluster-specific focus (OECD, 2007i). Within Mexico, the SME Network (*Red PyME* in Spanish) seeks to support SME policy-making through research, evaluations and dialogue in Mexico (see Box 2.5). And international benchmarks on different aspects (*e.g.*, per firm spending) could complement in-country comparisons.

Box 2.5. **The Mexican SME Network (*Red PyME*)**

In 2007, a group of national and international organisations launched *Red PyME*, the Small and Medium Enterprise (SME) Network. *Red PyME* gathers diverse actors, including representatives from SME associations, academia, federal, state and local governments, think tanks, universities and international organisations, who share a common commitment to improve the design, implementation and effectiveness of SME programmes in Mexico. *Red PyME* members are not SMEs themselves, but they all acknowledge that Mexico's economic future depends to a large extent on strengthening SME competitiveness. The Technical Secretariat of *Red PyME* is located in *Fundación IDEA*, a Mexican policy research institution. Network operation and activities are supported with funding from USAID.

Federal and state governments have made SME promotion a priority throughout Mexico. However, government programs that seek to improve SME competitiveness are typically not co-ordinated. Furthermore, most of these programs aim to finance SMEs with credits or subsidies. The lack of systematic evaluation undermines any effort to identify strengths and weaknesses and implement improvements. In this context, *Red PyME* engages in numerous activities to:

Identify, organise and disseminate information on SMEs (business characteristics, market challenges, resource needs, etc.);

Generate and communicate research and analysis on SME policies at the federal, state and local levels;

Promote dialogue and debate among relevant actors regarding SME policy to improve co-ordination; and

Promote the use of performance indicators and evaluations within SME policies and programmes as a mechanism to improve their effectiveness in the long term.

In order to ensure broad dissemination of findings and recommendations from these activities, *Red PyME* has a website that provides information about best practices, academic and consulting documents, news and events related to SME policies. It holds periodic meetings with members, where public officials of SME programmes can network and obtain information from consulting firms, think tanks and universities about ways to improve existing programmes.

Source: *La Red PyME* (*www.laredpyme.org*).

Science and technology policy: increasingly supporting a "regional" approach

Mexico's performance with respect to science/technology and innovation has lagged considerably behind other OECD countries. A number of barriers have been identified, including low overall rates of R&D investment (with low shares coming from the private sector), a lack of an intellectual property culture, few financing sources for innovation and lesser emphasis on inter-institutional collaboration for R&D, among others (see Chapter 1).

As discussed in an upcoming review of national innovation policy, there are a number of policy areas where Mexico could reinforce efforts in science, technology and innovation. These recommendations concern both framework conditions for innovation, as well as specific programmes and instruments (OECD, 2009b). In Mexico these programmes tend to be under-funded with a problem of fragmentation and dispersion of funding across programmes. There is also a lack of linkages of national policies to regional specialisations or specific industries.

The high level of territorial concentration of innovation resources has also been identified as a threat to Mexico's national innovation system (OECD, 2009b, FCCYT, 2006). Therefore, greater involvement of states in supporting S&T&I and greater attention by national government to the territorial dimension of both resources and outcomes is required. Furthermore, the path dependency of regional growth implies that the territorial disparities of innovation inputs, outputs and outcomes is likely to continue to reinforce itself over time. A key question for Mexico, and other OECD countries, is whether national policy supports the development of regional innovation systems generally, and if so does it address the development needs of lagging regions as well.

National science and technology policy in Mexico has been working towards the new paradigm which has positive benefits for regional innovation systems (see previous Table 2.1). Mexico is increasingly emphasising research collaboration and its relevance for firms with an implicit spatial dimension (see Box 2.6). In fact, the proposed 2008-12 Special Programme for Science, Technology and Innovation has added innovation as a key component of the national science and technology plan. Several of the programmes developed in this decade encourage collaboration, such as the recently launched Strategic Alliances and Innovation Networks for Competitiveness (AERIs), albeit this programme does not have a spatial dimension. Public research centres (PRC) are increasingly able and encouraged to engage with firms, in some cases for firms in immediate proximity of the centre. While rates of firm collaboration with HEIs and PRCs are increasing over time according to national surveys, and supported by institutional changes to allow greater PRC collaboration, the rates of collaboration both among firms and between firms and other actors remain low.

The overall budget for science, technology and innovation programmes is very small, and the allocation with a regional focus is only a small fraction of that (see Table 2.9). While the budgets between 2003 and 2005 ranged between MXN 4.7 and 5 billion (approximately USD 457 million in 2005), the share going to student scholarships and the national researcher system (SNI), regardless of the discipline or potential application to economic development needs, was over 57%. The amount available for direct programmes is therefore less than half of the budget. While several of the programmes do benefit regional innovation systems where the recipients are found, the actual amounts dedicated to the state level funds are less than 5% of this budget, approximately USD 25 million for all 32 federal entities (states) in Mexico. These funds are matched by state governments. Since 2005, FOMIX received an increased share of the CONACYT budget in some years.

CONACYT funding is not the only national spending on science and technology. In 2006, CONACYT was less than one third of the S&T spending, while with the Ministry of Education (33.8%), the Ministry of Energy (17.3%), the Ministry of Agriculture and Rural Development (7.5%) and the Ministry of Health (4%) accounted for almost 63% of S&T spending. However those Ministries tend to dedicate more of their S&T budgets to basic science research. Those that devote spending primarily to technology development, competitiveness and SMEs (the Ministry of Economy and the Ministry of Environment and Natural Resources) accounted for less than 5% of S&T related spending (FCCYT, 2006).

Box 2.6. **Evolution of science and technology policy**

Since the creation of CONACYT (National Council on Science and Technology) in the 1970s and during the following two decades, the policy for science and technology (S&T) has been essentially directed to training human resources through scholarships for advanced degree studies both domestically and abroad. By the middle of the 1990s, the instruments were diversified with the aim of fostering scientific research and encouraging technological development in the productive sector. Among the most important changes of this decade include the approval of the Law of Science and Technology (2002), the creation of the Organic Law of CONACYT, as well as priority definition for the design of an integral policy: the Program of Science and Technology (PECYT), superseded in 2008 by the Program of Science, Technology and Innovation (PECYTI).

The PECYT provided a stronger push than in the past for S&T activities in the different regions of the country, as well as the intention of decentralising financial resources. The decentralisation of resources strategy has been implemented in agreement with the National Network of State Councils (REDNACECYT, by its acronym in Spanish) and also from the establishment of the National Conference on Science and Technology. The REDNACECYT was founded in 1998 as a civil association with the objective of "generating diagnoses of the situation of scientific and technological development in the states, in order to promote the national decentralisation through the interaction of state councils, and to promote collaboration between institutions and researchers of the states". Likewise, it constitutes a forum to discuss and to propose initiatives which encourage scientific research and innovation in the states, albeit it has played a limited role thus far. In addition, the National Conference on S&T is a means of permanent co-ordination between CONACYT and the state governments, from which regional proposals are promoted in the two or three meetings that are carried out every year.

The elaboration of the PECYT incorporated the regional and sectoral dimensions of innovation through new instruments. As part of these reforms, there was an incentive for private R&D with new finance sharing arrangements (50% public and 50% private) and non-recoverable funds for projects from the conception and improvement of new products and processes through the creation of prototypes, for patenting development, or infrastructure for design and R&D centres. Furthermore, conditions for financial support to all the actors (universities, companies, research centres, civil associations, etc.) were modified, since the projects should be focused on specific thematic priorities and allocated on a competitive basis with peer evaluation of applicants. Thus, a group of programs which began to operate in 2002 arose, such as:

Funds to support technological development and innovation in the productive sector as the R&D Tax Incentives, Avance (High Added Value in Business with Knowledge and Entrepreneurs) and its complementary instruments, Innovation Consortia, etc.;

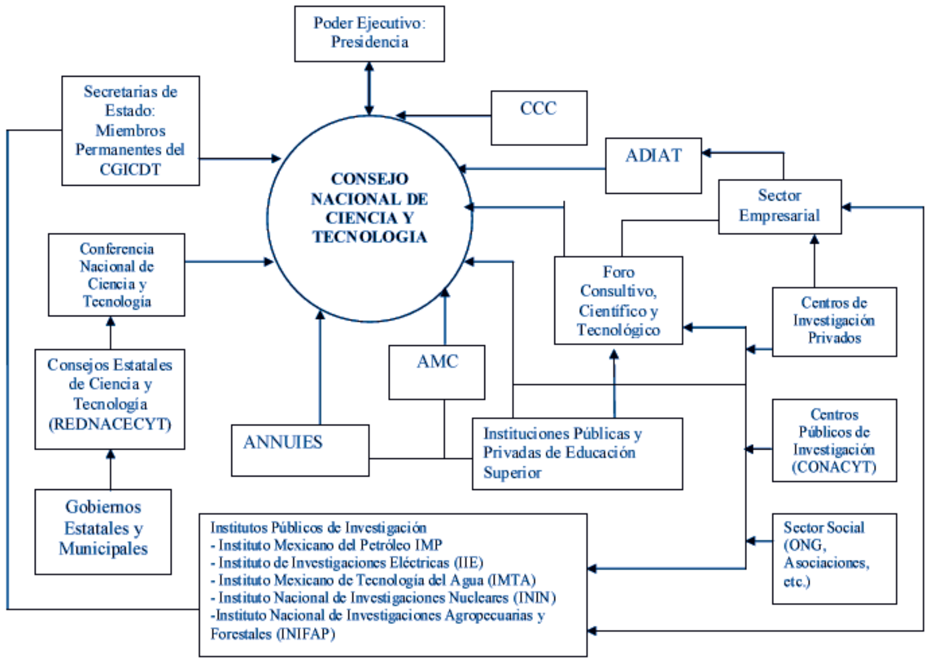
Sectoral Funds for applied research promotion, with shared funding between CONACYT and state departments, agencies or other public-sector offices;

International Co-operation Funding (National Science Foundation (US), European Union, etc.); and

Mixed Funds (FOMIX) for applied research with a regional decentralisation focus, shared between CONACYT and the state governments.

Note: For more complete analyses of the evolution of Mexican Science and Technology policy, see for example Cimoli M., (Ed.) (2000) *Developing Innovation Systems: Mexico in a Global Context*, Continuum, London-N. York, Villavicencio D., (2008), "*Los cambios recientes en la política de ciencia y tecnología en México: incentivos a la innovación*" in Martínez J.M. (Ed.) *Generación y protección del conocimiento*, ECLAC, United, Nations, Santiago; among others (ADIAT, 2006 in FFCYT, 2006).

Figure 2.3. National innovation system actors



Source: Villavicencio, Daniel (2007), "The Mexican National Research System" in Mouton, J and Waast, R. (co-ords), *Studies on National Research Systems: A Meta-Review*, UNESCO, Paris.

In fact, a much larger amount of public S&T support to firms is the R&D tax credit scheme (*Estímulos Fiscales*), which is highly concentrated in a limited number of states and firms. In 2007, the total value of tax credits was approximately MXN 4.5 billion, which exceeds the total amount of all other programmes to support business R&D and innovation financed by CONACYT (OECD, 2009b). Over 65% of the tax credits went to the top two states: the Federal District (44%) and Nuevo Leon (22%) (see Table 2.10). While there is likely a headquarters effect in this data, as many corporate headquarters are likely to be in the Federal District and Monterrey, the geographical concentration trend is clear. Furthermore, there is a strong concentration of the funding in any given state in a small number of beneficiaries. Approximately 22% of the firm beneficiaries in 2006 accounted for 80% of the resources. The tax credits do not accrue only to large firms (approximately 40% of beneficiaries in 2006), but the vast majority of funds flow to large and medium-sized firms.[6] Small firms are rarely accessing the tax credits, in part because of the volume-based approach. This amount is therefore a disproportionate share of national support that is characterised by high levels of spatial and firm level concentration. Between 2001-04, looking at a sample of the 92 firms that accounted for over 70% of the tax credit, the majority (69%) were foreign firms. Recipients were concentrated in the automotive, electronics, chemicals and pharmaceuticals industries (FCCYT, 2006). In 2009, the R&D tax credit programme was transformed into several active support programmes.

Table 2.9. CONACYT budget

Programmes	2002 (millions MXN)	2003 (millions MXN)	2004 (millions MXN)	2005 (millions MXN)	2005 (millions USD)[6]	2002-2005 (%)
Basic Science and Human Capital						
Scholarships	1 658.7	1 619.2	1 747.9	1 780.0	167.3	35
National Research System (SNI) Researchers	1 032.8	1 017.7	1065	1 218.3	114.5	22.3
SEP-CONACYT	596.1	300	280.3	267.9	25.2	7.4
Other (repatriation, retention, advanced degrees[1])	167.8	95.8	30.6	71.1	6.7	1.9
Applied Research						
Sectoral Funds (SEMARNAT, SAGARPA, Salud, Others[2])[3]	305.2	214.5	188.2	129	12.1	4.3
Total Fondos Mixtos	228.8	222.7	192.4	267.9	25.2	4.7
R&D and Innovation (Avance, Guarantee Fund, SEMAR, Economia, CFE, Consorcios)	139.7	287.3	167.8	146.4	13.8	3.8
Other (Finstitutionales[4], operating expenses, special support [5], other)	696	1319.5	1026.6	978.2	92.0	20.6
Total	4 825.1	5 076.7	4 699.0	4 859.0	456.8	100.0

Notes: 1) Advanced degree student support includes strengthening; *2*) Includes a small portion of projects for technological development; *3*) Other Sectoral funds include CNA, SEByN, ASA, Conafovi, DF Inmujeres, Segob, SRE, Conafor, Sedesol; *4*) Other Finstitucionales include: Proyectos GTM, Proyectos CIAM, Proyectos NSF y Revistas Mexicanas IC; *5*) includes resources assigned for special support to the Mexican Academy of Sciences, the Foro Consultivo Científico y Tecnologico, ADIAT, and other institutional fund support; *6*) Based on yearly average exchange rate for 2005 of 10.638 MXN to the USD.

Source: CONACYT (*Informe de Ciencia y Tecnología: Situación Financiera de los Fondos, Informes 2004, 2005 y 2006. Informe de Autoevaluación 2003).*

CONACYT's Mixed Funds (*Fondos Mixtos* or FOMIX) is the most direct instrument aimed at promoting scientific and technological development at the state and municipal level. The instrument channels resources through the constitution of trust funds, with funds coming from the federal government (through CONACYT) and either state or municipal governments (in Puebla and Ciudad Juarez only). This instrument allows for sub-national level entities to commit resources to scientific research and technological development oriented at solving strategic and specific problems, while helping build S&T capacities at the regional level. The programme is conducted through calls for proposals (responding to state-specific demands requiring S&T solutions) issued in each state. FOMIX has specific selection procedures and seeks to provide an answer to potential beneficiaries within five months following application.

A number of challenges with FOMIX exist. First, the utilisation across states varies considerably based not only on industrial or scientific capacity, but also on the financial commitment and the administrative management of the state (see Chapter 3 for more details). Administrative delays with the programme, along with a need for greater capacity building at the state level, are reasons for considering a greater decentralisation of the management of such funds to the state level. The time delay for approval is frequently cited by the states as a barrier to effective utilisation of resources, a similar concern as with the SME Fund. The joint national-state management of the funds contributes to the administrative delays given the multiple acceptance levels and the sometimes different procedures between the two levels of government. The state councils and the national approval board in some cases prioritise basic research given the greater involvement of researchers and HEIs in the selection process. One of the limiting factors for participants to receive funds is that they now must be in the national registry of S&T institutions and firms (RENIECYT), albeit states could support greater efforts to register firms in the system. The registry has been reported to be a barrier for small firms in particular.

Table 2.10. Utilisation of R&D tax incentive

2006

	Percent share of national programme funds	Number of total beneficiary firms	Percent of state funds received by main beneficiaries (number of main firms)	Percent large firms
Federal District	43.56	138	85 (28)	46
Nuevo Leon	22.11	77	77 (15)	51
Mexico	7.70	49	74 (9)	45
Puebla	5.14	15	91 (4)	47
Jalisco	4.25	59	58 (10)	20
Chihuahua	3.57	21	72 (5)	62
Guanajuato	3.04	29	83 (6)	14
Queretaro	2.58	18	63 (4)	61
Baja California	2.36	6	98 (2)	50
Veracruz	1.99	7	78 (2)	57
Tamaulipas	1.30	3	88 (1)	0
Coahuila	0.95	16	72 (4)	31
Michoacan	0.19	6	71 (2)	17
Sinaloa	0.17	3	66 (1)	0
San Luis Potosi	0.17	5	55 (1)	20
Hidalgo	0.17	4	87 (1)	25
Colima	0.16	3	38 (1)	0
Aguascalientes	0.15	4	75 (1)	25
Durango	0.14	1	100 (1)	0
Morelos	0.09	4	53 (1)	25
Chiapas	0.07	3	92 (1)	33
Tlaxcala	0.06	3	54 (1)	33
Sonora	0.04	4	48 (1)	0
Tabasco	0.03	1	100 (1)	0
Quintana Roo	0.02	1	100 (1)	0
Yucatan	0.01	1	100 (1)	0
Baja California Sur	0.01	1	100 (1)	0
Zacatecas	0.01	1	100 (1)	100
Campeche	0.00	0	0 (0)	0
Guerrero	0.00	0	0 (0)	0
Nayarit	0.00	0	0 (0)	0
Oaxaca	0.00	0	0 (0)	0
Total/Average	100.00	483	80 (107)	40

Note: The total amount of R&D tax credits in 2006 was approximately MXN 4 billion.

Source: OECD calculations based on data from CONACYT.

While there have been annual evaluations of FOMIX, this has not resulted in greater transparency regarding the nature of FOMIX projects across states, potentially resulting in duplication of research. Each state has a call for proposals on needs for their state. However, it is not known if that problem has been addressed in another state in the past. CONACYT does prepare state profiles that list the projects funded within each state, but they are not in a searchable database by theme to facilitate information sharing.

Additional efforts, not currently embedded in the existing instruments, are required to support state level capacity building to develop regional strategies or promote science, technology and innovation. While there is a national network of state science and technology councils, the funding comes from the rotating president, which severely restricts the network's potential efforts. Other organisations such as the *Foro Consultivo Científico y Tecnológico* and the ARCO Alliance have different projects that also seek to support state actions, but some states have significant needs to get up the learning curve.[7]

In OECD countries, there are numerous examples of national governments supporting directly the capability building efforts for regional innovation strategies. In the UK, the national government encouraged the Regional Development Agencies to develop regional innovation strategies and provided financing to support the strategy development efforts. For France, the European Commission noted that the different regional innovation strategies were too similar to each other. Therefore, the French government has been providing assistance to the regions in the development of their strategies as well as the development of indicators to better analyse regional needs and track progress. There are also OECD examples of an increasingly regionalised approach to innovation policy at the national level generally. For example, in Hungary, which has below OECD averages of innovation investment, the law on Research and Technology Innovation has recognised the importance of a coherent Regional Technology Innovation Initiative.

Decentralisation of national fund management is beginning for a few advanced states. This progressively increasing share of responsibility at the state level needs to be coupled with capacity building efforts and greater clarity on selection criteria and outcomes. A few states are already engaged in an agreement with CONACYT regarding several innovation funds. This experiment does not yet imply the FOMIX state trust funds, which a national innovation policy review recommends (OECD, 2009b). Lessons learned from the decentralised management for certain states should be used to identify effective strategies for regional funds, both to progressively build up sub-national capacity and to increase the administrative efficiency and coherence with other regional/state level actions.

The current range of instruments will not necessarily address the high levels of concentration of innovation resources (infrastructure, human capital, etc.) within the country, albeit there has been some progress in this decade. The question of concentration *versus* dispersion of innovation related resources is a challenge for all OECD countries to address. While innovation resources are typically much more concentrated than the general population, the balance between a pure excellence-based allocation mechanism and remediating measures for lesser developed regions remains an open debate. What is clear is that in the absence of any efforts in national policy, it will be increasingly difficult for the lesser developed regions to overcome their innovation deficits. In the US, for example, there are programmes that are specifically designed to address the problem of the concentration of research and education in science across the country (see Box 2.7).

Box 2.7. **Supporting R&D capacity in less advanced US states**

The mission of **EPSCoR (Experimental Program to Stimulate Competitive Research)** is to assist the National Science Foundation (NSF) in its statutory function "to strengthen research and education in science and engineering throughout the United States and to avoid undue concentration of such research and education." The EPSCoR programme is directed at those jurisdictions that have historically received lesser amounts of NSF Research and Development (R&D) funding. Twenty-five states, the Commonwealth of Puerto Rico and the US Virgin Islands currently participate. EPSCoR goals are: *i*) to provide strategic programmes and opportunities for EPSCoR participants that stimulate sustainable improvements in their R&D capacity and competitiveness; and *ii*) to advance science and engineering capabilities in EPSCoR jurisdictions for discovery, innovation and overall knowledge-based prosperity.

Through this programme, NSF establishes partnerships with government, higher education and industry that are designed to effect lasting improvements in a state or region's research infrastructure, R&D capacity and hence, its national R&D competitiveness. Eligible jurisdictions may seek such planning support to formulate a documented vision and implementation design for their research, education, and innovation strategies. An expected outcome from any supported planning activity is the submission of regular NSF proposals that combine capacity building with capability enhancement for addressing bold opportunities characterised by regional relevance and national importance.

- ***Research Infrastructure Improvement grants:*** These grants run for 36 months and provide up to USD 9 million to support infrastructure improvements in science and technology (S&T) areas chosen by the applying jurisdiction's EPSCoR governing committee as being critical to future R&D competitiveness.

- ***Co-funding Mechanism:*** This effort enables more awards to be made to researchers in EPSCoR jurisdictions from the Foundation's ongoing research, education and special emphasis competitions, by providing partial support for those proposals that merit review places at or near the cut-off for funding by the reviewing programme. This mechanism operates internally within NSF and does not require any action on the part of the proposer.

- ***EPSCoR Outreach:*** This mechanism provides financial support for outreach visits by NSF staff to acquaint researchers in the EPSCoR jurisdictions with NSF priorities, programmes, and policies. EPSCoR Outreach also serves to acquaint NSF staff more fully with the facilities, research activities, and investigator expertise/potential within the EPSCoR jurisdictions.

The Institutional Development Award (IDeA) programme broadens the geographic distribution of National Institute of Health funding for biomedical and behavioural research. The programme fosters health-related research and enhances the competitiveness of investigators at institutions located in states in which the aggregate success rate for applications to NIH has historically been low. The IDeA programme increases the competitiveness of investigators by supporting faculty development and research infrastructure enhancement at institutions in 23 states and Puerto Rico and has two main components:

- ***Centers of Biomedical Research Excellence (COBRE)*** augment and strengthen institutional biomedical research capabilities by expanding and developing biomedical faculty research capability through support of a multidisciplinary centre, led by a peer-reviewed, NIH-funded investigator with expertise central to the theme of the grant proposal.

Box 2.7. **Supporting R&D capacity in less advanced US states** (continued)

- ***IDeA Networks of Biomedical Research Excellence (INBRE)*** enhance biomedical research capacity, expand and strengthen the research capabilities of biomedical faculty, and provide access to biomedical resources for promising undergraduate students throughout the eligible states. INBRE implements the IDeA approach at the state level by enhancing research infrastructure through support of a network of institutions with a multidisciplinary, thematic scientific focus. INBRE is the second phase of the Biomedical Research Infrastructure Networks (BRIN) programme, which began by providing planning grants in 2001.

Source: National Science Foundation (*www.nsf.gov/od/oia/programs/epscor/statewebsites.jsp*); National Centre for Research Resources, National Institutes of Health (*www.ncrr.nih.gov*).

There remains both an underinvestment in S&T infrastructure relative to other innovation inputs, and high levels of territorial concentration. From a national perspective, there is a need to invest in S&T infrastructure in those regions where the payoff to the nation is highest. However, it would appear desirable for some attention to be paid to different growth poles around the country when considering massive investments that could serve in part as a catalyst for growth. The technological level of investments is likely to vary across regions (*i.e.*, more lagging regions may require basic technology transfer centres, while more advanced states may need more sophisticated support).

Many states are seeking national funding for strategic projects that often involve some form of technology or science park. In several states visited, the proposed projects included funding from the state, CONACYT and the SME Fund along with a private sector contribution. It is not clear in several of the park proposals that there will be an active presence of leading regional firms, making these parks more a mechanism to strengthen R&D supply but not necessarily with immediate links for supporting innovation in firms. It would appear that a lot of the funding now for developing the physical infrastructure will need to be complemented in the future by concrete actions to get the benefits of these investments. For example, in the North of England, several major parks received investment and they have a symbolic effect for the region, however there have been challenges in some cases for getting the economic spillovers of these massive investments (OECD, 2008b).

There are no formal assessments of sub-national S&T&I needs or formal mechanisms for recognising the nature of science and technology expertise by region. However, a new initiative to map research competencies is underway within CONACYT based on the information collected through several years of the FOMIX applications from across the country. The goal is to be better able to link the needs of the country to the existing resources, wherever they are located within Mexico. One small example of what could be done is to simply better track the relevance of the work of those national researchers receiving CONACYT funds for meeting innovation-related needs within the country. In a separate initiative, ADIAT is conducting an exercise to map technological/cluster competencies in participating locations around the country. The Networks of Competence programme is one example of how such a mapping can be used as a tool with international visibility (see Box 2.8).

Data with respect to sub-national performance related to innovation is sorely lacking in Mexico and national government could play a greater role in supporting sub-national data collection. As highlighted in Chapter 1, basic information such as R&D investment (in total or by actor) is not tracked at the sub-national level across the country. The lack of a perspective at national level on what is happening in the regions, beyond programme utilisation, is problematic for both diagnosing the problems and measuring progress towards addressing them. Given the limited state expertise and resources, it would be important for national statistics agencies, like INEGI, and for certain CONACYT financed studies to make this data collection a higher priority. A national level initiative by CONACYT to work with state councils on data issues is in process, albeit some of this would make more sense to manage centrally, such as a regional component to the national innovation surveys. There is also a greater role for data collection by organisations that work with higher education institutions (see next section), and the federal agencies related to them, as human capital is one of the key inputs for innovation.

Box 2.8. **Networks of Competence in Germany**

Promoted by the Federal Ministry of Economics and Technology, the German Competence Networks programme supports innovative clusters. The networks are defined as regionally concentrated innovation networks with a focus on high technology and able to generate innovations with a high rate of added value and to convert them in products ready for the market.

The initiative is designed to strengthen the international competitiveness of Germany as a hub for research and to illustrate to potential investors Germany's attractiveness as an innovation location. It is designed to be a league of the best innovation networks in the country and membership is a quality label only for the best networks. The networks are also open for international co-operation.

The networks must be admitted to the programme based on an evaluation. Some of those requirements include: a thematic focus within a particular field of innovation, being concentrated and embedded in the region, being an organised network with an identity and potential for sustainability, collaborative technological development, and participants from different links in the value added chain with innovative potential. Ideally these networks have actors from the communities of research institutes, education and training entities, start-ups and established companies, and finally additional specialised services.

There are approximately 115 networks, each with a profile. The initiatives are clustered in nine topics to represent the structure of the German economy. They include biotechnology, health and medical science, transportation and mobility, new materials and chemistry, production and engineering, aviation and space, energy and environment, information and communications, and micro-nano-optical technology. While there are 16 *Länder* (administrative regions), the programme groups them into eight meso-regions, each characterised by several economic similarities, especially by a typical, long-term grown economic structure.

Source: *http://www.kompetenznetze.de/, http://www.sophia-antipolis.org/poles2competitivite/manifestations/2Forum-poles(2006)/presentations/16h00-18h00/allemagne.pps*.

Higher education policy: incentives and disincentives

Higher Education Institutions (HEIs) play a vital role in supporting regional clusters and innovation systems but there are common barriers for regional engagement. They educate the future labour force, in some cases provide training for the current labour force through lifelong learning, generate knowledge through research that could potentially have commercial applications, and provide services (consulting, contract research or training) to support firm needs. The common barriers to regional engagement of universities include: a lack of administrative autonomy/mandate, the civil servant status and evaluation criteria for professors, as well as long-term time horizons and other cultural barriers to interacting with firms (OECD, 2007e).

Mexico contains a diversity of HEIs in terms of mission and funding structure that has implications for their ability to engage regionally. These HEIs range from universities, technical universities and technological institutes, among others (see Table 2.11). Another key distinction is the public or private status of a university. Some successful examples of regional engagement with private institutions are attributed to differences in organisational cultural and financial management from their public counterparts. And technical universities have been particularly successful in linking with the business sector given their mission. Among public universities, another difference is whether the institution has "autonomous" status or not. The autonomy relates both to federal and state level universities and their self governance, however these institutions still receive their budgets from federal and state public sources, amounts which far exceed tuition revenues.

National higher education policies in Mexico focus on access and quality but offer few formal incentives for regional engagement. According to the Higher Education Co-ordination Law, the federal government should promote tertiary education through: resources, evaluation, support of agreements between national and sub-national levels, and encourage and co-ordinate tertiary education planning. The Ministry of Education is responsible for supporting evaluation, quality, statistics collection, administration of several higher education funds and co-ordination across institutions and with the states. There is a stated goal of co-ordinating between federal and state levels to support higher education, and national policy can encourage state action. For example, the federal government issued procedures to revitalise state level committees on matching educational offer and labour supply needs (the COEPES). However, there is no mandate or policy initiative out of the Ministry of Education on regional engagement beyond the encouragement of the COEPES (and even less so with the private sector).

The policy of diversifying the types of higher education institutions and supporting decentralisation has clearly benefitted regional innovation systems across the country. Given their mission, the technological institutes and universities were consistently reported in the participating states to play an active role in regional innovation systems across the states, notably for adaptation to labour market needs. While they only serve a small percent of the total student population, their success in this respect has been recognised.

The traditional public universities were reported across the states to have greater difficulty in meeting local labour market demands. As these national and state public universities train almost half of the tertiary student population, addressing this mismatch with market needs on a systemic basis is required. States consistently reported an insufficient number of students in sciences, technology and engineering to meet local needs. The states vary in terms of enrolment by discipline, with a range of between 25% to 46% of undergraduates enrolled in the sciences and engineering depending upon the state (see Figure 2.4).

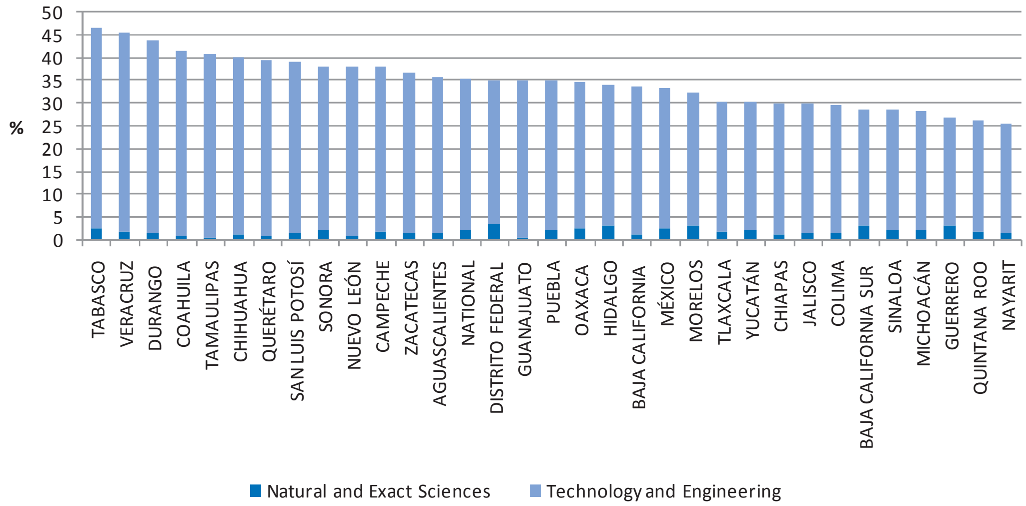
Table 2.11. Types of higher education institutions

Institution type	#	%	Student enrolment	%	Public subsidies	Description
Public federal universities	4	0.2	307 778	12.1	100% federal	Large public HEIs including the National University (UNAM, the main university in Mexico) and the *Instituto Politecnico Nacional* (IPN, the main polytechnic) covering the vast majority of disciplines. Next to their teaching activities, these institutions develop a wide array of programmes and research projects aimed at generating and applying knowledge (GAK), and at expanding and promoting culture.
Public state universities	46	2.4	785 917	31.0	Split federal/state negotiated per institution	Decentralised agencies of state governments. Most of them are autonomous and tend to be the largest institutions within each state. They usually offer the vast majority of disciplines in different fields and conduct relevant research activities.
Public technological institutes	211	11.2	325 081	12.8	50% federal/ 50% state	Focused on engineering studies and professional studies in administrative areas. In addition to teaching activities, they develop programmes and projects aimed at GAK, and expand and promote culture. Most of these institutes are of federal nature while others are state level. The curricula are closely linked with labour market requirements and regional development, facilitating graduate access to the labour market.
Public technological universities	60	3.2	52 726	2.5	50% federal/ 50% state	Federal system co-ordinated from the Federal Ministry of Education since 1990 based on the French model for two-year programmes leading to certificate of university level technician. Their purpose is to ease student access to the labour market; the academic programmes are based on 70% practical and 30% theoretical curriculum; closely linked with industry. Most students are first generation in HEI (90%). Decentralised agencies of state governments, which conduct teaching activities, carry out programmes and projects aimed at GAK, and expand and promote technological services.
Public polytechnic universities	18	1.0	5 190	0.2	50% federal/ 50% state	Of recent creation, they are decentralised state government agencies. The emphasis of current study programmes is based upon professional skills and on a learning-centred approach.
Public intercultural universities	4	0.2	1 281	0.05	50% federal/ 50% state	Created in 2001, these universities are decentralised agencies of the state governments, and are located in regions with high densities of indigenous population, albeit open to students of all origins. Under a cross-cultural concept, these institutions offer higher education options aimed mainly at satisfying the needs and intensifying the development potential of the regions they serve.
Public teacher education institutions	249	13.2	92 041	3.6	NA	These types of institution offer higher education programmes in pre-primary, primary, bilingual intercultural primary, secondary, special, initial, technological and physical education among others for preparing and training teachers at different levels.
Private institutions (universities, institutes, centres and academics)	995	52.6	776 555	30.6	None for basic operations, eligible for programme funds	Includes universities of world-class stature as well as all other non-public institutions. In most of these institutions, teaching is the primary activity, however, the strongest also carry out activities aimed at GAK.
Private teacher education institutions	184	9.7	54 267	2.1	NA	NA
Public research centres	27	1.4	2 801	0.1	Principally federal funding	Their main objectives include diffusion of S&T; generating and applying knowledge in different areas; linking S&T with the productive sector to address problems and develop mechanisms and incentives that promote the contribution of the private sector to S&T activities. Co-ordination of most of the 27 centres is under the responsibility of the National Council for Science and Technology (CONACYT). Others, such as CINVESTAV (one of the main PRCs) are under supervision of sectoral ministries or affiliated with universities.
Other public institutions	94	5.0	124 609	4.9	NA	NA
Total	**1 892**	**100**	**2 538 256**	**100**		

Source: Adapted and expanded from OECD (2008) *OECD Reviews of Tertiary Education: Mexico*, OECD Publishing, Paris based on the Country Background Report provided by the *Secretaría de Educación Pública*. Additional information extracted from OECD (2008) *Tertiary Education for the Knowledge Society, OECD Thematic Review of Tertiary Education: Synthesis Report, Volume 3,* OECD Publishing, Paris derived from Background Reports prepared by countries participating in the project and other country-specific documents.

Figure 2.4. Undergraduate enrolment in engineering, technology and sciences

2006-2007



Source: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES) (2007), *Anuarios Estadísticos (primera etapa) 2004-2007*, Mexico.

While these large public universities may not be sufficiently connected to the labour market, they do play a pivotal role in regional innovation systems. They are the pillars of research and expertise for their regions. They are very active in regional efforts for economic development. For example, the *Universidad Nacional Autónoma de México* (UNAM), with campuses in several states, has recently created a technology transfer department. The *Instituto Politécnico Nacional* has a group to support entrepreneurial competitiveness and launched in the mid-1990s an incubator for technology-based firms, supporting start-ups in several states. These large public universities are typically in active dialogue with state governments. The challenge is to reduce any barriers to collaboration and increase incentives to do so. One problem is the lack of knowledge and communication on what resources are available at the university that might be of relevance to firms. Furthermore, there are few intermediaries to help communicate the needs of firms to universities, as this is a function that is very costly to manage directly with SMEs. Examples in other countries have shown both successes and failures in this HEI-SME interfacing based on the quality of the intermediary.

While private universities have no specific mandate for regional engagement, they are often engaged because of their business model. The *Instituto Tecnológico y de Estudios Superiores de Monterrey* (ITESM) is a unique case given its very active regional engagement across the country, including 14 of the 15 participating states of this study. That engagement includes curriculum to meet local industrial needs, research centres that interface with firms, and incubators, among others. The University of Guadalajara in the state of Jalisco is another interesting example with very active regional engagement in a number of areas.

Public research centres (PRC) play an important role in the innovation landscape, including a higher education role. The system of public research centres in Mexico generally has been increasing its collaboration with the private sector. There are 27 CONACYT centres around the country, with 17 of them located in the Centre and Centre West regions across the middle of the country (see Table 2.12). The CONACYT centres are now asked to show that their research has a benefit for social or economic needs. Furthermore, changes in funding have resulted in centres seeking more alternative financing from the private sector (OECD, 2009b). Other public research centres, including the Centre for Research and Advanced Studies (CINVESTAV) are also becoming more active in supporting industrial needs of the regions where they are located. Branches of these centres are being opened or moved to different regional technology parks to better link with local actors. PRCs also have academic programmes, albeit with only a small fraction of a percent of all students in the country.

Table 2.12. CONACYT centres by region

Pan-state region	States with centres	Centres per region
North West	Baja California (3), Sonora (1)	4
North East	Coahuila. (2), Chihuahua (1)	3
Centre West	Jalisco (1), Michoacan (1), Guanajuato (3), Queretaro (3), San Luis Potosi (2)	10
Centre/Federal District	Federal District (6), Puebla (1)	7
South Southeast	Chiapas(1), Veracruz (1), Yucatan (1)	3
National total		27

Source: *Foro Consultivo Científico y Tecnológico* (2006), *Diagnóstico de la política científica, tecnológica y de fomento a la innovación en México (2000-2006),* October 2006 based on data from CONACYT.

There are a number of disincentives for university engagement across OECD countries, and Mexico is no exception. Professor evaluation systems do not recognise engagement with firms or other community stakeholders. The lack of an intellectual property culture in Mexico and the less clear rules for intellectual property resulting from collaboration between HEIs and firms are also barriers for joint research.

An important federal actor that offers different types of incentives for HEI regional engagement is the National Science and Technology Council, CONACYT. This is done through several vehicles. Many of their instruments promote joint projects involving HEIs that provide incentives for university-industry linkages regarding research and knowledge transfer. Instruments such as the Mixed Funds with states and the newly launched Strategic Alliances and Innovation Networks for Competitiveness (AERIs) require the participation of an HEI in funded projects. Many OECD countries also use this financial carrot as a vehicle for inciting collaboration between HEIs and firms, such as in the Klastry programme in the Czech Republic or the *Pôles de compétitivité* in France, among many others. A new programme joint with CONACYT and IMPI (Mexican Institute for Intellectual Property in Industry) has been funded to support technology transfer offices in HEIs, research centres and other institutions.

CONACYT also provides designations of quality through different labelling systems, for example researchers through the National System of Researchers (SNI for its Spanish acronym). The system offers financial rewards to professors and researchers that meet certain quality standards. The number of SNI members (all disciplines combined) in a given state is an indicator of the academic quality of research. Almost 44% of these researchers are in the Federal District in 2005, albeit this is down from over 50% in 2000 (see Table 2.13). However, the criteria for designation are the traditional academic qualifications (such as publications and citations in journals), and this evaluation system, as mentioned above, is one of the classic barriers to regional engagement of universities across the OECD. To reduce this barrier, it has been recommended that the criteria of excellence be expanded to research-based innovation with research centres or the private sector (OECD, 2009b). Furthermore, as recipients of public funds, it might be advisable to make the publication of SNI recipients mandatory and an obligation for SNI researchers to report information on their research that could potentially benefit other actors in Mexico, presumably in a searchable database format that could be organised by CONACYT.

CONACYT further plays a role in supporting regional innovation systems by financing advanced degree training, competitive research and scholarships. As with researchers, these scholarships are also highly focused on the Federal District which accounts for almost 44% of all scholarships, down from over 47% in 2000 (see Table 2.13). The financing of research and students can have benefits for the regions where this funding is spent, albeit extracting these benefits for the local economy requires a strong innovation system. However, if the students simply move to other regions upon completion of studies, part of that investment may benefit the country, but not the particular region that experiences a "brain drain." It should be noted that the scholarships are for all disciplines, not only those that support science and technology. In the future, there may be a set aside of some scholarships for those fields deemed of importance to Mexico's S&T and economic development.

Another quality label designation, jointly with the Ministry of Education, is that of the High Quality Graduate Programmes (PNP for its Spanish acronym). The label recognises programmes within an HEI, not the HEI overall.[8] The purpose of the programme is "to promote the continuous improvement and ensure the quality of the national post-graduate programmes so as to increase the country's scientific, technological, social, humanistic and innovation capacity." This recognition serves the beneficiary institutions and their regional innovation systems by increasing the probably of obtaining research funds, attracting top students and potentially serving the science and technology needs of firms.

Table 2.13. Scholarships, SNI researchers and basic science support by state

Percent of total support

States	SNI Researchers		Advanced Degee Scholarships		Basic Science	
	2000	2005	2000	2004/p	2000	2004
Federal District	50.6	43.7	47.4	43.7	42.9	42.0
Morelos	5.9	5.7	3.0	2.7	6.8	7.4
State of Mexico	5.8	5.7	7.8	5.5	6.1	3.5
Puebla	4.4	4.1	4.6	6.1	4.0	4.6
Jalisco	3.9	4.8	6.2	4.5	2.4	3.3
Baja California	3.1	3.1	3.9	3.2	6.2	6.4
Nuevo Leon	2.5	3.2	3.2	2.9	1.5	4.7
Guanajuato	3.0	3.0	3.9	4.0	3.8	4.3
Other states	20.9	26.8	20.0	27.4	26.3	23.7

Notes: p/ indicates preliminary data.For the SNI researchers and advanced degree scholarships, the percentage is calculated with respect to the total number of individuals. For Basic Science, the percentage is calculated based on amounts granted.

Source: *Foro Consultivo Científico y Tecnológico* (2006), *Diagnóstico de la política científica, tecnológica y de fomento a la innovación en México (2000-2006),* October 2006 based on data from CONACYT.

The Ministry of Economy, through the SME Fund, is another driver of HEI regional engagement. A number of programmes are financed by the SME Fund that HEIs may participate in. For example, the Programme for Innovation and Technology Development funds business accelerators and innovation laboratories that in many cases are housed within HEIs. The incubators of the National System of Incubators are also often run by HEIs. Small business support is one of the areas that many Mexican universities are engaged in. For example, the Mexican Association of Small Business Development Centers (SBDCs) is a network of over 50 SBDCs that are housed within universities across the country. They use the SBDC model form the US that links HEIs and different levels of government to serve micro and small businesses (see Box 2.9).

There are examples in OECD countries of cluster-based approaches with a focus on universities at the core that Mexico could consider. One of the reasons for this focus is that research shows a tipping point with a high level of research excellence required for cluster development such as that around Cambridge, UK (Library House, 2007). For example, the Japanese Knowledge Cluster programme sponsored by the Ministry of Education seeks to support clusters around several key universities based on their research specialties as engines of regional growth. In these types of OECD country cluster policies, the focus is often on research specialties in high-technology industries to promote start ups. Universities are actively used in cluster policies in lesser developed regions for supporting firms more generally; however this orientation tends to be used more in the context of regional development rather than a high-technology competitiveness approach.

The importance of different types of university contributions to the economy and society is increasingly recognised across OECD countries. In the UK, this regional engagement is known as "third stream" activities. Not only have HEIs identified their engagement in regional development as important, they are also receiving increasing financial incentives from national government to do so via the Higher Education Innovation Fund (see Box 2.10). Several leading national policy strategy papers in the UK have reinforced this important mission for HEIs. Another interesting feature of this fund is an on-going assessment of the scale and nature of these engagement activities through the annual Higher Education-Business and Community Interaction Survey.

The Ministry of Education and the National Association of Universities and Higher Education Institutions (ANUIES) have a greater role to play in supporting HEI regional engagement. At a minimum, they could promote regional engagement, support information sharing and collect regular statistics. Both entities already collect statistics annually on universities and could begin to add indicators of regional engagement, such as the indicators collected in the UK in the Higher Education-Business and Community Interaction Survey (see Box 2.10). They could also collect basic information on the financing revenue structure of universities and sources of revenue from public and private sources for regional engagement activities. Going further, they could consider greater incentives for HEI engagement in the third mission activities.

Box 2.9. **Mexican Association of Small Business Development Centers**

Started in 2001 with the support of USAID Mexico, the Mexican Association of Small Business Development Centers (SBDC) was created to build capacity among Mexican higher education institutions to fulfill their role as key actors within Mexico's economic development infrastructure. University extension services to SMEs provide managerial education and consulting at all levels of enterprise development, from firm formation to mid-size and high-growth "gazelle" firms. SBDCs provide both business and technical expertise in combination to improve SME outcomes, offering linkages to their host university researchers to aid with product commercialisation in tandem with advisement on topics such as capital access, marketing, human capital and practical business operations. Many universities further support regional innovation with applied economics research and economic development planning.

SBDCs in the US have a 30-year track record as an SME service delivery network, with 1 100 Centers located in universities and colleges, which annually serve 750 000 SMEs. Affiliated wtih the US Small Business Administration, SBDCs also assist clients gain both debt and investment capital, contracts and exports. In 2007 the SBDC network assisted SME clients create 73 377 new jobs, save another 93 449 jobs at-risk, obtain new growth capital totalling USD 3.3 billion and new sales increased by USD 7.2 billion. The SBDC model has been adapted for implementation by Mexican universities: a training program has graduated over 800 SBDC professionals to-date from 150 universities across 30 Mexican states, a nationwide MIS to track and evaluate SME client services installed, and accreditation standards and peer reviews to assure quality programs have begun. To date there are 54 *Mexican Centros para Desarollo de la Pequeña Empresa* in operation, principally supported by local universities, the private sector and states.

The Mexican Association of SBDCs (AMCDPE for its Spanish acronym) with 54 university members is led by the *Universidad Veracruzana*, organised with five regions across the Republic, and serves as a focal point for promotion, advocacy and a national network that could solicit public funding sources, including from the federal level. A Memorandum of Understanding to formally link individual Mexican SBDCs with partner university SBDCs in the US is in place, both for mentoring and development of trade relationships among SMEs to more fully exploit opportunities of NAFTA and improve North American competitiveness. A web-based trade platform to link 750 000 small business clients of the US SBDCs with the Mexican SBDC networks is in process to increase bilateral trade opportunities, market research and technology deployment among SMEs on both sides of the border. The goal of the project is to create a network of over 100 Mexican SBDCs.

Source: Institute for Economic Development, University of Texas at San Antonio.

Box 2.10. **Higher Education Innovation Fund: England**

National funding for higher education institutions (HEIs) in England has increasingly taken into account the importance of what is deemed "third stream" activities, *i.e.*, the contribution of HEIs to the economy and society. Prominent national policy strategy documents have highlighted this point, including the 2003 *Lambert Review of Business-University Collaboration* and the 2007 Review by Lord Sainsbury *A Race to the Top: A Review of Government's Science and Innovation Policies,* among others.

One of the mechanisms used to grow knowledge transfer activities within universities is the Higher Education Innovation Fund (HEIF) fund. The purpose of this fund is to support and develop a broad range of knowledge transfer activities which result in economic and social benefit to the UK. The fund builds capacity and provides incentives for HEIs to work with business, public sector bodies and third sector partners, with a view to transferring knowledge and thereby improving products, goods and services.

The first round (announced in 2001) awarded GBP 77 million nationally. Funding for the fourth round (HEIF 4 covering three financial years 2008 to 2011) will be GBP 404 million nationally. Originally this funding was awarded through a competitive bid processes and in the third round through a combination of competitive bid process and formulaic allocation. The current mechanism for allocation in the fourth round is a fully formulaic process, putting further emphasis on performance and spreading the benefits of HEIF more widely across the HEI sector. The formula for the most recent funding round has two components: *i*) first component (40%) – focuses on capacity building and is based on full time equivalent academic staff; and *ii*) second component (60%) – focuses on performance using various measures of income from business and non-commercial sources. SME income is double weighted within this component.

One of the key sources of evidence for the second component is the Higher Education-Business and Community Interaction Survey (HE-BCI). This is an annual survey collecting data on a wide range of "third stream" activities, reflecting the contribution of HEIs to the economy and society. These range from commercial and strategic interaction with businesses and public sector organisations to working with the local community. (For further information on this survey, please see: *http://www.hefce.ac.uk/econsoc/buscom/hebci/*).

Source:*http://www.berr.gov.uk/dius/science/knowledge-transfer/heif/page12054.html; http://www.port.ac.uk/research/researchandknowledgetransferservices/HEIF/.*

Notes

1. The *Opciones Productivas Programme* (Productive Options Programme) is targeted to the poorer regions of the country or those with a majority of indigenous population (applicable only for those individuals, families or organisations under the patrimonial poverty line). This programme supports the targeted population through three main mechanisms: identification of sustainable and viable production models; human capital formation (technical and entrepreneurial skills); and financing, application and evaluation of productive projects. It also links beneficiaries with other SEDESOL programmes including *Oportunidades*.

2. For every MXN 1 put in by a migrant, federal, state and municipal governments put in the remaining MXN 3 aimed at their home region or other highly marginalised region. The main objective of the programme is to promote improvements in basic social infrastructure or development of productive projects (as selected by the migrant).

3. Data from sectoral presentations obtained from the Ministry of Economy, Mexico.

4. For example, in 2006 the federal budget for *Fondo PyME* in Mexico was USD 200 million for 254 000 firms served (out of a total SME population of 4 million) or on average USD 800 per firm. In the US, the Small Business Administration budget of USD 600 million served 1.5 million firms (out of a total SME population of 25 million) or an average of USD 400 per firm (McKinley, 2007).

5. The Inter-Ministerial Commission on Industrial Policy in Mexico, which no longer exists, had identified more than 500 SME programmes.

6. Per OECD (2009b), some of the challenges with the R&D tax credit include: the concentration in a few large firms, the concerns about its additionality which may not be sufficient and result in windfall profits to participating firms, a broader scope for R&D expense eligibility than is recommended by OECD norms, and an inability to effectively support SMEs, among others. A number of proposed reforms to this system are discussed in this report.

7. ARCO is a non-incorporated alliance between three national organisations which share the mission of promoting a feasible sustainable development for states and regions of Mexico through innovation. One of its members is ADIAT (*Asociación Mexicana de Directivos de la Investigación Aplicada y el Desarrollo Tecnológico*, A. C.) which was founded in 1989 to drive the formation and assure the efficient operation of Mexico's national innovation system. Created by the 2002 S&T Law, the *Foro Consultivo Cientifico y Technológico* is a permanent advisory body to the federal government and CONACYT governance bodies.

8. A similar programme in the UK is the Research Assessment Exercise that ranks research excellence by area across UK universities.

Chapter 3

Sub-national Initiatives for Regional Clusters and Innovation Systems

Introduction

Mexico's lack of productivity growth is one of the primary barriers to country competitiveness. Unlike in many OECD countries, there are relatively few incentives provided by national policy in a range of policy families to promote the development of regional innovation systems and clusters as a vehicle for supporting productivity growth (see Chapter 2). Are Mexican states (and in some cases municipalities) able to fill the gap? Although in a federal country the expectation would be for states to take a lead role in supporting regional innovation systems, the high level of fiscal centralisation (see Chapter 4), along with the territorial concentration of innovation resources within the country (see Chapter 1), are among the barriers for states.

This chapter reviews the state level initiatives to support regional clusters and innovation systems. First it explores the different competitiveness approaches taken at the state level, which tend to be focused more on business environment conditions and indicators rather than from a holistic approach. It then reviews the state strategies for selecting and supporting sectors and clusters which are increasingly a focus of state policy but often for the same sectors across several states. It then analyzes support for the regional innovation systems, including the science and technology efforts at sub-national level (which are under-developed in most states) and utilisation of relevant national programmes, illustrating wide variations in state innovation assets, capacity and programmes. International good practices in these different fields are also discussed.

State programmes for competitiveness

Overall approaches based on narrow definition of competitiveness

Mexican states have made "competitiveness" a priority for state action. One of the main drivers for the state level approaches is the range of competitiveness ranking systems actively used in Mexico. As discussed in Chapter 1, the most commonly used are that of the *Instituto Mexicano para la Competividad* (IMCO) (for state and now city level) and the World Bank's *Doing Business* report, as well as Aregional.com and those produced by leading HEIs such as CIDE (Centre for Economics Teaching and Research), among others.

Several states use these indices as their diagnosis for a competitiveness plan or even hire one of these ranking organisations to provide consulting services aimed at improving competitiveness. The state of Mexico and Jalisco, for example, are working with one provider on action plans to improve their scores on certain indicators and implement concrete policies. Not all the indicators in these indices are easily influenced by state policy, however states focus their attention on those indicators that have a stronger weight in the composite index in which they can have an impact. The challenge with these indices, in addition to the inability for an index to identify a state's unique characteristics, is that they tend to have few knowledge economy related indicators (see Chapter 1).

The competitiveness approaches tend to be focused on the relative position with other Mexican states, but not in a global context. Of course depending on the particular industry, states discuss international benchmarks, usually more oriented towards production costs, doing business conditions and FDI attraction. For example, in the software industry states often refer to their advantages relative to India given physical proximity to the US. An interesting example of a more global perspective was noted in the state of Chihuahua. They are working on a specific strategy for addressing competition with China. The state has an officer in Beijing to identify niches where they are not competing but are complementary and may work together effectively.

Many of the competitiveness statements seek to be long-term visions. The names of these strategies make allusion to this: Coahuila 2020, San Luis Potosi 2030, Chihuahua 2020, among others. A key point to ensure the success of these long-term strategies will be the creation of mechanisms that assure that policies and objectives are not negatively affected by political changes or programmes easily discontinued. In this sense, the involvement of non-government institutions, associations and the participation of civil society will play an important role. Coahuila has established civil committees in each of the state's regions, including HEIs and firms (and supported by government) seeking to address specific needs and demands in terms of competitiveness. The inclusion of the private sector may help induce greater durability and certainty of such committees. The governance of regional innovation systems could also take a more clear public-private partnership approach. Given rapid changes driven by global trends these strategies will require regular re-assessments.

Overall, Mexican states tend to view competitiveness first as a question of regulation and business environment. As attracting FDI is one of the top goals of Mexican states, the orientation for competitiveness is on attracting such firms with physical infrastructure and low regulatory burdens with respect to firm establishment and labour laws. There is also an effort to put together a training package that would meet the firm's needs. While some advantages in terms of human capital, education level and English proficiency are mentioned as selling points generally (albeit more so in the Northern states), innovation-related assets are discussed significantly less in promotional materials or public documents for most participating states.

Measures of labour productivity (or total factor productivity) are not typically part of the diagnosis of competitiveness challenges or used as an indicator of progress, in contrast to many other OECD regions. There is some discussion of capturing more value added in the value chain which addresses a need for greater productivity in part. Other strategies commonly being pursued include the integration of value chains, promoting an increased number of local suppliers (hence increasing local content) and moving towards high-tech "appealing" sectors. States tend to promote the size of a particular industry relative to other states within Mexico, which is important but not the only characteristics that may make investment in that industry in that state most relevant.

There is an opportunity for the federal government to set an example for states by taking a more holistic approach to competitiveness. Within the national Ministry of the Economy, the new Under Secretary for Normativity, Foreign Investment and International Commercial Practices is being referred to as the Under secretary for

Competitiveness and Normativity, indicating a potential shift in the role of this Under Secretariat. There is an opportunity for the national government to set a new tone for Mexican states with respect to the term competitiveness, whether through this Under Secretariat or more generally. The competitiveness approach could give greater weight to knowledge economy factors and measures to improve productivity in addition to general business environment factors. Furthermore, the spatial dimension of economic activities around the country could be taken into account to a greater extent for national competitiveness. Such an approach could support a long-term and more fundamental change.

While there exist different competitiveness strategies based on a state's level of development, there are interesting and successful examples even among lagging states. Often these examples involve technology upgrades and mobilising innovation resources to benefit more traditional sectors. Additionally, polices may be devised to ensure that lagging regions also benefit from new (higher-tech) sectors in more advanced states. For example, some of the declining industries suffering from international competition, like textiles and leather, are now supplying to the aerospace industry.

Public and private stakeholder roles in competitiveness strategies

The process of developing a competitiveness strategy as well as its implementation is as important as the strategy itself. Successful regional strategies, whether for competitiveness or innovation, have proven to be those where there is a consensus about the problem (based on objective information), an agreed upon action plan to address the identified problem, and clear action steps for the different stakeholders. These stakeholders include not only different government departments but firms, educational institutions, research entities, and key civil society associations, among others (OECD, 2007k).

One important and highly positive trend is the increasing involvement of civil society actors in the development of these competitiveness strategies. Several states are now using public-private councils or initiatives to support their competitiveness approaches. Diversifying these private sector stakeholders beyond the top businessmen is important. For example, the process for developing Colima's competitiveness strategy involved many stakeholder interviews. The result of this dialogue and diagnosis was the development of a list of 82 strategic projects, and the lead of each project is a non-governmental entity. However, the funding for many of these projects is likely contingent upon future public budgets.

The greater involvement of civil society actors is a vehicle for ensuring the longevity of important strategies and gaining credibility with the business community. At all levels of government in Mexico, a change in administration can result in considerable turnover and a reinvention of many programmes. There is a strong risk of not building on prior successes. For example, in Nuevo Leon the current governor has made science and technology an important component in the state's development plan and competitiveness approach. In a future administration, there is always a possiblity that this strategy may not be maintained, therefore embedding the approach will help it survive political fluctuations for the long-term economic development benefit of the state.

Another positive trend is the cross-sectoral approach to public sector mobilisation behind the competitiveness strategies in several states, representing a more comprehensive approach. For example, in Puebla the secretariat charged with competitiveness is also responsible for labour issues, and therefore co-ordinates actively with the economic development secretariat. The state of Mexico has several competitiveness working groups (in different topics) led by the Economic Development Secretary (through its Industry Department), but with many other secretariats, private sector representatives and members of HEIs participating in improving competitiveness and whose performance on indicators is tracked regularly. In Jalisco, the *Gran Alianza* for competitiveness is directly under the governor, and therefore can more easily co-ordinate across the different ministries. The state of Michoacan also had a very interesting cross-sectoral approach to addressing many important issues for competitiveness, in part due to the importance of the agricultural sector in the economy. The S&T councils were not typically actively involved in the public sector competitiveness groups, however in this respect Guanajuato stands out for the Council's very tight collaboration with economic development and a high level of linkage of relevant firms in most sectors in the state's regional networks (see later section on state S&T councils).

Supporting sectors and clusters

Sectoral priorities common across many states

Mexican states prioritise a series of sectors, often stated in their State Development Plans, however they tend to be broad and similar across most states (see Table 3.1). The popularity of certain sectors for regional plans is not unique to Mexico. Many OECD countries and regions seek to support the same sectors. For example, eight out of the nine English regions have given a priority to biotechnology or health sciences in their strategies. And while three-quarters of the US biotechnology industry is located in just five urban centres, 41 out of 50 US states have established significant funding programmes to spur development of the life sciences industry (Cortright and Mayer, 2002).

The criteria for state selection of these prioritised sectors appears to be a mix of those with the largest employment and in some cases a "strategic" higher-technology sector. Across OECD countries, sectors could be selected for public support for a range of reasons (dynamic growing sectors, exposed sectors experiencing job losses, sectors of strategic importance for a key technology, existing comparative advantages, historic specialisation or sectors of social importance to respond to specific needs). However, the states generally did not appear to have clearly defined criteria or indicators for such selection. The state of Baja California, while not a case study state, is reported to have strong cluster strategy development and selection mechanisms.

The prioritisation of sectors is not necessarily consistent across different sets of actors at state level. For example, a state economic development secretariat may target one list while the same state's S&T Council may target another list. While complete coherence is not necessarily advisable, there is a need to look across different national and state efforts to support particular sectors generally, and the needs of individual clusters in particular.

The specificities of each state with respect to these common sectors merits greater clarification, as well as the potential links among the different specialisations in the same state. Again, this is a problem for many OECD regions in terms of establishing their position in global value chains (OECD, 2007k). Within the automotive sector, one of the priority sectors for many Mexican states, there are trends in other OECD regions to better define their specificities. In Mexico, Chihuahua has specialised in certain design processes (especially in software, electronic and electric devices for automobiles – based on Delphi's Design Centre in Ciudad Juarez) and Michoacan (taking advantages of its varied climatic conditions) specialised in vehicle testing. The state of Queretaro has been strategically consolidating the aerospace sector (which could potentially become a cluster) around its international airport (the "aerospace park") supported by two large investments in the state by MNEs.

Table 3.1. Prioritised sectors in participating states

	Ags	Chi	Coa	Col	Gto	Jal	Mex	Mich	NL	Pue	Qro	SLP	Tam	Yuc	Zac
Automotive	√	√	√		√		√	√	√	√	√	√	√	√	√
IT/Software	√	√	√	√	√	√[3]	√	√	√	√	√	√	√	√	√
Electronics (consumer and other)	√	√							√		√	√	√	√	√
Textiles / leather and footwear	√		√		√	√	√	√		√				√	
Aeronautic		√	√		√		√		√		√	√	√	√	
Agro industrial/ food and beverage	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Wood and furniture	√	√				√									
Chemicals and pharmaceuticals						√	√			√					
Maquila		√	√										√		
Nano-tech		√			√				√						
Bio-tech			√	√	√				√						
Energy; incl. renewable				√	√							√		√	
Metals-mechanics			√				√	√				√			
Mining		√	√		√										√
Logistics (includes ports)				√				√			√	√		√	
Services1									√					√	√
Other[2]	√	√				√				√	√	√		√	

Notes: 1) Jalisco (services related to manufacturing, tourism, education, finance), Nuevo Leon (medical servcices), Puebla (tourism), San Luis Potosi (ecotourism), Yucatan (education, health, tourism), Zacatecas (tourism). 2) Aguascalientes (robotics, commerce, transport), Chihuahua (building materials), Guanajuato (crafts, construction), Jalisco (machinery and equipment, plastics, commerce), Puebla (dairy products), Queretaro (telecommunications), San Luis Potosi (plastics, steel), Yucatan (crafts), 3) Althought not listed in the state's development plan, Jalisco does priortise IT.

Source: State documents or state officials.

A number of OECD examples illustrate this niche development within their priority sectors. For example, as production has transitioned to other countries, Gothenburg (Sweden) has specialised in car safety and climate testing, while the region of Piedmont (Italy) has sought a niche with respect to IT in the automotive sector. Shanghai has successfully built up its position in global value chains in biopharmaceuticals, specifically as a research hub. Other regions in China may be more specialised in biopharma production (OECD, 2007k).

In Mexico, several of the participating states have shown a particular interest in becoming a logistics hub based on the importance of existing ports. Michoacan and Colima host two of the most important ports on the Pacific coast (Lazaro Cardenas and Manzanillo), naturally making them an entry and distribution point in the country. Local governments have centred part of their sectoral approach in becoming true logistic centres and in that sense upgrading their capabilities to increase productivity. Similarly, Yucatan has progressively positioned itself as a logistics centre for the highly touristic southeast region, in which the state port of Progreso plays a pivotal role.

Cluster support: achieving critical mass

Overview

The emphasis on sectors in the different state approaches is increasingly nuanced with the concept of clusters. Moving beyond a sector focus is vital for identifying niches, understanding the kinds of actors in the particular location, and providing more tailored policy support. The academic literature on clusters presumes that the agglomeration effects and linkages will increase the productivity of the firms in the cluster, levels of employment in the cluster, or both.

There are different definitions of clusters used across OECD countries (OECD, 2007a). They generally, but not always, imply a spatial dimension, as relational proximity is often supported by geographical proximity. Definitions of clusters have also expanded to include not only firms but other key actors that can support the cluster, including specialised service providers (for example, intellectual property attorneys) and knowledge generators (such as research centres and Higher Education Institutions). For example, Chihuahua is supporting a targeted cluster through research centres with the goal of becoming one of the national leaders in terms of nanotechnology (Box 3.1).

Box 3.1. **Supporting nanotechnology through knowledge generators**

Although nanotechnology is still an incipient sector in Mexico, several states mention it within the framework of their economic development strategies as a priority given observed global trends. Several have highlighted the magnitude of this industry in terms of potential revenues and its accelerated rate of growth in the first decade of the century. Chihuahua is one of the states that has put a stronger emphasis on the importance of developing capabilities that could allow for increased activity in nanotechnology. The state was recently selected as the location for CONACYT's Research Centre in Advanced Materials (CIMAV), the first national lab for nanotechnology. The state of Chihuahua also created a Centre for Research in Applied S&T located within the Autonomous University of Ciudad Juarez. This centre was created with the objective of promoting development, innovations and transfers of advanced technology of Microsystems (MEMS) for this industry through the promotion of R&D projects that may help upgrade the region's industry and technology level.

Source: Based on information from the state of Chihuahua.

Some caution should be used with respect to the trend of *clusterización* in Mexico. A certain degree of duplication across states is inevitable; however the economic costs of the competing strategies could be monitored. If only the leading states in any particular sector are supported and reinforced with national funding flows, it is of course more difficult for certain lesser developed states to take risks that could change the path dependency of their regional trajectories. The term *clusterización* used by many states implies that there is a belief that clusters can be created by policy when critical mass does not already exist. There is a caution to supporting so-called "wishful thinking" clusters given the greater potential for inefficiency of public investment.

The lack of critical mass among many "clusters" that the states seek to support could be solved in part by creating a stronger links across states. In some states, a handful of firms or the presence of one large firm with a few suppliers was deemed a cluster by the state. There are a range of cluster footprints, and in many cases they crossed state lines. However, cluster support often did not seek to take into account these naturally occurring linkages. For example, one state had a number of suppliers to a neighbouring state's OEM (original equipment manufacturer). The state's strategy was not to build stronger linkages but rather to attract its own OEM. In addition, greater inter-state collaboration could help achieve economies of scope and scale.

Like at the national level, FDI attraction is at the top of state agendas and is seen as a key element for triggering economic development and creating jobs. However, there are some challenges related to FDI in Mexico: first, for many states, the flows of FDI are relatively small as a percentage of their economies and second, there seem to be insufficient science and technology spillovers from FDI firms (see Chapter 1). An additional problem seems to be a national framework that does not prevent or take into account regional flows, nor the "race to the bottom" approach undertaken by states (see Chapter 2). Furthermore, half or more of FDI flows in Mexico is not new investment but rather reinvested earnings and intra-company loans (OECD, 2007p).

In addition to (and in support of) FDI attraction, states may use a wide range of cluster development instruments:

- ***Engaging actors:*** this may include mapping/benchmarking analyzes, the use of brokers, incentives for firm networking, cluster awareness-raising events, and support of cluster initiatives.
- ***SME support:*** instruments may be targeted towards business development, supplier development and supply chain linkages, export networks, market intelligence, and technical standards/ISO certification support.
- ***Skilled labour force:*** often the development of a skilled labour force to meet cluster needs is supported by labour market information, specialised vocational and university training, and policies to attract students.

Engaging actors

One of the first steps to supporting clusters is of course to identify that one exists. There are examples across the states to go beyond a basic sectoral analysis. A few states have engaged in cluster mapping studies. They are typically in the form of location quotient analysis (whether there is a disproportionate share of employment in one geographic region relative to a larger area like the nation). Puebla and Coahuila commissioned cluster studies performed by local consultants. Chihuahua's state government uses location quotient analysis by detailed industrial code, including by sub-region within the state. It is important to note that these kinds of mappings based on location quotients only indicate the potential for a cluster. The presence of a large number of firms in the same sector does not necessarily indicate that there are active links among the different firms and specialised service providers.[1] The diagnostic studies done by Jalisco and Guanajuato in the early 2000s to assess technological capabilities helped to identify the industrial-innovation potential, even if they were not specific cluster studies.

This regional/sectoral analysis to understand clusters is even more important in states that are polycentric. Many states participating in this review have a disproportionate share of economic activity centred around one core metropolitan area, such as Aguascalientes, Nuevo Leon, Puebla and Queretaro. Other states have multiple economic hubs: Coahuila has three clear urban growth centres, Guanajuato six industrial districts, and there are several hubs in Tamaulipas and the state of Mexico. Jalisco, albeit with one clear leading metropolitan region around Guadalajara, has also encouraged the development of regional-sectoral plans to account for the specificities of different sub-regions within the state.

Zacatecas has taken an interesting approach that goes beyond a basic cluster mapping to make this information interactive. The state has created a type of "economic Google" which will be made publicly available. They have been mapping clusters and productive value chains within the state. They have also tried to gather information on different financing sources of benefit to the mapped clusters and value chains. While Zacatecas is one of the lesser developed participating states, it has taken this creative approach to increasing transparency on its clusters and the resources that could support them, while decreasing transaction costs for firms and other users.

Cluster initiatives are one vehicle for promoting greater interaction among relevant stakeholders and to better identify possible public and private action to support the cluster. Many OECD regions have supported the development of cluster initiatives through policy. Several OECD cluster programmes involve two phases of possible funding: one to put together a cluster initiative and a second to fund common projects. One of the main challenges for public support of cluster initiatives is the cultivation of sufficient private sector leadership so as to have an appropriate public sector support exit strategy. Studies of cluster initiatives have shown that those with a private sector leadership tend to be the most successful (Sölvell *et al.*, 2003).

Several Mexican states have recently begun encouraging the development of cluster initiatives. There are already examples of different business chambers, some with branches in different states throughout the country. For example, the state of Nuevo Leon has constituted civil councils in three of its eight strategic sectors (IT, automotive and specialised medical services) that include the participation of both HEIs and private firms. Three additional civil associations are in process (nanotechnology, biotechnology and consumer electronics). These cluster initiatives (such as in the IT industry) have performed an assessment of their needs to remain competitive and have developed a list of action items for the cluster. In Aguascalientes, a number of cluster initiatives have been created; they are recognised by the public sector and are currently co-ordinated by the state's Institute for Competitiveness.

The public sector can better orient its policies to address cluster needs, when there is a justified role for public action, through clear communications with cluster initiatives. Guanajuato, for example, has civil servants assigned to each of the targeted clusters. One interesting international example from the Basque Country (Spain) reveals an innovative way of not only supporting existing cluster initiatives, but also the common needs across cluster initiatives to ensure a transversal cluster approach (see Box 3.2).

One opportunity for firms organised in a cluster initiative is that they can then obtain adapted technical services. Furthermore, there is a need to develop intermediaries that can provide such quality services to meet firm demand. By providing technological services that are needed by member firms, such institutions can become self-sustainable. The cluster initiatives in Aguascalientes, for example, are seeking such a model.

Box 3.2. **Basque Country (Spain) cluster support**

The Basque Country Competitiveness Programme offered a new approach to be used as a part of the region's industrial policy. It nevertheless was built on a prior tradition of firm co-operation. The region had already developed an infrastructure of sectoral support mechanisms through technology and business support centres. The idea for the explicit cluster approach came from a contact between a high level official in the Basque Government and Michael Porter. A 1991 study on the region's competitiveness issues included a statistical analysis and other competitiveness analysis criteria to select target clusters. The study prompted a public/private debate that led to the programme.

The Competitiveness Programme falls under the region's Department of Industry, Commerce and Tourism. A team of civil servants across different Divisions serve as liaisons with the cluster initiatives. Their duties are conceived in the context of an organisational matrix. They ensure that all the meetings of a cluster are attended by the same person, and that all the meetings on a particular horizontal common theme across clusters are attended by the same person (internationalisation, technology and quality/excellence in management). As a result, there is very active contact between the cluster initiatives and civil servants. While the Competitiveness Programme remains only one component of the industrial policy, it is thought to cover 80% of manufacturing GDP and 30-40% of overall GDP for region. The goal for the programme is to go deeper and wider by working with a few more clusters and strengthening the relationships with (and within) each cluster.

Source: OECD (2007), *Competitive Regional Clusters, National Policy Approaches*, OECD Publishing, Paris.

SME support

As many of the cluster initiatives described above are focused on the model of a well known multinational anchor firm and suppliers, there is perhaps insufficient attention to incorporating SMEs into basic networks. This is even more important in some of the lesser developed states in Mexico. Denmark's network programme had an active approach to recruiting and training facilitators that was replicated around the world. The Danish programme trained brokers, including the development of a broker certification system, as well as used other "scouts" to identify opportunities for joint activities (see Box 3.3). Many US states replicated this approach in the early 1990s, especially for rural areas, in states such as North Carolina, Arkansas and Oregon (Rosenfeld, 2001). The concept of facilitator training and certification continues to be used today, including in the latest Oregon programme and the Czech Klastry programme (OECD, 2007a).

All states have programmes to support the development of SMEs generally, and some of these have a technology upgrade or cluster integration focus. Many of the state programmes are based on funding and guidelines from the national SME Fund (see Chapter 2) and PROSOFT in the case of firms related to the IT/software sector. While many of these programmes are generic business support, there are some interesting experiments at the state level either managed by the state itself or through an intermediary.

Box 3.3. Denmark's Network Programme: brokers and scouts

Denmark's programme offered monetary incentives to promote co-operation among firms. Groups of at least three independent firms that sought to commit themselves contractually to a long-term relationship. Grants were provided for three different phases of network creation: feasibility studies to evaluate the potential for co-operation, planning grants to prepare an action plan or budget for a network, and start-up grants for operational costs in the first year.

Network "brokers": The Network broker was the key to the programme, serving as external facilitator, or systems integrator for network functions. In some instances, the brokers were consultants expecting to earn a living in this role but, in most cases, brokers worked for agencies that already served small and medium-sized enterprises (SMEs). Because the idea of working with groups of firms was uncommon, Denmark designed a training and certification program.

Network multipliers: These are people intimately familiar with the companies and able to detect and assess opportunities for collaboration that can be passed on to brokers. Sometimes referred to as "scouts," they include staff of chambers of commerce, trade associations, banks, accounting firms, law offices, trade centres, technical colleges, and technology extension services that serve SMEs.

Incentives for rural networks: Denmark offered sequenced incentives to compensate small firms for some of the costs of participating in activities with uncertain returns. The Danish program was based on the US Small Business Innovation Research program, with small 100% concept grants (up to USD 10 000), larger planning grants (up to USD 50 000), and larger still implementation grants (up to USD 500 000).

Information campaigns: Denmark also distributed information widely through the media, brochures, and newsletters on the potential value of networks and funding opportunities. They used distribution venues ranging from conferences to pubs.

Institutional hubs: This was not part of Denmark's official program but was part of those of most of its imitators. The sector centres in Emilia-Romagna (Italy) were viewed as essential parts of its co-operative structure, therefore many regions used specialised technical institutes, research centres, and councils for network formation and services.

Source: Rosenfeld, Stuart (2001) "Networks and Clusters: The Yin and Yang of Rural Development" in the conference proceedings *Exploring Policy Options for a New Rural America*, (Kansas City, Missouri: Federal Reserve Bank of Kansas City) pp. 103-120.

Basic SME support is not the focus of this study, however efforts to develop one-stop shops for SME support deserve attention. One national initiative to facilitate firm openings, SARE (by its Spanish acronym), seeks to reduce the regulatory burden for firms across the three levels of government. Beyond firm start-ups, states are trying to facilitate firm access to different public programmes given the complicated landscape with programmes provided for different services across multiple levels of government.

A number of state examples illustrate interesting approaches to SME support broadly. Michoacan, for example, has taken several initiatives to facilitate the environment for SMEs. The state has made one-stop shops a high priority, reflected by their high rankings in reducing firm-start burdens, and has developed an initiative to combine all the SME financing sources in the state into a common fund. Yucatan has also launched a clearinghouse entity that is seeking to serve as an information broker on the different publicly supported financing support programmes. Puebla's Institute for Productive

Competitiveness (IPPC for its Spanish acronym), whose board includes HEIs, members of the private sector and unions, has designed a programme to support SMEs that seeks to identify on a case-by-case basis factors that would have the most impact in such firms. An interesting approach of this programme is that it sets the clear objective of increasing the size of firms within a specific timeframe (*i.e.*, a small firm to become a medium-sized firm within two years) while having a control group of firms, facilitating periodic evaluations.

Supplier development is vital for Mexico as the local content of products is much lower than it could be, leaving many under-exploited opportunities for domestic SMEs. A national SME Fund strategic area is supplier development. A number of states have programmes of varying degrees of intensity for supplier development. Some states have followed international models, such as those proposed by the UNDP, which are often based on anchor firms.

At a minimum, states can develop registries of potential suppliers. At times it can be easier via internet to find a supplier outside of Mexico, even as far away as China, than inside of Mexico. Therefore, the development of state level registries, while valuable to public officials for FDI attraction strategies, could also be of general benefit to other firms and other states when considering where complementarities may exist. For example, Nuevo Leon developed a registry entitled Supply Hub. Similarly, Queretaro has developed a database by economic sector as a way to attract firms based on existing suppliers in the state. This online tool shows for each sector in the state the name of potential suppliers as well as their capabilities and their production processes. The challenge with such registries is that they are state specific and therefore when suppliers are working with purchasers in another state, which is frequently the case, the registries are less responsive.

Perhaps the most intensive form of supplier development programme was observed in San Luis Potosi. The Programme for Supplier Development to Large Industry (PDP for its Spanish acronym) works with a very limited number of firms. An intensive advisory service and support of these firms results in a very high per-firm investment for a limited number of firms (*Fundación IDEA*, 2007.) The aforementioned Supply Hub programme in Nuevo Leon is another example of a policy aimed at integrating SMEs into both domestic and global value chains. This programme links larger firms in the state with potential suppliers (registered in the Supply Hub) which could satisfy their specified needs. Chihuahua also has an important Centre for Supplier Development (CEDEP for its Spanish acronym), which seeks to achieve greater integration among local and national suppliers with the *maquiladora* industry through three strategic lines of action: a competitiveness intelligence department, a virtual business centre and a programme to promote entrepreneurs.

Efforts to support ISO certifications, bar code registrations and other standards could receive greater attention within the states. Furthermore, such certifications reinforce technical upgrading within the firms. They also increase their potential business supplier base, both domestic and international. Several states mentioned programmes along these lines, although they appear to receive perhaps insufficient attention in the general offer of SME-related services. There are also business chambers, such as CANACINTRA, that are supporting firm certification efforts. Some of the challenges for certification are that the cost is very high for the firm, and yet sometimes the payoff for higher quality is not recognised by purchasers who may still, in some fields, prefer the lower cost uncertified provider. The use of basic technologies, notably IT related, is also another minimum technology support for the least developed firms. The state of Aguascalientes has an innovation support programme for SMEs (see Box 3.4).

Box 3.4. **The Aguascalientes Innova Programme**

The main objectives of Aguascalientes Innova are: *i*) to develop innovation projects for participating SMEs; *ii*) to increase the chances of a higher income level among the owners of the participating firms and their employees; and *iii*) to develop a general awareness of the impact that innovation poses in a globalised business environment. The programme (currently in its pilot stage) has served 39 local SMEs and trained approximately 700 people on innovation. The programme is subsidised by the state's S&T Council. An outside contractor, iNovel Consulting, selects SMEs and invites their CEOs to trainings. The programme has triggered awareness of the impact of innovation within the small business community. Several firms have already developed, selected, and task-scheduled their own innovation projects. The programme rests upon three pillars: *i*) a methodology where SMEs can develop high-impact innovations; *ii*) a vision to select and pick the right innovative ideas among the many posted by participants; and *iii*) a task-scheduled process about the strategic sequence of activities of the implementation and launching of the innovation projects. So far, the firms are innovating in new product development, new business models, and technological and processes-upgradings. The programme has begun to raise awareness among SMEs about the fact that firm competitiveness is not only a question of costs, but often a matter of product differentiation and reinvention. *i.e.,* the kind of competitiveness that is sustainable over time.

Source: *www.innovacionregional.com.*

Several states have initiatied interesting programmes for certification, registrations and related instruments. In addition to financing intellectual property registration, as is done in other states such as Aguascalientes and the State of Mexico (see later section on science and technology), Zacatecas is helping to finance the registration of bar codes. For a firm wanting to sell to a large purchaser, whether domestic or international, this bar code registration is often necessary and can immediately open a much wider market to which micro enterprises and SMEs may sell their products. The state encourages the development of nutritional value labels required on many food products for wider distribution. The state also supports certification processes. One of the programmes is targeted at the mezcal sector whereby the programme helps finance the advisory services and process to get certified and the firm pays the certification registration.[2] In Michoacan, the office CEXPORTA (an export promotion bureau) helps SMEs to export Mexican food products to the Hispanic community in the US. The bureau funds the package design, labels and sanitary certifications, among other export support needs.

Another strategy that supports both niche strengths and is a form of intellectual property, is the support of recognised regional labels and branding for food products. This strategy can be used in any state, regardless of its level of development. In Yucatan, such initiatives have been observed for the habanero pepper and octopus sectors. In Zacatecas, there is a similar initiative with mezcal producers. In Michoacan, this was observed with several regional products making the state one of the national leaders in this type of registration. In Colima, a niche strategy for economic development is related to its lime production.

Specialised labour supply

Similar to national level policy, state level higher education policy is limited in its mandate or actions to promote a specialised labour supply to meet local industrial needs. There are certain types of higher education institutions that are more closely linked to labour market needs given their mission and operating methods (see Table 2.11, Chapter 2). For example, the technological institutes and universities are both designed to have active engagement with the local industrial base to meet labour demands with student placement in firms as an integral part of the curriculum. Private sector universities that receive their funding mainly by tuition revenues must prove the relevance of their curriculum for graduate placement in order to attract students.

A State Commission for Higher Education Planning (COEPES) is the main state level entity to promote the regional engagement of HEIs. In existence since 1979, these councils were reinvigorated through reforms in 1997 to improve their performance, albeit not all states have a functioning commission (OECD, 2007e). They are charged with the task of ensuring that the range of HEIs in a state take into account the different lines embedded in the state's development plans and that there is some systematic revision of the curriculum. Membership includes representatives of different types of HEIs, as well as firms and other social partners. The focus of the committees is on the educational demand needs of the state broadly, but tends to be more labour market focused. Aguascalientes is an example in which the state government has taken an active role in better linking labour supply and demand. The state constituted a special committee to identify labour market needs and define priorities in terms of human capital formation, working together with different industry chambers to define regional needs in terms of HEI graduates.

State level labour ministries are also involved in ensuring an appropriate labour supply, but generally for relatively lower skilled qualifications. They tend to focus much more on basic level training for individuals not destined for higher education. They target the unemployed population and provide training on specific basic competencies in certain professions or trainings tailored to the needs of local firms. They also implement a national training programme that targets vocational training and high-school level programmes.

One of the often cited challenges across the participating states is the insufficient labour supply with technical skills. Statistics in most states reveal a cultural trend in Mexico whereby students favour law, business and social science curriculum. There are a few states that have achieved a higher rate of student enrolment in technology, engineering and science relative to the national average, including Tamaulipas, Chihuahua, Coahuila and Queretaro.[3] The state of Chihuahua has recently established the Training Centre for High Technology (CENALTEC for its acronym in Spanish) providing training directly linked with local industry. This centre works through a reverse engineering method in which regional firms define human capital requirements. Through 2008 this institution had provided services to more than 3 000 workers in the two main cities in the state, including relevant certifications.

In terms of human capital requirements, some of the clusters at the state level have done a mapping of their labour supply needs. They have found that the largest gaps are not necessarily in the highest skilled labour, although it is frequently mentioned that the overall number of engineers tend to be a limitation. In Northern states, Jalisco, the State of Mexico and other states with a strong presence of multinationals or with strong presence of highly integrated global sectors, English language skills of the labour supply were also frequently mentioned.

Attracting and retaining high quality students and graduates is a challenge for the lesser developed states. For example, Colima's HEIs produce graduates in IT that find few job opportunities in the area and migrate to nearby Guadalajara. The state is now seeking to develop a firm base with jobs that will help retain these skilled graduates in the state. This net deficit of specialised human resources undermines the innovation potential of such states while making transition to a more knowledge-based economy even more difficult, reinforcing existing cleavages.

State level actions to support regional innovation systems

The concept of a regional innovation system is not yet integrated into the policy approach of most participating states. However, there is an increasing desire to change from a "made in Mexico" to a "created in Mexico" approach. And several states are beginning to use terms found in other OECD countries, like the "triple helix" of industry, government and research/higher education. The *maquiladora* industry has gone through four different generations with an increasing innovation approach. However, many of the existing *maquilas* may still be trapped in the earlier generations implying a lower level of innovation capacity and potential spillovers.[4] While not a major world R&D centre hub, there are a several design centres in the country that states seek to attract and capitalise on in their innovation systems.

A focus on innovation and technology in SME programmes and other strategies is relatively new for most states, dating back no more than ten years. The relationships across firms, HEIs, and research centres have also evolved due to a number of systematic drivers at national level (see Chapter 2) and through different bottom-up initiatives from the states. Still, there is a broad consensus on the lack of a collaboration culture between knowledge generators and the private sector, and the need to build more communication channels and confidence on both sides.

Studies of regional innovation systems within Mexico are rare. There are state profiles produced by CONACYT that show state utilisation of their programmes ranging from scholarships to R&D tax credits, however this is more of a listing than an analysis. Many of the common problems for the national innovation system are observed across states including disincentives and cultural barriers for collaboration between firms and HEIs/PRCs (but with a positive trend) and a lack of intermediary institutions to support firm technology and research needs. An isolated example of a study of a particular dimension of the RIS approach was elaborated in San Luis Potosi where determinants, barriers and types of collaboration between firms and knowledge generators were mapped.

States are beginning to think in a systemic way about regional innovation systems and to encourage greater linkages across actors in the system. Coahuila mentions regional innovation systems in their Economic Development Secretary working plan. Yucatan's state government decreed a State System for Research, Innovation and Technological Development in June of 2008. Puebla has a similar approach of increasing linkages among members of the researcher community. And Guanajuato has a very thoughtful approach to supporting sectoral innovation networks within the state, including different RIS actors (see Box 3.5). In addition, other actors are seeking to strengthen regional innovation systems through joint action in several states, such as with the ARCO Alliance (see Box 3.6).

Box 3.5. **Guanajuato Networks of Innovation**

The Networks of Innovation are a relatively low cost mechanism of promoting innovation that also has the virtue of linking actors, with government serving merely as a facilitator. The networks are constituted as groups of businessmen, academics and other researchers related to certain topics, economic activities or sectors. In place since 2005, the start-up of these networks (11 initially and now up to 15) is funded by the state government with a relatively small amount of resources (MXN 1 million approximately) through the state's S&T council. The idea is for these networks to be self-sustainable through joint or collaborative projects between industry and knowledge generators. In this sense, all projects originated in the network are required to have at least one partner from the private sector, but may be in either basic or applied science.

The sectors of the networks are defined by the state government. Researchers and firms in the sector (usually through their Chief Operations Officers) are called upon to participate and discuss potential problems and projects. If profitable collaboration is deemed possible, the network is constituted with a leader from the private sector. Within these networks, government is invited as an observer with the possibility of expressing opinions, showing the state's offer in terms of available programmes and making recommendations, but with no voting rights. After a one-time start-up grant, projects for the network are pursued and finalised through the network itself (both firms and researchers are members) which serves as a broker. The networks are constituted as civil associations and may seek researchers outside of their own network or even beyond state boundaries if specific knowledge needs are identified as unavailable. Most firms engaging in this kind of consortia are SMEs.

Source: Based on information from the state of Guanajuato, Secretary of Economic Development.

Box 3.6. **Coalitions for regional innovation system support: ARCO**

ARCO is a non-incorporated alliance between three national organisations which share the mission of promoting a sustainable development for states and regions of Mexico through innovation. The aim of ARCO is to launch and strengthen as many regional innovation systems as possible. Participants in ARCO are: ADIAT (National Association of Directors on Applied Research and Technologies Development), REDNACECYT (National Network of State Councils and Organisations for Science and Technology) and COFUPRO (Co-ordinator of PRODUCE Foundations; these Foundations group most agro-related producers from every state in the country).

The specific mission of ARCO is to advise Mexican states and regions on the design and implementation of an RIS based on a guide Model which considers six core processes and four enabling processes plus a dedicated effort to trigger a major social change in the region. The six core processes are: Strategic Mapping, Strategy and Vision, Indicators and Goals, Brokers for Connectivity, Project Portfolio and Policies at all levels of government. The four enabling processes are Technology Transfer, Project Management, Governance Structures and Financial Structures. Workshops on major features of the ARCO Model have been carried out in six states from the end of 2007 through 2008 with participation of potential leaders of each state for the establishment of a RIS. States already covered include: San Luis Potosi, Guanajuato, Nayarit, Chiapas, Coahuila and Jalisco. Future projects with EU funds may seek to support projects in several states.

Source: Information provided by ARCO.

Science and technology plans

While the states do not have a regional innovation strategy per se, many have a science and technology plan that is supported by an S&T council. As part of the 2001 national science and technology programme (PECYT), and to support S&T in different regions of the country, a system of state S&T councils was created. The role of the diverse S&T councils has been crucial not only for their contribution to the combined actions along with CONACYT, but also for the attainment of specific programs in such fields as scientific knowledge diffusion, awards to scientists, the development of links between universities and enterprises or the promotion of innovation by means of networks, consortia and clusters in strategic industries. The Law of S&T and other policy changes established the commitment of the states to elaborate their respective S&T laws and commissions, and to create S&T councils as well as develop S&T plans or programmes.

Not all the 32 states are equally advanced in the execution of their state level science and technology commitments. There are 30 laws and state councils, but only 18 S&T state plans. Marked inequalities are also manifested by the available budgetary amounts (in absolute values and as a percent of the economy), and therefore in the capacity to generate specific actions in favour of S&T&I or the ability to complement and co-fund national instruments and programmes. Some state Councils only implement programmes in co-ordination with CONAYCT, mainly the Mixed Funds (FOMIX) while others have been able to offer additional instruments to strengthen the state's scientific and innovation capabilities.

The framework for state level action is inscribed in each state's science and technology law, which varies from being a brief paragraph to several pages. The benefit of a more general text is that this leaves greater flexibility for policy initiatives, however that flexibility means that the long-term goals may not be supported with a government change. Even if a law exists with very specific goals, it may not be respected. For example, similarly to what happens at the national level, a state law may determine that there should be a certain percentage of expenditure relative to the size of the total economy (such as 1% of its GDP) in science and technology; however, if this goal is reached (or not), there are no accountability mechanisms.

Of the 15 participating states, nine have developed a formal S&T plan (see Table 3.2). The plans pick up, as a frame of reference, the structure of the federal law (PECYT). They start from the dictates of the S&T state law and from the considerations of the State Development Plan (PED for its Spanish acronym) regarding science, technology and innovation. In this context, the general structure of an S&T plan contains, more or less, the following common chapters: *i*) diagnosis or context; *ii*) vision, aims and objectives; *iii*) strategies and/or action lines; *iv*) specific instruments or programs; and v) operation, assessment, and monitoring. For the states without a plan, several are in progress.[5]

Table 3.2. Elements of state S&T plans

	GJ	JAL	Mich.	Coah	Puebla	SLP	N Leon	Zac	Tamps
Year of Plan	99 (1) 05 (2)	01 (1) 08 (2)	05	02	05	03	04	04	05
Ex Ante Evaluation									
Productive activities	1	1	1				1		
Sectoral activities	1	1	1						
Scientific capabilities	1	1	1	1	1		1		1
Vision, goals and objectives									
Scientific research	1	1	1	1	1	1	1	1	1
Human Resources	1	1	1	1		1	1	1	1
Technol. Development & innovation	1	1	1	1	1	1	1	1	1
Science dissemination	1	1				1	1		
Science-Industry relations	1	1	1	1	1	1	1		
International co-operation				1		1			
Solutions for State problems	1	1	1	1	1		1		1
Strateges and actions									
Support for Scientific research	1	1	1	1	1		1	1	1
Support for Hum. Resources	1	1	1	1	1	1		1	1
Support for Technol. Development & innovation	1	1	1	1	1		1		1
Suppport for Science dissemination	1		1	1		1	1	1	1
Support for Science-Industry relations	1	1	1	1	1	1			1
International co-op. agreements		1					1		
Solutions for state problems	1	1	1	1	1	1			1
Policy programmes and instruments									
Scientific research	1	1	1	1	1	1		1	
posgraduate progr.	1	1	1	1	1	1		1	
Technol. Development & innovation	1	1	1	1	1	1		1	
Dissemination of science	1			1	1	1		1	
Science-Industry relations.	1	1	1		1			1	
Internacional co-op. Agreements						1		1	
Solutions for state problems	1	1	1	1	1				
Monitoring, evaluation of performance	1	1	1	1	1	1	1		
Number of elements	22	21	20	19	17	16	13	12	11

Source: Based on analysis by Villaviciencio *et al.* for the OECD.

Consistent with the tradition of different ministry or government-wide plans, the S&T plans tend to be more ideals or lists of action items rather than overall strategies. While the competitiveness visions appear to include an increasing participation of stakeholders in problem definition and solutions (see previous section), it is not clear that these more administratively produced S&T plans have prominence or wide stakeholder participation. Again, the process of defining a regional innovation strategy has been noted as being very important for the success of a region in adapting to global trends (Benneworth, 2007).

Observations regarding the overall plans include:

- ***The form (chapters and structure) is very similar among state level and federal plans***. This is explained by the characteristics of the federal and state S&T laws that define the frame of the activities and the areas of priority for S&T public policy. In the case of Guanajuato, Nuevo Leon or Jalisco, the state plans actually surpass the federal plan in the design of some instruments.

- ***Lack of coherence within a plan.*** Some of the plans show lack of coherence between priorities or detected problems, aims/strategies definition, programme design and, finally, their implementation. Either there are no programmes and instruments to address the stated problem or there are programmes that do not respond to a stated aim or strategy. Some plans do have a diagnosis and an orientation of instruments towards some or all of those priority sectors, such as in the plans of Jalisco, Guanajuato, Michoacan, Coahuila and Nuevo Leon.
- ***Challenges for continuity***. The uncertainty expressed by the six-year change of government, as well as the desire to change with every six-year development plan, have prevented the development of long term S&T public policies. The problem is exacerbated by the annual budget negotiation which can, in some circumstances, limit resources or cancel specific programmes.[6] In this sense, some states (Jalisco, Guanajuato and soon Michoacan) have updated their plans with the aim of improving previous instruments. The continuity of policies with the objective of contributing to the construction of S&T state systems in the medium and long term in these cases has shown positive results.
- ***Insufficient commitments to effect desired change.*** The resources and actions outlined in the plans usually fall far short of the stated goals. Some non-targeted actions are supported (such as scholarships to increase human capital) while others may be very specific, such as a one-time reward for industrial innovation. In some cases these programs replicate the federal ones, handled at a smaller scale (*i.e.*, fewer funds). In this sense, evaluations of these actions at national level are very important since the same types of programmes are often replicated at the state level. There is also a need for greater understanding with regards to the strategic, as opposed to generic, objectives for state S&T plans.
- ***Different areas of best practice noted across state plans.*** *Guanajuato's* plan, which has a long history, has a number of novel instruments in it relative to other states, including the creation of an energy information system, a state observatory and innovation networks related to strategic productive sectors. *Jalisco*'s plan is based on more sophisticated background research to diagnose the problem, including direct surveys to firms (the only participating state where this kind of research was performed, and based on Oslo Manual definitions). The plan includes some innovative institutions, like the Jalisco Institute for Information Technologies, the Jalisco Centre of Biotechnology and the programme PROVEMUS to encourage links between universities and firms. *Michoacan* has avoided the tendency to be too focused on "fashionable" high-tech industries and (beginning with a sectoral diagnosis) focuses on the benefits of science and technology for other areas like the environment and natural resources, as well as the diversification of existing traditional industries like foods and textiles.

Support for the effective development of state plans would be of benefit across Mexico. As discussed in Chapter 2, this is an issue that national governments within the OECD view as important. They are providing resources to support plan development, such as the national level initiatives in the UK and France for regional innovation system strategy support.

Science and technology councils: variations in models and budgets

The prominence and effectiveness of the S&T councils varies widely across states, and is not always correlated with the state's level of development. A council's relative importance is the result of governance differences across states as well as the leadership of particular S&T council directors and other public officials. It is also strongly related to the focus of the S&T strategy and its linkages with the different business sectors. Budgetary considerations are also likely to be an important (but not exclusive) determinant.

There are a number of challenges for the councils from an operational standpoint. They tend to be very small in terms of staffing, often just a handful of individuals. In addition to small operating budgets, they also in most cases have small but usually increasing programme spending. As an order of magnitude, these budgets range from approximately MXN 10 million to over MXN 300 million (approx. USD 730 000 to 22 million). That upper bound is unusual, as most of the budgets are very low relative to the size of state economies and their needs. Furthermore, the mobility of government staff has implications for the stability of state councils. While some directors have gone beyond a six-year period (equivalent to the length of a governor's term) such as Jalisco or Guanajuato, others have changed during the last one, two or three years (Michoacan, Coahuila, Tamaulipas, Zacatecas) or in the extreme case, Aguascalientes, with four different directors since 2004.

The ministry or entity to which the S&T councils report (where they are "sectorised") can play a role in its perception within the state and the focus of the policies it will implement. While there are some associated with an education secretariat, there is a greater likelihood that those councils are more oriented to basic research and academic activities. Several other S&T councils report to an economic development secretariat. In general, those councils tend to be more oriented towards an industry linkage approach.

Some councils are now under the direct administration of a governor's office, hence gaining in terms of flexibility and autonomy. For example, the S&T council for the State of Mexico has been using this strategy of seeking to be "desectorised" to become more prominent in the state and leverage more funds. In recent years, the council's budget has quadrupled from approximately MXN 20 to 80 million (and final figures for 2008 are expected to be considerably larger). Guanajuato is one of the most active in terms of promoting science and technology as part of the state's economic development strategy, and its council is directly under the governor's office, giving it more flexibility and contributing to the state's disproportionately high share of resources from national S&T funds.

Colima and San Luis Potosi also illustrate how the S&T council can serve the needs across government sectors. Colima's S&T council is new but the approach within the state is interesting. The Governor asks all state-level ministries to submit their S&T needs and an accompanying budget such that the council has a list of priorities for projects in service of the state across different secretariats. All the different secretariats are on the board of the S&T council even if the operations of the council sit within the culture secretariat. In the case of San Luis Potosi, although the state council is formally under the education secretariat, several other secretariats of the state government (including economic development) are part of the council's board of directors.

State level science and technology programmes and federal programme use

Building capacity and linkages

States have taken very different strategies in terms of the kinds of programmes they have created. At a minimum, states implement the national FOMIX programme for research projects. In evaluations of that programme nationwide, it has been found that in some states this is the only S&T support programme. Other states have helped local firms, HEIs and PRCs access a wider range of national S&T programme funds. Above and beyond these national programmes, they have created new programmes themselves. State-initiated programmes include exchange visits and scholarships to visit foreign firms or study in foreign universities, support for intellectual property registration, technology transfer and innovation network support (including the creation of new intermediaries) and even technology parks.

Some state councils are trying to support an intellectual property culture. For example, the states of Mexico, Zacatecas, Tamaulipas, Guanajuato and Aguascalientes help finance patent searches and registrations. Many of the states co-ordinate with the regional offices of IMPI to further promote an intellectual property culture, and in some cases systematically disseminate information on intellectual property issues. Tamaulipas specificies in its S&T plan that a key objective is to promote intellectual property. The state has established a centre of advisory services for such purpose with the objective of increasing patents in the state. In addition to working with firms, states also need to consider greater efforts to work with HEIs on intellectual property issues.

The number of firms, HEIs and other actors that could potentially use national S&T funds is limited to those in the national S&T registry, RENIECYT. This has been noted as a barrier in particular for SMEs. States can therefore play an important role in increasing the number of potential national fund programme recipients by awareness raising and assistance to firms to increase the number of potential beneficiaries of national funds. For example, the state of Aguascalientes has a service to advise firms on registration in RENIECYT. Other states would also benefit from doing a similar programme.

For sustainability and to diversify the landscape of intermediaries, states can support the development of non-university research and technology institutes. For example, the Jalisco Institute for Information Technologies is a separate institution outside of the council to support initiatives in the IT sector. Guanajuato has created a state innovation observatory as well as innovation networks linked to the state's strategic sector priorities. A somewhat different but interesting programme is found in Queretaro developed by two external institutions (ADIAT and CIDESI) that trains firms in innovation processes, while also subsidising innovation seminars or granting financial resources for firms seeking to attend innovation-related events.[7] Spain has a long history of technology centres that play a vital role in different regional innovation systems (see Box 3.7).

Box 3.7. **Spain's Technology Centres**

Technology Centres are private non-profit research bodies that use their own material and human resources to carry out activities both for generating technological knowledge and facilitating its exploitation, either by existing companies or by generating start-ups. They function as a support platform for companies, generating and facilitating the use of technological knowledge, providing local companies with research, development and innovation services. Their success is measured by the competitive improvement of companies and their contribution to the economic development of their environment. The important role played by these Centres in Spain as instruments for making new technologies available to SMEs was already highlighted in the *OECD Economic Surveys: Spain* (2007).

Founded in 1996, Fedit is the Spanish Federation representing Technology Centres. The Federation is composed up of 67 Technology Centres, with a total workforce of more than 5 500 and providing services for around 30 000 companies a year. These figures make Fedit one of the most active agents in the Spanish Innovation System.

The Ministry of Industry, Tourism and Trade recognises Fedit as an expert body in R&D and innovation, and as a privileged partner in the Spanish Innovation System. This involves participation in the industrial observatories, in which Fedit working groups take an active part. At the same time Fedit belongs to a number of international associations and bodies in which it represents the interests of Spanish Technology Centres. Among them, it is part of the Executive Committee of the European Association of Research and Technology Organisations (EARTO), and it is also a founding member of the Executive Committee of the International Network for Small and Medium-Sized Enterprises (INSME).

The combined revenue of Fedit Technology Centres in 2007 totalled EUR 520 million. This was a 19% increase over 2006, which in turn was 20% higher than 2005. Technology Centres have doubled their revenue in the last five years. The main activity is R&D projects, accounting for EUR 340 million in 2007, half of which were in-house projects and the other half were contract projects for more than 3 400 customer companies. Next were technology services, with around EUR 112 million, followed by training and diffusion activities, totalling EUR 39 million. Another interesting outcome of Fedit is the creation of new technology-based companies, at a rate of about 20 per year.

The current funding of the activities of Fedit is 57% private, via contracts and fees of the associated companies, and the remaining 43% public: 26% from local and regional administrations, 11% from the Spanish government and 6% from abroad (mainly EU funds).

Source: www.fedit.es.

Technology parks

Across OECD regions, there has been a long history of the development of technology and science parks. Unlike a basic industrial park, which has more of a spatial planning and infrastructure focus, these other types of parks imply the presence of research facilities (including specialised research centres and HEIs) or other service providers that could be accessed by firms. In many cases, science parks are co-located with a university. The results of these projects, which often involve significant infrastructure investments (buildings, IT and other technology-related investments) are mixed across OECD regions (OECD, 2005a). For example, it took the now successful Sophia Antipolis technology park in southern France many years to be fully operational as a technology park. In its early stages, it was merely a location for several multinational firm offices.

A notable trend among strategic state projects to support their RIS is the development of technology parks. The Ministry of Economy announced in 2007 it planned to invest MXN 240 million (MXN 140 million for infrastructure and MXN 100 million to support firms being established within the park) in funds aimed at building some 33 technology parks. These parks seek to set the conditions for firm development in a context of better technology infrastructure, while bringing together HEIs, PRCs, and firms. Many of these parks are expected to house business accelerators and incubators that can support high-growth SMEs and start-up firms. ITESM is a private university that has played an active role in the development of the concept in Mexico, while participating in great number of these projects through their campuses in different states. One of the most prominent examples is the PIIT in Nuevo Leon that is part of the City of Knowledge initiative (see Box 3.8). Many other states are now trying to replicate the concept. One of the challenges in ensuring the success of these massive investments to support regional innovation systems is the potential lack of focus and specialisation of the park.

Box 3.8. **Monterrey International City of Knowledge and the PIIT**

Since 2004, the state government in Nuevo Leon set as one of its main pillars for economic development the strategic project Monterrey International City of Knowledge, which is based on an alliance between government, HEIs and industry to promote growth through innovation. Some of the first initiatives undertaken were bringing the Universal Forum of Cultures to Monterrey and the creation of the Institute for Innovation and Technological Transfer (I2T2). In the beginning, the project followed some basic strategies which included revising educational contents and methods, the incorporation of technology specialists for industry, increasing the number of researchers and PRCs, promoting business incubators, and strengthening the city's infrastructure. To make the alliance stronger, several clusters were initiated in sectors including auto, IT, medical services, life sciences, agro, nanotech and biotech, accompanied by Centres for Innovation and Intellectual Capital by sector. For the creation of new enterprises, the government launched the programme INVITE in 2005 helping researchers and local entrepreneurs license and register their knowledge while promoting the creation of new knowledge-based firms. Additionally the I2T2 started two funds with seed money and resources from private investors to help firm start-ups as well as high-growth SMEs.

In order to further enhance the RIS (predominantly centred around its main city Monterrey), the state invested in the Research and Innovation Technology Park (PIIT). The objective of the park is to strengthen innovation endeavours and technological developments while facilitating technology transfers to the private sector. The park hosts HEIs and specialised business incubators as well as public and private research centres. For this purpose, the state government invested USD 90 million, providing land and other needed infrastructure, reserving the majority of the space for firms and knowledge generators.

Source : Information provided by the state of Nuevo Leon.

Capitalising on higher education institutions

HEIs play several important roles in regional innovation systems. In addition to developing a specialised labour supply to meet regional needs (see previous section), HEIs can be the source of potentially commercialiseable research and provide a range of services to firms including contract research or consulting (see Chapter 2). Additionally, they may engage with firms in joint projects or be the source of new SMEs through business incubators. There are numerous examples across the states of HEI involvement in incipient regional innovation systems through different forms of support (see Box 3.9).

Box 3.9. **Higher education institution engagement: examples**

The following examples show that local conditions and differing funding sources have been driving factors in the establishment and development of linkages between universities and firms while underpinning the different regional innovation systems. Cultural problems nevertheless remain and confidence by the private sector is still deemed insufficient.

In **Puebla**, the presence of subsidiaries of multinational firms and competitive domestic firms has increased the demand for highly trained personnel thus making the provision of training among local private universities highly profitable. Selling services through industrial liaison offices has not only been a source of income but has also contributed to establishing a pool of business consultant experts and developing an entrepreneurial attitude among universities. The *Benemerita Universidad Autonoma de Puebla* (BUAP) now has a liaison office (*vinculation* department), but most of the research contracts with the business sector have been signed with large and often public companies such as PEMEX. UAP received the national award for university-industry linkages. It has launched an entrepreneurship program and provides services to companies all over Mexico (reflected in the BUAP *mapa de servicios*). The Technological University of Puebla (TUP) performs audits on companies upon demand from the private sector including Volkswagen. Some universities have a regional vision (UPAEP) but they do not collaborate with other HEIs. Some have alumni programmes but their main focus is business incubation (30 companies in the TUP incubator).

In **Tamaulipas**, UAT (*Universidad Autonoma de Tamaulipas*) devotes 12 to 15% of its budget to technological development. Collaboration with business is in general limited, but the situation is changing. For example the *Instituto Nacional Polytechnico* (INP) has signed 168 *convenios* with firms (mainly heavy industries). In private universities, the possibility to link with business for students is greater (85% are involved at one level or another with firms). 32% of students enrolled in HEIs are born in the state. INP is looking for highly skilled researchers and encourages professors to follow education programs in other states. In Tamaulipas, universities are not allowed to patent research result for their own benefit, thus providing an incentive for researchers to patent their own work. But infrastructure for research is lacking.

Source: Alliance for International Higher Education Policy studies (2005), *Determinants of University-Industry Collaboration: the Cases of Four States in Mexico*, AIHEPS Research Study. http://steinhardt.nyu.edu/iesp.olde/aiheps/downloads/finalreports/June%202005/University-Industry%20Collaboration%20(Mexico).pdf and OECD.

With a lack of a national intellectual property culture, HEIs in Mexico need support in this respect and states can play an active role. As the skills to identify commercialisation opportunities for HEI-generated research are generally lacking, and not always available within a given HEI, there is an even greater need for capacity building support. There are also economies of scale to supporting several higher education institutions in the same region in their efforts to increase commercialisation prospects. For example, in the four provinces of Atlantic Canada, the national government through the regional development agency has supported the creation of Springboard Atlantic as a vehicle for improving the quality of such offices and their effectiveness with respect to intellectual property in member HEIs. In the trans-national (Denmark and Sweden) Øresund Science region, the universities are linked in a joint network with a range of different cluster-specific platforms (see Box 3.10).

Box 3.10. **Networks across HEIs to support commercialisation**

Established in 2004, ***Springboard Atlantic Inc.*** is a network of university technology transfer/industrial liaison offices that supports the commercialisation of university research in Atlantic Canada. Fourteen universities and the four provincial community colleges comprise the nework. It is funded by the national government via the Regional Development Agency (Atlantic Canada Opportunities Agency) and its Atlantic Innovation Fund, the Natural Sciences and Engineering Research Council's Intellectual Property Mobilisation (IPM) Programme, and the member higher education institutions.

The network offers services and resources to its member universities including; *i*) delivering educational programmes (*e.g.,* on intellectual property); *ii*) hosting network events for researchers and business people; *iii*) facilitating industry sponsored research; *iv*) assessing discoveries; and *v*) developing proof of concept projects marketing technologies. Springboard's *Interns in Innovation* training program provides professional development, mentoring and job shadowing opportunities for new and existing staff in members' technology commercialisation offices. The programme seeks to create an unprecedented cohort of highly qualified technology professionals who can accelerate innovation and commercialisation in the Atlantic region.

The ***Øresund Science Region*** is a platform that seeks to link 14 higher education institutions which participate in the cross-national Øresund University. There are nine networks or platforms linked to specific industry/service areas spread across two countries (Denmark and Sweden).* The platforms are thus organised around core competencies in the region. Each platform has built a database of the relevant regional businesses and organisations into its respective core competences, which creates the possibility of directing specific knowledge streams from HEIs to the targeted areas of development. For example, Diginet Øresund, Øresund food network and Øresund IT academy are key sector areas for generating regional development outcomes as they are mainly made up of small firms. Having different platforms under the umbrella of one single organisation also increases potential benefits from the economies of scale and scope. Learning advantages and cross fertilisation between different platforms of the Øresund Science Region can be exploited. For example the Øresund Food Network is linked to the Medicon Valley platform and the Diginet Øresund to the Øresund IT Academy.

*Øresund Science Region Platforms: Medicon Valley Academy, Øresund IT Academy, Øresund Environment Academy, Øresund Design, Øresund Logistics, Øresund Food Network, Diginet Øresund, Nano Øresund, The Humanities Platform.

Source: *www.springboardatlantic.ca*; OECD (2007), *Higher Education and Regions: Globally Competitive, Locally Engaged*, OECD Publishing, Paris.

Use of national S&T programmes

Given the lack of data at sub-national level, one area for analysis with respect to state access to innovation resources is the utilisation of national innovation/technology and scientific research programmes. As eligibility for receiving national S&T funds from CONACYT is restricted to actors who are in the national registry RENIECYT, the number of firms or other institutions registered serves in part as a proxy for potential capacity to absorb federal funds. However, it does not necessarily represent true state capacity. As discussed in Chapter 1, the state receipt of national programme funds illustrates that some states benefit from a greater share of public funds relative to their GDP (even if overall levels are universally low). Such states include Guanajuato, Zacatecas or even Chiapas. Several of the largest states access a much lower share as a percent of their GDP, in part given their much larger GDP (see Figure 1.34, Chapter 1).

With respect to participation in innovation and technological development programmes and incentives, the most active states are among those with a strong and highly developed industrial base (Table 3.3). Among the most prominent are Nuevo Leon and Jalisco. Some important industrial states might not benefit from as many projects due to a lack of mobilisation for capturing national resources as opposed to a lack of capacity per se, such as the state of Chihuahua. The average project size per fund per state was not readily available for a finer analysis of programme utilisation. Project sizes vary considerably based on the purpose and industrial branch, ranging from USD 10 000 to USD 2 million with a maximum 50% co-financing from CONACYT.

Different states have shown greater success in capturing scientific research funds (Table 3.4). Some states have a higher number of research centres and higher education institutions in the RENIECYT, implying a greater stock of such reources and greater mobilisation of knowledge generators. Some states have a long history of using national programmes. Tamaulipas has had a large number of project calls for its state S&T fund through FOMIX, due in part to the longer programme history. While again, further information on per project size would add greater clarification, some general conclusions may be derived from this data:

- ***Use of national programmes is not always correlated with the scientific capacity*** of a state (as defined by the number of CONACYT eligible entities registered in the RENIECYT, the number of high quality advanced degree programmes, or the number of nationally accredited researchers). There are also examples of states that outperform with respect to the fundamental research fund even if there is lower scientific capacity per these variables. However with such low levels of national funding and minimal, if any, state-level funded programmes, it is essential to promote within the scientific community a larger participation in the federal programmes that finance scientific and technological activities. Potential for scientific research is undervalued in several states that appear to have resources but are accessing fewer projects.
- ***For FOMIX, the number of projects is more related to administrative issues.*** Looking at the projects financed from FOMIX outside of the industrial development category, those states with the greatest number of projects had organised more calls for proposals. Again, performance is not necessarily linked with capacity in terms of scientific resources. Some states have put a greater share of FOMIX towards industrial development projects rather than basic research.
- ***There are 14 sectoral funds, some accessed by only a few states,*** but open to a wider range of actors than the RENEICYT registry. For agriculture, low levels are observed even in states with a strong agricultural vocation. Agriculture is an area that could benefit from a regional innovation system but is not usually recognised or included in competitiveness strategies to the same degree.

Table 3.3. State participation in select innovation and technological development programmes

	Number			Granted projects				
State	RENIECYT[1] # of firms / total registered	CONACYT public research centers[2]	*Estímulos Fiscales* (R&D tax credit) (2001-2006)[3]	Avance (2003-2006)	*Fondo Economia*[4] (2002-2006)	*Fondo Innovación* (2007-2008)	FOMIX (2002-2006)[5] (Industrial development area)	PROSOFT (2004-2008)
Aguascalientes	53 / 78	2	33	1	10	1	38	42
Chihuahua	127 / 171	4	68	7	5	7	3	12
Coahuila	123/ 164	2	71	8	10	8	65	39
Colima	19 / 26	0	4	0	9	0	0	30
Mexico	264 / 356	0	189	18	26	9	3	9
Guanajuato	329 / 425	3	84	8	32	4	55	31
Jalisco	345 / 424	2	269	19	56	15	25	200
Michoacan	84 / 109	1	19	0	0	4	2	7
Nuevo Leon	343 / 386	0	348	16	45	19	57	197
Puebla	86 / 136	1	44	2	9	5	54	52
Queretaro	81 / 116	3	87	11	25	2	24	48
San Luis Potosi	54 / 67	3	26	1	1	1	95	2
Tamaulipas	47 / 77	0	29	0	1	1	3	33
Yucatan	26 / 59	2	7	2	0	0	9	20[6]
Zacatecas	11 / 26	0	4	1	0	0	56	24

Notes: The information is not homogenous for all programs and states. The main reason is the different cycles of management for each program (call, evaluation, contracts, etc.). 1) This information is for December 2008. It changes every month since membership is only for three years and has to be renewed. 2) This concerns the technological and scientific research centers linked to CONACYT. There do exist other public and private research centers but there is no centralised listing. 3) The *Estímulos Fiscales* statistics may double count the same firm that received the incentive in multiple years within the period, which is a frequent occurrence. 4) This program became Fondo Innovación in 2007. 5) Information after 2006 was not available for all states. Some states did not begin their FOMIX programme until after 2004. 6) The state of Yucatan reports 23 and not 20 grant projects.

Source: Based on data from CONACYT and the Ministry of the Economy, Mexico.

Table 3.4. State participation in select scientific research programmes

Number or granted projects

	Number of universities[1] (public & private)	RENIECYT[2] Universities & Research Centers/ total	High Quality[3] Advanced Degree Programs (PNP)	SNI[4] Researchers	Fundamental Research Fund[5] 2002-2006 (% of total)	FOMIX[6] (2002-2006)		Sagarpa Fund (2002-2006)	Semarnat Fund (2002-2006)
						Projects	Calls		
Aguascalientes	28	6 / 78	6	78	11(0.3%)	29	6	8	3
Chihuahua	74	1 / 171	17	186	39 (1.1%)	26	4	9	2
Coahuila	86	16 / 164	29	199	76 (2.2%)	43	4	18	6
Colima	25	1 / 26	7	112	28 (0.8%)	18	2	0	3
Mexico	228	34 / 356	58	878	115 (3.4%)	15	2	29	15
Guanajuato	148	20 / 425	34	466	176 (5.2%)	161	11	20	4
Jalisco	200	19 / 424	53	776	104 (3.0%)	20	8	15	5
Michoacan	69	11 / 109	33	424	111 (3.3%)	56	6	10	9
Nuevo Leon	100	8 / 386	68	511	108 (3.2%)	20	8	15	16
Puebla	209	24 / 136	52	561	181 (5.3%)	18	2	3	4
Queretaro	56	17 / 116	14	312	108 (3.2%)	42	4	16	6
San Luis Potosi	87	6 / 67	33	288	123 (3.6%)	69	4	7	12
Tamaulipas	108	12 / 77	8	125	17 (0.5%)	168	12	15	2
Yucatan	64	14 / 59	23	308	106 (3.1%)	96[7]	6	18	8
Zacatecas	31	7 / 26	4	111	13 (0.4%)	56	6	3	0

Notes: 1) Information taken from the CONACYT state profiles in 2007, from ANUIES (2009) and the Ministry of Education. In almost all states, directories can also consider Arts and Universities performing teaching studies (*Escuelas Normales*). 2) Information as of December 2008. It changes every month since membership is only for three years and has to be renewed. 3) This information is as of February 2008. It changes every year since the designation is valid only for three years and has to be renewed. 4) Information is as of December 2008. Designation as a SNI is for three or four years depending on the category (junior, senior). Evaluations take place for renewal and new members, thus the exact numbers change anually. 5)The total projects granted by this program during the analysed period are 3 411. 6) This excludes projects for the industrial development area. Information after 2006 was not available for all states. Some states did not begin their FOMIX programme until after 2004. 7) The state of Yucatan reports a significantly higher figure.

Source: Based on data from CONACYT, ANUIES, and some state S&T councils.

Regional innovation systems (RIS): typologies

There are different types of regional innovation systems across OECD regions. Overall performance on innovation inputs, linkages and outputs gives a sense of rankings across Mexican states on these parameters (see Chapter 1). However, it is the combination of these variables that helps categorise different types of existing or potential regional innovation systems. And what is perhaps more important, and more difficult to measure, is the effectiveness of different systems relative to their assets. Unfortunately, due to a lack of sub-national data, Mexican states can't be as easily compared quantitatively with other OECD regions in terms of regional innovation. The state of Jalisco stands out for its measurements of R&D using OECD definitions (based on the Oslo Manual) and using international comparisons of its S&T performance on a couple of key indicators. Beyond the data (which is particularly limited for Mexico), other forms of diagnosis can help determine which actors are important in the RIS.

One possible RIS categorisation for OECD regions is based on the lead generators of knowledge in a region. The share of R&D expenditure (as a percent of GDP) by actor can be used as a proxy for this. Some regions have a strong public research driver, due to the location of key national centres. Other regions may have particularly active higher education institutions. Finally, a system with a very high share of business sector R&D indicates a firm-driven regional system with R&D likely to be more oriented to industrial needs.

There are several types of potential regional innovation systems across Mexican states based on their industrial and scientific innovation-related assets. As R&D expense by actor is not available, use of some national programmes by type is used as a rough proxy. Other factors include the state's industrial base, scientific research capacity and the strength of local S&T and innovation support institutions. Table 3.5 illustrates one possible characterisation; however there are many possible groupings that could be used in the conception of RIS policy support mechanisms. A more refined categorisation for the entire country could be used to inform national S&T, industrial and regional development policy approaches that currently do not account for such regional differences. An example of a categorisation of regions in Europe with respect to their regional innovation system characteristics and the corresponding policy recommendations can be found in Table 3.A1.1 in Annex 3.A1.

Table 3.5. Categorisation of states by type of innovation assets

Category	States	Description
Intensive and diversified S&T&I	Guanajuato	Strong scientific profile with qualified human resources, prestigious public and private universities and postgraduate programmes as well as CONACYT research centres, diversified industry in mature and high-tech sectors, strong relationship between Council and other public entities, high participation in most CONACYT programmes.
Industry intensive, innovation	Chihuahua State of Mexico Jalisco Nuevo Leon	Strong industrial activity, high utilisation of innovation-related programmes, some important universities but few Public Research Centres.
Rising scientific and technological capabilities	Aguascalientes Coahuila Puebla Queretaro San Luis Potosi	Presence of CONACYT Research Centres and active S&T Councils, lower participation in innovation-related as opposed to scientific-related national funds.
Strong scientific capabilities, lesser innovation performance	Michoacan Yucatan	Strong scientific community with high number of recognised researchers (the SNI designation) but lesser application of this research to economic needs (in these states more agricultural than some others), success in FOMIX calls and projects from national Fundamental Research funds
Unexploited S&T/innovation potential	Colima Tamaulipas Zacatecas	These states do not have as many basic science resources and have captured less national resources in both innovation and science funds, in part due to the newness of the Councils in several of the states.

Notes

1. ADIAT and ARCO are cultivating a network of suppliers who can develop mapping tools for regional innovation systems, that includes business clusters, so as to identify and analyse linkages across regional actors.

2. Another interesting programme in Zacatecas is the 4x1 programme similar to the 3x1 found at the national level (see Chapter 2). Given the particularly high migration rates to the US, this programme uses resources sent by migrants and multiplies them by four (federal government, state government, municipal government and a local firm) which are then invested in productive projects decided by the migrant, including SME support and scholarships.

3. As per the ANUIES classification, science includes only natural and exact sciences.

4. The example of the high-tech *maquila* industry in Ciudad Juarez (Chihuahua) and Tijuana (Baja California) shows the importance of this industry in bringing together training institutions, brokers, and other intermediate organisations to build a more competitive "milieu" for this industry, as mentioned in Villavicencio D., (Ed.) (2006), *La emergencia de dinámicas institucionales de apoyo a la industria maquiladora en México*, M.A Porrúa/UAM, México.

5. *Aguascalientes*: Its S&T plan is in process of elaboration and it should be approved by the state instances soon. *Chihuahua*: The S&T state council was created by official ordinance at the end of 2007; therefore a plan is in process. However, the State Development Plan 2004-2010 does not make an explicit reference to the S&T topic. *Colima:* The S&T state council was officially created in 2007, it must soon proceed to the elaboration of the Plan. *State of Mexico:* The state Law of Science and Technology since 2004 mentions that the S&T plan should be created, which has yet to occur. *Queretaro:* Although the state Law of S&T has been approved since 2004, the state does not have yet a plan. *Yucatan:* The state government decreed the State System of Research, Innovation and Technological Development in June of 2008; its implementation should be enshrined in the strategies which the S&T plan will present. This plan will be elaborated soon.

6. According to the law, each new federal and state government should elaborate its Development Plan and, thereby, its sectoral plans or programs. In this sense, every six years state governments redesign strategies and public policies. In the best case, a new government can give continuity to some of the existing programs which show success and are popular with the electorate and, in the worst case, programs are re-invented every six years. Furthermore, these Plans for any sector, at federal and state levels, are only indicative as they are subject to annual Finance Department budgetary allocations, a state's Congress and on the priority each state government assigns to it.

7. CIDESI is the Spanish acronym for the Centre of Engineering and Industrial Development.

Annex 3.A1

Table 3.A1.1. Policy recommendations by type of RIS: European regions

Broad category	Sub-categories	Description and regions	Key strategic messages	Potential focus of EU Structural Fund support
Global consolidation	Nordic high-tech learning; Science and service centre	These regions are on the top rung of the ladder of European innovative regions and include: Copenhagen, Ile-de-France, London, Prague, Stockholm and Vienna, etc. These regions are clearly well above the average for all factors as well as GDP/capita with the exception of the private technology factor where they are close to the EU average.	--Becoming or maintaining position as international innovation and knowledge hubs --Enhance strengths in cutting edge pervasive technologies (ICT, nano-micro, materials, life sciences, renewable energy)	--Developing clusters in emerging strategic areas, such as creative industry, life sciences, eco-industries, etc. --Competence centre type projects to increase networking of universities and smaller firms --Major projects to test/develop new technologies for urban/public services, etc. --Regions as lead partners of inter-regional networks in advanced technologies
Sustaining competitive advantage	Learning; Centro techno; High techno	Sustaining competitive advantage regions (strong industrial and learning Regions, *e.g.*, Baden-Württemberg, Flanders, Ireland, Piemonte, Rhône-Alpes, Salzburg and Scotland, etc.) are relatively strong on private technology (reflecting the industrial tissue and heritage of these regions) and on learning families but much weaker in public knowledge and urban services (suggesting a difficulty to restructure towards more knowledge-based services).	--Consolidate competitive advantage in high value-added manufacturing activities --Maintain higher value added activities (research, marketing, etc.) within value chains --Diversify the economic structure into knowledge intensive services	--Competitiveness/ innovation poles in core or emerging regional sectors --Promotion of science and engineering careers and research-industry and international mobility --Mentoring, innovation management tools, etc. for boosting entrepreneurship --Regions as lead partners in EU level sectoral innovation networks (automotive, electronics, etc.)
Boosting entre-preneurial knowledge	Local science and services; Aging academia	This category includes second-tier capitals and regions with strong public research *e.g.*, Athens, Berlin, Bratislava, Catalunya, Lisbon, Midi-Pyrénées, Warsaw, and Wallonia, etc. that are strong on public knowledge and relatively competitive in terms of urban services but need to boost private technology and in particular Learning family drivers of their knowledge economies.	--Encourage and support science-business co-operation --Support traditional industries to diversify through the uptake of persuasive technologies --Develop current niches (public and private) into competitiveness poles --Strengthen regional innovation system and improve governance of regional innovation policies	--Focus on systematic instruments such as competence centres, industry-academic joint R&D, etc. --Support to universities propensity to engage in entrepreneurial activities --Mentoring, innovation management tools, etc. for boosting entrepreneurship --Support for internationalisation of regional clusters/poles in inter-regional projects
Entering knowledge economy	Southern cohesion; Rural industries; Eastern cohesion; Low-tech government	The Entering knowledge economy regions (broadly similar to the Structural Fund convergence regions) lie on the southern and eastern rims of the EU. This group includes most of Greece, southern Spain, Poland except Warsaw, Estonia, Lithuania, Portugal except Lisbon, the Mezzogiorno, etc.). These regions are broadly speaking users rather than producers of technology.	--Develop operational innovation policy frameworks based on regional partnership --Develop new specialisation areas by combining local advantages in traditional industries with knowledge intensive activities --Restructure agricultural areas through multi-functional rural activities --Develop new trajectory for tourism industry by linking it to other high value added activities and provision of advanced logistics and ICT for the personalisation of services --Exploit untapped potential in renewable energy and tackle environmental degradation by introducing clean technologies	--Renew regional innovation strategies focusing on specific technologies and sectors --Support innovative initiatives based on the actual regional potential (*e.g.*, in traditional low-tech sectors) --Productivity/technology grant for SMEs --Profile human resources according to the needs of economy (*e.g.*, placement schemes) --Creation of cross-border research or innovation networks to create critical mass

Source: Adapted from Technopolis *et al.* (2006) *Strategic Evaluation on Innovation and the knowledge based economy in relation to the Structural and Cohesion Funds, for the programming period 2007-2013: Synthesis Report.* A report to the European Commission, Directorate General Regional Policy, Evaluation and Additionality, 23 October 2006.

Chapter 4

Multi-level Governance to Promote Regional Competiviness and Innovation systems

Introduction

All levels of government can influence the competitiveness of a region. While the competitiveness of a place is due to a number of factors, the focus for this review is on what can support productivity improvements for firms via clustering and regional innovation systems. While Chapters 2 and 3 reviewed the policies at national and state levels that may reinforce these phenomena, this chapter focuses on the governance arrangements that could support such policy goals.

The chapter begins with a discussion of the division of labour across levels of government in Mexico for supporting competitiveness, with an accent on regional innovation. Continuity in governance is a problem at all levels. There are different areas where greater horizontal co-ordination (including a "gatekeeper" at the national level) and vertical co-ordination across levels of government are needed. Mexico is a highly centralised federal country, and given this centralisation, the chapter then considers the different options to achieve the common benefits associated with decentralisation for competitiveness. Contracts are one tool for promoting greater national/sub-national responsibility sharing given their applicability in economic development. The relational nature of such contracts, as noted in may OECD country examples, can play an important trust-building and capacity-building role as well to facilitate multi-level governance dialogue. Finally, the need for monitoring indicators to support these contracting arrangements is discussed.

Responsibilities for regional competitiveness and innovation systems

In Mexico, all three levels of government have an impact on regional competitiveness: federal, state and local (see Table 4.1). While Mexico is a federal country, on a number of areas relevant for competitiveness, such as innovation-related resources, the national government has a leading role. The municipal level has many of the traditional roles of a local government, however the variation and burden of regulatory requirements at the municipal level is a particular challenge for competitiveness.

Table 4.1. Governance sharing for competitiveness

	Federal	State (31 states plus the Federal District)	Municipalities (2 500)
Human Capital			
Primary and secondary education	Financing, regulation, standards, monitoring	Financing, administration and co-ordination of programmes at state level,	Implementation of federal programmes, resources and actions. (Art. 17)
Tertiary Education	Quality assurance, institutional financing, student scholarships	Financing	None
Clusters and innovation			
FDI attraction	Some national programmes (ProMexico)	Mainly state role	Spatial planning considerations, regulations (some big municipalities have an FDI programme)
SME support	Programmes (mainly finance and basic business support)	Programmes (co-financing national programmes, own programmes)	Programmes possible
Science and technology	Support to researchers, public research centres, funds to support R&D, tax incentives for R&D investment, support to consortia	Co-financing of certain national programmes; minor number of programmes	Some municipalities (2) have constituted FOMIX trust funds to promote S&T&I
Social policies			
Health	Sets policy, wages and makes infrastructure investments	Administration of programmes; responsibility for urban and rural poor	No formal responsibility, may support federal and state programmes
Other key social policies	Financing, design and monitoring of Federal programmes (Art. 21)[1] (and Chapter II)	Financing, administration and co-ordination of programmes at state level (Chapter II)	Implementation of federal programmes, resources and actions. (Art. 17) and financing, administration and co-ordination of municipal level programmes. (Chapter II)
Infrastructure			
Water and sewer	National Water Commission	Joint with local	Joint with state and other municipalities
Electricity	CFE: Federal enterprise (Art. 1)[2]; regulation by federal agency (CRE)	Local offices of CFE	None
Road construction/ maintenance	Joint across all levels by geographic jurisdiction	Joint across all levels by geographic jurisdiction	Joint across all levels by geographic jurisdiction

Notes: 1) Art. 35: The Federal Government and state governments may bring resources, such as venture capital, to support the viability of firms as well as reources to support inidividuals, familiies and social organisations with the purpose of financing projects for social development. (*Ley General de Desarrollo Social*, 2004); 2) *http://www.cre.gob.mx/documento/46.pdf.*

Municipal level

In Mexico, a number of issues with respect to the municipal level pose challenges for competitiveness in a broad sense in terms of local public goods relevant to firms. Capacity levels, as measured by the educational level of municipal employees, are low. The three-year municipal election cycle, with no immediate re-election possible, results in high and frequent levels of staff turnover. Furthermore, this constant turnover can serve as a disincentive for investments that have longer-term payoffs. These factors, among others, can impede the provision of the basic public infrastructure and services that are at the basis of the competitiveness of a place (OECD 2003, OECD 2007l, OECD 2007o). While municipalities may participate in inter-municipal associations to achieve economies of scale and improve public goods and services, only about 25% of municipal governments have entered into such agreements with neighbouring municipalities (World Bank, 2006).

Many of the state level reforms to improve competitiveness are focused on greater regulatory harmonisation across municipalities, as this also impacts firms. For example, Jalisco has an important initiative to harmonise the regulatory regimes across all municipalities in the state—a major undertaking. The state of Mexico is also putting a strong accent on this harmonisation to improve its competitiveness performance. Furthermore, the large states appear to lose out somewhat in the competiveness rankings in part because of this diversity in municipal regulations and performance (see Chapter 1).

Therefore, the size of a state (in terms of the number of municipalities and their average size) influences both municipal service provision and the ability of a state to co-ordinate across municipalities. For example, a state like Aguascalientes has only 11 municipalities to co-ordinate across, with several of them being in the same core metropolitan region around the city of Aguascalientes that concentrates most of the state's economic output. On the other extreme is the state of Oaxaca with 570 municipalities (see Table 4.2).

Table 4.2. Municipalities: number and population distribution by state

		Percent of population in municipalities (by population size)				
	No. Municipalities	<5 000	5 000-99 999	100 000-499 999	500 000-999 999	1 million and above
Aguascalientes	11	0	32	0	68	0
Baja California	5	0	6	15	30	50
Baja California Sur	5	0	25	75	0	0
Campeche	11	0	42	58	0	0
Coahuila	38	1	31	19	49	0
Colima	10	1	34	65	0	0
Chiapas	118	1	70	17	12	0
Chihuahua	67	2	23	11	23	41
Distrito Federal	16	0	0	37	28	35
Durango	39	2	34	29	35	0
Guanajuato	46	0	28	46	0	26
Guerrero	81	0	59	18	23	0
Hidalgo	84	0	77	22	0	0
Jalisco	124	1	32	18	8	41
México	125	0	22	38	20	20
Michoacán	113	0	58	25	17	0
Morelos	33	0	57	43	0	0
Nayarit	20	0	65	35	0	0
Nuevo León	51	1	15	41	16	27
Oaxaca	570	24	65	12	0	0
Puebla	217	3	58	12	0	28
Querétaro	18	0	34	20	46	0
Quintana Roo	8	0	18	31	50	0
San Luis Potosí	58	1	53	16	30	0
Sinaloa	18	0	24	46	30	0
Sonora	72	3	26	42	29	0
Tabasco	17	0	31	41	28	0
Tamaulipas	43	1	16	66	17	0
Tlaxcal	60	4	96	0	0	0
Veracruz	212	1	62	30	7	0
Yucatán	106	5	56	6	33	0
Zacatecas	58	3	63	33	0	0

Notes: States in bold are those that participated in the study.

Source : OECD calculations based on *Estimaciones del CONAPO con base en el II Conteo de Población y Vivienda 2005 y Encuesta Nacional de Ocupación y Empleo 2005 (IV Trimestre).*

State and federal role sharing to support innovation

Support for regional development generally, and regional innovation systems in particular, is a shared set of responsibilities between regional and national governments. While in Mexico the municipal level plays an important role in terms of public services (see above), they are not as involved in larger scale economic development planning and innovation system support. There may be some exceptions to this rule for several large metropolitan areas. Another exception is Guanajuato, where the economic development strategy (including its innovation dimension) has been defined around an important industrial corridor that encompasses several municipalities with varying economic vocations. In this case there seems to be important co-ordination across levels of government including close linkages with municipal authorities.

There are different approaches to organising and managing innovation policy across the OECD, largely dependent on institutional and constitutional frameworks. They differ across types of innovation-related policy – from funding R&D to building science parks or providing business advice to firms (see Table 4.3). There are also clear rationales for particular levels of government to take responsibility for different aspects of regional innovation and cluster support policies. Such rationale include: the spatial dimension of the regional innovation actors, the spatial dimension of the economic spillovers, the financial resources available, the technical capacity of the government actors and the knowledge of government actors of the needs for policy or programme support.

Table 4.3. National-regional responsibility sharing for innovation policy

	Federal, decentralised	Centralised	Small country or single region countries
Innovation environment	↔	↑	↑
Innovation poles, clusters and science parks	↓	↔	↔
R&D, pure research/applied	↔	↑	↑
Enterprise support for innovative firms	↓	↔	↔

Notes:

↔ = both central and regional levels involved

↓ = essentially a regional responsibility

↑ = essentially a national responsibility

Source: Adapted from Technopolis *et al.* (2006), *Strategic Evaluation on Innovation and the Knowledge Based Economy in Relation to the Structural and Cohesion Funds, for the Programming Period 2007-2013: Synthesis Report, A report to the European Commission,* Directorate General Regional Policy, Evaluation and Additionality, 23 October 2006.

Mexico is therefore unusual for federal countries in that most of the policy direction and funding for supporting innovation comes from the federal level. Regions, or in the case of Mexico states, can serve different roles in this process of multi-level governance of regional innovation policy. Even where the constitutional framework suggests one model or another, there are choices to be made about what the role of the region is within the governance arrangement. The different ways of perceiving the role of the region can be summarised as (adapted from Perry, 2007):

More "passive" roles for regions:

- ***Regions as stages:*** Within nationally-defined policy frameworks, regions are seen as appropriate scales of action, as "containers" of innovation or "stages" on which policy is enacted. It is important to note that policy may be defined or organised within regional units yet regional authorities or agencies are not seen as participants in that process.
- ***Regions as implementers:*** Regional authorities and agencies have a role in the implementation of nationally defined and funded policy initiatives. Regions provide not only stages for policy delivery but are also agents for delivery according to centrally conceived priorities and targets.

More "active" roles for regions:

- ***Regions as partners:*** Regional authorities and bodies have increasing influence in shaping national priorities for science and innovation in a more co-determined model of policy formulation. Regions may, for instance, co-fund scientific infrastructure that is located in their region but which is of national importance.
- ***Regions as independent policy makers:*** Regional authorities and bodies devote their own finance and resources to fund regionally significant scientific investments or projects without *a priori* links with national S&T targets. This can involve independent agenda-setting, institutional creation and new governance arrangements.

Most Mexican states are currently serving a passive role by implementing jointly national policy. There are a few more advanced states that are being given more autonomy to be partners with national government. While the states may play an independent policy-making role given the constitutional frameworks, they do not generally take this option, albeit there are interesting policy experiments across states with respect to innovation support programmes (see Chapter 3). The fiscal centralisation, lack of state capacity and tradition of following national policy cues help explain why most states do not take an active role as independent regional innovation policy makers. Furthermore, S&T at the national level is governed by a general law, therefore there is no legal basis for co-ordination with the sub-national level.

Continuity challenges at all levels of government

Continuity in governance is another barrier for long-term strategies in support of regional competitiveness. Re-election is not possible at municipal, state or national levels (including in the legislative branch), resulting in frequent turnover in political leadership. And while there is a national public civil service which supports a certain degree of continuity in the public sector, there is no comparable system at sub-national levels where staff turnover with a new administration is very high. Even when there is not a new administration, frequent staff changes may have a negative impact on the basic functioning of public institutions to support regional innovation, which has been observed in some state S&T councils, for example.

In addition to the political and civil service turnover, there is also a common practice of policy turnover. Each new administration develops a battery of new plans and programmes. This discontinuity is problematic for policy development generally. It is also an obstacle for evaluation as with frequent changes in programmes, rules, and reporting it is difficult to track over time the effectiveness of public policy interventions.

For longer-term economic and innovation development strategies, this discontinuity poses additional challenges. International and domestic firm decisions on location and investments are negatively impacted by uncertainty. Efforts to involve non-public actors in strategy development and implementation for cluster and regional innovation system support are one vehicle for addressing this governance challenge. This has already been observed in several states with respect to competitiveness strategies, cluster initiatives and, to a lesser extent, regional innovation initiatives.

Cross-sectoral co-ordination and "gatekeeper" roles

One of the classic challenges for place-based policies is the co-ordination across the different sectors that influence regional development and competitiveness. Not only are different policy streams relevant, but also the coherence across those different policy streams to support regional competitiveness goals. This cross-sectoral collaboration is a challenge at all levels of government in OECD countries. In Mexico, there exist already a number of different co-ordination bodies at each level of government with a place-based focus for various purposes (see Table 4.4).

Table 4.4. Examples of co-ordination bodies for place-based approaches

Municipal	State	National
• Municipal Councils (*Cabildos*) • Municipal Planning and Development Committees (COPLADEMUN) and subcommittees • Municipal Development Councils (CDM, associated with implementing FAIS) • Councils for Sustainable Rural Development • Community Committees (CC, associated with FAIS in urban areas) • Rural Development Committees (CDR, associated with FAIS in rural areas)	• State Councils for Economic Development or Competitiveness Commissions (some states) • State Planning and Development Committees (COPLADES) and subcommittees • Councils for Sustainable Rural Development • CONAGO's Commission for Regional Development (CODERE, not governmental) • *Comisión para Asuntos de la Frontera Norte* (regional co-ordination of northern border states) • *Fideicomisos* for each meso-region • State councils for economic development (many states)	• Inter-Ministerial Commission for Social Development (CIDS) • Inter-Sectoral Committee for Micro-Regions • Inter-Ministerial Commission for Sustainable Rural Development (CIDRS) • Council for Sustainable Rural Development

Note: FAIS is the Social Infrastructure Contributions Fund.

Source: OECD (2007), *OECD Territorial Policy Monitoring Review: Mexico* (unpublished) with updates.

National level

Coherence of national policy approaches to regional development can be achieved through a range of governance vehicles. In a few OECD countries there is actually a ministry in charge of regional development policy. Others, such as Canada and the UK, have created regional development agencies that bring together different national funding and policy streams in service of the economic development of a particular region. Both those models include an innovation component. In Sweden, under the Ministry of Enterprise, Energy and Communications, the Swedish Agency for Economic and Regional Growth (Nutek) seeks to promote economic growth across the regions of the country through policies that support cluster development and firms, among others. There have also been examples of mergers of national level ministries that have a strong link in terms of their impact on regional development.

Many OECD countries choose inter-ministerial co-ordination bodies at the national level as an alternative mechanism to the above options. The French Inter-Ministerial Committee on Territorial Planning and Competitiveness is an interesting example (see Box 4.1). There are at least seven ministries that have an important impact on regional development in Mexico. In the prior administration, responsibility for regional development was originally placed in the Office for Strategic Planning and Regional Development within the Executive Office of the President. While the positioning of regional issues in this office held potential for producing a cross-sectoral orientation, the office lacked sufficient budget and authority to develop and implement programmes, or to incite local actors to participate. In August 2005, many of these responsibilities shifted to the Office of Public Policy. Concurrently, the location of many place-based policies at the Ministry of Social Development (SEDESOL) has facilitated their implementation, but resulted in an emphasis on the relationship between poverty reduction and place-based policies. Additional policies for rural places are under the Ministry of Agriculture and Rural Development (SAGARPA) (OECD, 2007o).

Therefore, a cross-sectoral gatekeeper responsible for regional development overall at national level is still lacking, and the existing approaches remain more poverty focused. There is an important role for programmes from the Ministry of the Economy and CONACYT in supporting a more integrated approach to regional development with a competitiveness orientation. If Mexico seeks to institute an inter-ministerial gatekeeper, then care should be used not to complicate the landscape. In the past, for example, proposed changes to the Planning Law would have created an Inter-Ministerial Commission for Regional Development in addition to the other three inter-ministerial committees addressing rural and social policies. If something similar were to be proposed in the future, it should have an over-arching role for regional development that preserves these important committees as working groups within a larger committee. Furthermore, as federal agencies have representatives in the states, those in ministries that would correspond to such a commission could be in contact within the individual states to facilitate vertical co-ordination (see later section).

Box 4.1. **The DIACT/CIACT in France: an inter-ministerial committee for regional competitiveness**

DIACT provides secretariat services and prepares documents for the Inter-ministerial Committee on Territorial Planning and Competitiveness (CIACT), chaired by the Prime Minister. This committee decides territorial planning policy guidelines and measures. DIACT is also the prime partner of the regions. These partnerships were extended to the European level, and will be strengthened by the decentralisation process underway in France. They involve:

- ***Preparation, implementation and monitoring of the State-Region Planning Contracts (CPER),*** in which the central government and the regions agree on strategic priorities. For each contract, an action plan is adopted and the respective financial commitments are set. For the fourth generation of contracts (2000-2006) central government expenditure totaled approximately EUR 18.3 billion. An equivalent amount was provided by the regional authorities.

- ***The interface with Europe:*** DIACT serves as liaison between the European Commission, the French government (at the central and regional levels), sub-national governments and other bodies concerned with European regional policy. France was allocated more than EUR 16 billion for the period 2000-2006 within this framework.

- ***Implementation of territorial development policies.*** Along with the National Fund for Territorial Planning and Development (FNADT), which finances measures that serve broad objectives, the DIACT supports its activities with a specific assistance mechanism for enterprise development: the Territorial Planning Bonus (PAT). It is involved in promoting clusters and the so-called "competitiveness hubs" (pôles de compétitivité). DIACT also conducts studies and performs monitoring and forward planning activities within its fields of competence.

Organisation. DIACT consists of five teams responsible for specific areas: regional development; local development and rural policy (although urban policy is entrusted to the *Délégation Interministérielle de la Ville*, which is part of the Ministry of Housing and the City); economic development and attractiveness; the central government's territorial policies and sustainable development; and European affairs and international relations, to which may be added the monitoring and forward planning units, and a General Secretariat. Specific trained personnel for industrialisation and development in some areas and in mountain regions assist DIACT. In addition, DIACT contributed to the creation of the French Agency for Foreign Investments (AFII) and its foreign offices (including New York, Boston, Chicago and Los Angeles) to identify possible investors. DIACT is still responsible of this agency jointly with the Ministry of Economy, Industry and Employment.

The National Territorial Planning and Development Fund. The instrument for financing CIACT decisions is the FNADT. This fund supports projects to encourage employment and attract industry to territories, as well as to promote their natural and cultural heritage. FNADT also provides funding for projects that use information and communication technologies. It consists of three units, handling: *i*) implementation of CIACT decisions; *ii*) financing of planning contracts and inter-regional activities; and *iii*). contributing to the establishment of public services and local efforts at inter-municipal co-operation level.

Source: OECD (2007), *OECD Territorial Review: France*, OECD Publishing, Paris, with updates.

State level

A number of interesting cross-sectoral initiatives are observed at state level to support regional competitiveness (see Chapter 3). The state level public sector is increasingly using cross-sectoral groups to support competitiveness. The models observed included a gatekeeper within the governor's office or in the state level economic development ministry. One of the observations is that these groups, with a more general regulatory and business environment focus, do not sufficiently incorporate science and technology related actors at state level. There are also an increasing number of public-private initiatives to support economic development generally within the states, and several of them have a competitiveness focus. And while in many states the S&T council is not necessarily given prominence within the state, there are some councils that have multiple ministries on the board or that have sought to be placed outside of a particular ministry so as to serve a greater cross-ministerial function.

As an illustration, the State of Mexico has developed numerous mechanisms of co-ordination among different actors for competitiveness. Coming directly from the governor's office, this strategy seeks to identify potential areas of co-operation and co-ordination at the state and regional levels. Concrete examples of such co-ordination include: a commission with those responsible for labour and education as a way to better link labour supply and demand; a metropolitan commission with Mexico City; seven working commissions to deal with competitiveness integrating HEIs, government and the private sector; systematic co-ordination efforts with the neighbouring state Hidalgo; and the project of harmonising municipal level regulations across the state.

Centralisation and impacts on competitiveness

Fiscal centralisation

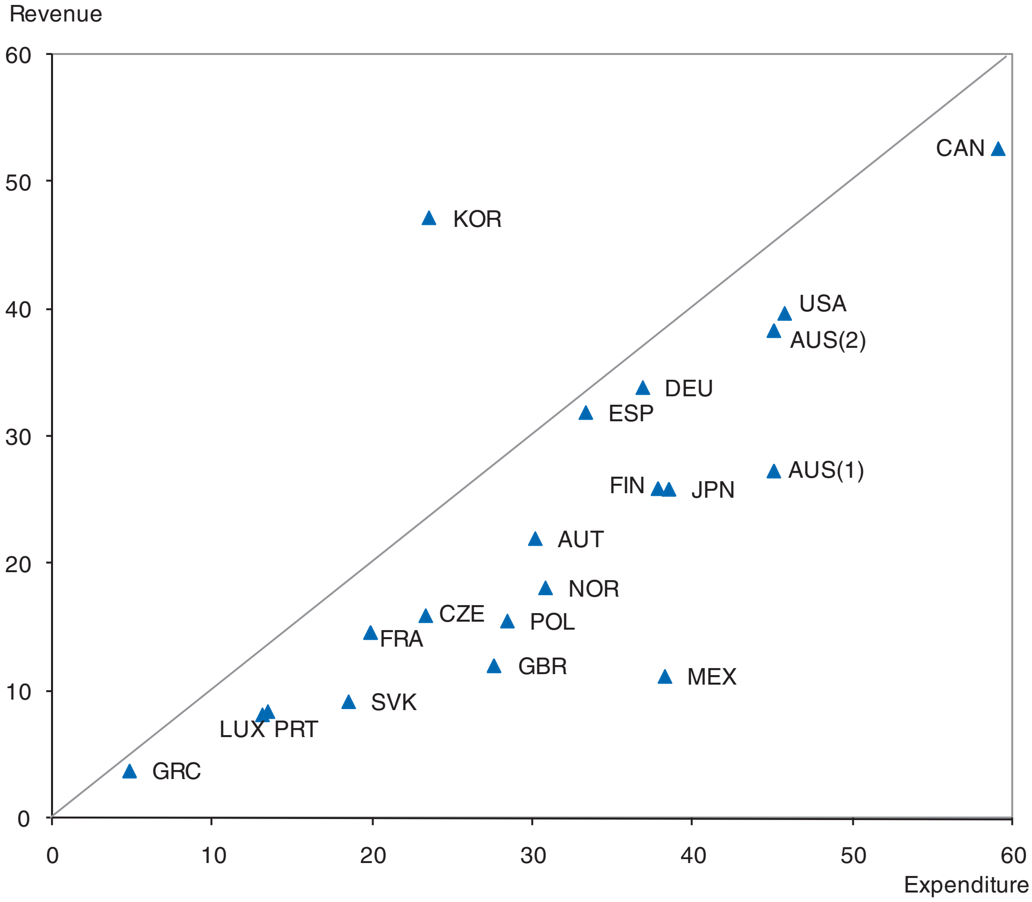
One of the reasons for this stronger national level role for regional competitiveness is that Mexico is the most fiscally centralised federal country in the OECD. This is true for the level of decentralisation of both revenues and expenditures (see Figure 4.1). Sub-national governments therefore rely heavily on inter-governmental transfers, federal programmes and decentralisation agreements (*convenios*). In fact, only approximately 3% of total tax revenue comes from sub-national sources (see Figure 4.2). Sub-national tax autonomy, already low, declined in Mexico (1995-2002) while it has been stable or increased in other federal or highly regionalised countries (OECD, 2007n). Municipalities have a slightly higher share of own revenues (22%) relative to states (7%) (See Figure 4.A1.1 in Annex 4.A1).

Tax reforms have given states the authority to levy new taxes but they have been hesitant to take advantage of this. Many states are not applying the payroll tax, which they have the right to levy, as a vehicle for competition across states to attract firms. Nevertheless there have been some interesting experiments with the payroll tax whereby the states are applying the tax, but then getting firm input on how to support economic development of the state and its competitiveness with this revenue stream, thereby linking the taxpayer with the goods and services provided (Box 4.2).

State budgets are overwhelming made of transfers from the federal government with most of those transfers earmarked, further restricting state financing flexibility. Over the last several years, on average approximately 88% of state budgets originate from the federal level with a slight upward trend in own funds increasing from 6.5% to 7.9%. The composition of state revenues does vary somewhat by state (OECD, 2007n). Of that amount of transfers, approximately three-fifths is conditional, leaving only 40% of transfers with some flexibility in spending. Over time, the share of non-earmarked transfers from national government has declined dramatically (from 70% of state revenues in 1989 to slightly under 29% in 2007) while the share of earmarked transfers has dramatically increased from 1% to almost 55% over the same period (see Figure 4.3). Therefore, while the share of public expenditure by state has increased considerably, that increased spending is earmarked (see Figure 4.A1.2 in Annex 4.A1). Mexico is more like a unitary country in terms of revenues even if it is closer to a federal type model in terms of expenditures (Cabrero, 2008).

Figure 4.1. Sub-national shares of revenues and expenditures

as a percent of total general government, 2003 or 2004[1]

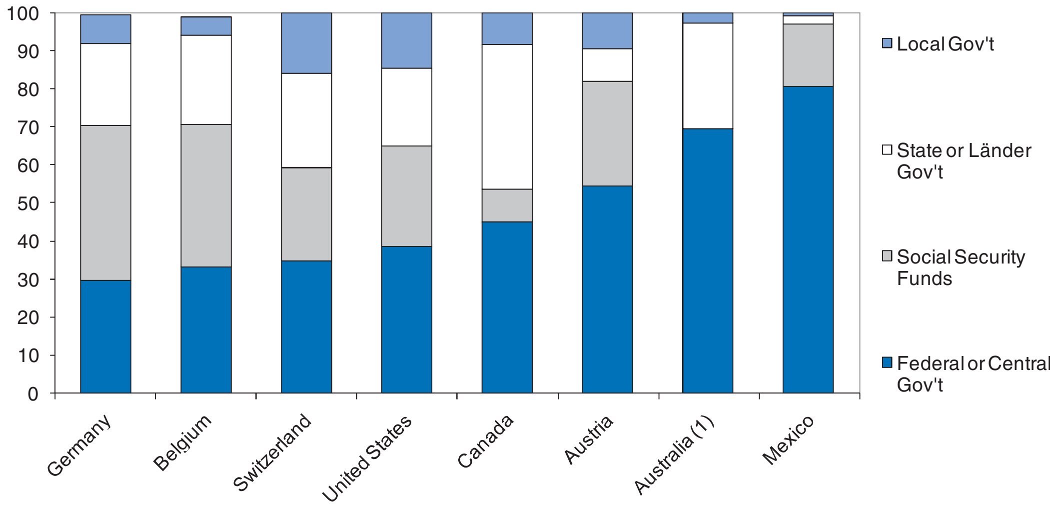


Notes: i) 2002 for Mexico. *ii*) Revenues include direct and indirect taxes as well as non-tax revenues received by regional and local governments. Transfers between government levels are netted out. *iii*) The two data points for Australia show : 1) the goods and services tax (GST) is considered a grant, and 2) GST is considered a state tax. *iv*) For Norway, data excludes revenues from oil production.

Source: OECD (2006), *OECD Economic Surveys: Australia Volume 2006/12*, OECD Publishing, Paris based on OECD, Annual National Accouts database, March 2006; Statistics Norway; Statistics Canada; Bureau of Economic Analysis; ABS (2006), Government Finance Statistics (cat. No. 5512.0).

Figure 4.2. Tax revenue by level of government

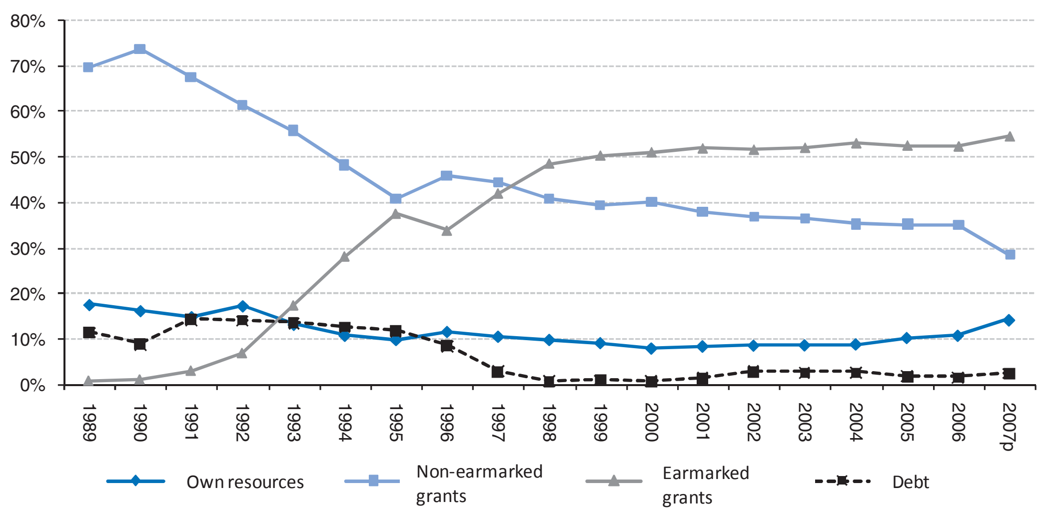
2004



Note: 1) VAT is collected by the federal government and all receipts are appropriated to states and territories.

Source: OECD (2006), Revenue Statistics.

Figure 4.3. State revenue sources, 1989-2007



Source: Cabrero (2008) "*La trampa del federalismo fiscal*" *Nexos* Volume 371, November 2008 based on data from INEGI, *El ingreso y gasto público en México* (2000-2007).

Box 4.2. **Linking taxpayers with services provided: the state payroll tax**

One of the few taxes collected at the state level is the 2% tax on payroll. While this fiscal instrument may be used for different purposes, a high percentage of states have eliminated it as an incentive to attract investments. While firms indeed may benefit from not paying such a tax, there have been other interesting approaches for using resources derived from its collection at the state level. Different approaches to alternate uses of the tax (besides exemption or pure elimination) may be identified, but they all revolve around the simple economic rationale of linking taxpayers with the goods and services provided (that would otherwise not be provided or funded individually) with levied resources, in this case by allowing the taxpayer to help decide the use of such resources.

Several examples can be identified across the country. One is the state of Aguascalientes which has constituted a council composed of members of the private sector to address specific needs or problems through projects funded by collected resources from the payroll tax, and consequently enhance the state's competitiveness. Chihuahua partially uses resources coming from the aforementioned tax for improvements in education infrastructure, HEIs and other social projects. In the case of Puebla, the state Council for Industrial, Commercial and Service Development (with members of the private sector, government and different chambers and industry associations) periodically analyzes problems affecting economic development of the region. The Council then holds the responsibility of deciding the use of resources of a fund constituted from payroll tax revenues in projects deemed as necessary for strengthening economic performance, hence making the use of public money more transparent. Zacatecas is another example where a trust fund has been constituted with the 2% payroll tax and its use decided by a committee of the state's industry chambers and government to support priorities for economic development.

Source: OECD based on information obtained during state site visits.

In addition to the challenge of strong centralisation of resources, the overall level of government expenditure is low, preventing sufficient investment in areas to sustain regional competitiveness. In Mexico, that public expenditure is approx 20% of GDP. This is much lower than can be found in other OECD countries. In addition to moderate to low tax rates, there is a low tax base and a relative lower rate of tax collection. Another challenge for Mexican public finance generally is the high dependence on oil-related revenues.

Finally, the current system does not promote effective regional development efforts. Despite clearly positive reforms in 1998 by the Fiscal Co-ordination law, the fiscal arrangements do not address inefficiencies in the design nor regional inequalities. The system of financial arrangements does not sufficiently incite sub-national tax effort, distribute macroeconomic risks, or ensure efficient and equitable public service delivery (Diaz-Cayeros, 2006; World Bank, 2006). Recent OECD analysis has pointed out:

- A substantial imbalance between sub-national governments' spending and financing autonomy;
- Sub-optimal spending due to overlapping responsibilities between jurisdictions and the design of earmarked grants;
- Few political incentives for states and municipalities to raise their own revenue;
- Little information on the use of financial resources by sub-national governments; and

- A lack of auditing co-ordination between the national and sub-national governments, and a limited role of sub-national auditing bodies (Jourmad, 2005).

The level of regional and region-type inequality across Mexico is the highest (or among the highest depending on the indicator) within the OECD, which has important implications for fiscal policy. In support of regional economic development, many countries put forth equity concerns as a need for some mechanisms for fiscal allocations that seek to reduce disparities for people or places. Such equalisation type measures are not intended to support the conditions for growth per se that corresponds with the new paradigm in regional development policy to support competitiveness. However, there are economic rationales for Mexico to consider in its support of policy streams most relevant for regional economic development that, by reducing disparities, can support efficiency. Such rationales include: increasing returns of adoption, decreasing returns of investment, and the dynamic perspective (see Box 4.3).

Box 4.3. **Is there always an efficiency *versus* equity trade-off?**

Redistributive approaches for equity purposes aim at reducing (financial) disparities among people and places when sub-national authorities are responsible for basic public services. Selective approaches for efficiency and competitiveness purposes aim at growth in some places (based on the acknowledgment of agglomeration effects) that are expected to have some spillovers to other parts of the country. A first glance would thus consider policies for efficiency as contradictory from equity ones. However in practice, there are several economic rationale for reconsidering this presumed trade-off.

Increasing returns of adoption: There are positive externalities associated with growing number of users in many aspects of the knowledge economy. It is quite evident for network technologies. It is also the case with education, for example, since the larger number of diploma holders (regardless of where they study) the better the national ability to adopt innovation. Thus equity in public spending can create efficiency in this case.

Decreasing returns of investment: An excessive concentration in the allocation of public spending will meet limits in its ability to produce additional results. For example, health policy in the US results in 15% of the GDP being spent on only 60% of the population. An additional USD on the same people will not improve the output of the policy, such as average life expectancy, which show poor results in the US comparatively. The same argument is true for higher education in France. There is a strong concentration of resources to a very limited number of students in the *grandes écoles* relative to the vast majority of university students, contributing to sub-optimal results.

Dynamic perspective: Efficiency/competitiveness of some regional economies at time (t) might create wealth that could be redistributed at time (t+n). Thus, efficiency in public spending (either by limiting the cost of public policy for the same results, or by improving its outcomes) could give an opportunity (resources) for equity. Greater efficiency (in terms of jobs creation, etc.) could also impact the demand for public services (education, health, etc.) and thus the implementation of equity programmes. Some would also consider that this dynamic perspective would support the idea that necessary conditions are requested for a place to be able to add sufficient conditions to be competitive. In that sense equity at time (t) conditions efficiency at time (t+n).

Strategies to capture economic benefits of decentralisation-type mechanisms

The question of decentralisation is a sensitive topic in most countries. While a general discussion of decentralisation is beyond the scope of this review, mechanisms are required to best support the positive benefits of decentralisation-type tools. Regional competitiveness is simply very difficult to support across a large country with national policies that do not sufficiently account for regional inputs or regional differences in economic structure, governance capacity, etc.

There are several arguments for promoting decentralisation, however the effectiveness is highly dependent on country context. Arguments for decentralisation typically put forth one or a combination of the following: *i*) deepened democracy, *ii*) improved administrative efficiency, or *iii*) economic competitiveness (see Box 4.4). There are a large number of empirical studies of both OECD and non-OECD countries that seek to establish a relationship generally between decentralisation and economic performance (see Table 4.5). While the results overall are not uniform, there is a link between the impact on economic competitiveness and the other factors of accountability and administrative efficiency.

A number of OECD and non-OECD countries are increasingly "decentralising" to the regional level to achieve some of these potential benefits. Different forms of decentralisation in stages include deconcentration (national authorities with national budgets in a region), delegation (national level subcontracts with, and supervises, the sub-national level) and devolution (sub-national level acts independently perhaps with some unrestricted national transfers) (Gaulthier and Vaillancourt, 2002). However, efforts to build capacity for certain responsibilities or funding to lower levels of government may not be feasible across the country in a uniform manner.

Box 4.4. **Decentralisation and economic competitiveness**

The literature abounds with arguments for and against decentralisation as a means of promoting economic growth. Economists in favour of decentralisation often assume that decentralisation leads to better resource allocation and a more productive, and possibly smaller, public sector (Oates, 1972, 1999; Shah, 1998; Tiebout, 1956). Their logic is that locally determined policies are better able to take account of local conditions in the provision of public goods, such as infrastructure, health and education. Others assume that decentralisation will produce healthy competition among different levels of government, which in turn will promote lower tax rates and the efficient delivery of public goods and services (Brennan and Buchanan, 1980). Yet others have argued that decentralisation may also deliver incentives for local governments to innovate in the production and supply of public goods and services (Vasquez and McNab, 2003; cited in Thornton, 2007). Note that all of these arguments assume that decentralisation reforms indeed produce both improved accountability of government and administrative efficiency. If decentralisation fails to produce these intermediary outcomes—a possibility highlighted above—the positive link between decentralisation and economic growth disappears.

Economists who are more skeptical about the economic benefits of decentralisation argue that decentralisation poses many difficulties for managing macroeconomic policy, especially when it comes to ensuring fiscal co-ordination, and for implementing stabilisation policies (For example, see Prud'homme (1995) and Tanzi (1996)). More specifically, several studies in this genre question the desirability of transferring the responsibility of revenue and expenditure functions to local levels because it may well be that a tax assigned to local governments could be more efficiently managed centrally—it depends on the nature of the function and the problems that the government seeks to address with the policy. A second worry is that sub-national governments would have an incentive to spend excessively on public consumption rather than public investment, which would lead to suboptimal levels of infrastructure capital formation.

These opposing theoretical predictions from the literature have provoked a great deal of interest in empirical studies on the plausible links between decentralisation and economic performance. Despite the large number of empirical studies conducted over the past two decades, the empirical literature has not significantly reduced the uncertainties associated with decentralisation and its economic impacts. The empirical literature is filled with contradictory results, as illustrated by Table 4.5. Empirical findings about decentralisation effects on economic performance are highly contingent upon four factors: *i*) the countries included in the sample; *ii*) the time period considered; *iii*) how decentralisation and growth variables are measured, and *iv)* the methods used for estimating the effect.

Source: OECD (2009), *OECD Territorial Review: Chile*, OECD Publishing, Paris (forthcoming).

Table 4.5. Empirical results on the effects of decentralisation on economic growth

Effect*	Explanations	Author (year)	Data	Sample
- (nonsign)	Low capacity of local government, local expenditures are not growth-oriented, many counteracting forces	Davoodi and Zou (1998)	1970-1989	World (n=46)
+(nonsign)	Household mobility and spillover effects mediate decentralisation effect.	Crucq and Hemminga (2007)	1978-2002	EU (n=14)
+	When local governments compete citizens win. A better match between local needs and policy responses makes citizens and businesses more productive.	Stansel (2005)	1960-1990	United States (n=314)
-(nonsign) +(nonsign)	Economic impact in cross-national studies loses significance when decentralisation is measured as the sub-national mandate to raise revenue.	Thornton (2007)	1980-2000	OECD (n=19)
+	Fiscal decentralisation decreases the public sector's share in the economy and this stimulates economic growth (significance in effect depends on whether country is unitary or federal and how decentralisation is measured)	Yilmaz (1999)	1971-1990	World (n=46)
+	The effect of fiscal decentralisation is significant when controlling for historical, cultural and institutional variation. Only sub-national studies can control for such factors.	Akai and Sakata (2002)	1992-1996	United States
+	Decentralisation produces more accountability of public sector. Correlation is significant but no regression statistics are available	Hunter and Shah (1998)	1980-1993?	World (n=80)
+	Fiscal decentralisation in China increased efficiency of resource allocation by strengthening local incentives for local problem solving.	Lin and Liu (2000)	1970-1993	China (n=28)
-	Provincial spending failed to deliver fast economic growth because projects financed by the central government are more crucial to growth.	Zhang and Zou (1998)	1980-1992	China (n=30)
-(nonsign) +(nonsign)	The effects of decentralisation are more likely to be detected at the local level rather than in national growth rates.	Woller and Phillips (1998)	1974-1991	World (n=23)
-(nonsign) +(nonsign)	No discernible and consistent effect of fiscal decentralisation on economic growth when controlling for energy, investments, labour, income inequality and inflation.	Xie *et al* (1999)	1949-1991	United States
Curvilinear	Positive effect when decentralisation is increasing from low to medium levels, but negative when increasing from medium to high	Thiessen (2003)	1973-1998	OECD countries
+	The positive effect of decentralisation depends on political freedom (interaction effect)	Iimi (2005)	1997–2001	World (n=51)
-/ +	Lower levels of economic growth in countries where devolution has been driven by the central government; greater growth in cases where regions have been the main drivers (Spain).	Rodrígez-Pose, Tijmstra and Bwire (2007)	1985-2002	Germany, India, Mexico, Spain and the United States
-/ + Regional Disparities	Decentralisation in a context of liberalisation may lead to an increase in interregional disparities, with concentration of economic growth in dynamic regions.	Rodriguez-Pose and Gill (2003)	1980-1998	Mexico, Brazil, India, United States, Spain, China

Note: * Positive or negative correlation between decentralisation and economic growth. "Nonsign" means that the analysis did not find a statistically significant effect of decentralisation.

Source: OECD (2009), *OECD Territorial Review: Chile*, OECD Publishing, Paris (forthcoming).

Tools for national and sub-national responsibility sharing and alignment

Mexico is a federal system where there is no legislative mechanism that requires vertical co-ordination. Therefore, alternative mechanisms are required to inform national policy of both concerns of the states for policy generally as well as the specific needs that might have a differential impact on certain states more than others. The National Conference of Governors (CONAGO), for example, brings together all 32 states and its 26 subsidiary commissions by topic and serves as a platform for expressing state needs. It is has the status of a voluntary civil association. There are also some formal organisations or associations of state level Secretaries in different areas that work together on a systematic basis. The Association of Mexican Economic Development Secretaries (AMSDE) is one example with the aim of exchanging experiences, programmes and actions directed towards promoting economic development in the states (see Box 4.5). With the science and technology law, the National Conference of S&T as well as the network of S&T councils (REDNACECYT) and other entities may provide input to CONACYT.

There are other mechanisms that allow for a bi-directional co-ordination and communication to help strengthen the linkages between levels of government. Many federal ministries or other entities (including the Ministry of Economy and CONACYT) have regional or state level delegations that serve to liaise with sub-national governments and oversee application of federal programmes. Similarly, all states have installed permanent representation bureaus in Mexico City to facilitate co-ordination with the federal level, which can also serve to address state specific issues. There is an administrative unit within the federal Ministry of Finance in charge of co-ordinating with states. Through it, states and the federal government deal with the vast majority of regional level fiscal matters including transfers to sub-national governments.

There are also commissions in both the Chamber of Deputies and the Senate that cover the different ministries or strategic government areas. In this sense, states may communicate needs and demands to the federal government through their representatives in the legislative branch. Of particular relevance is the Chamber of Deputies (responsible of approving the yearly budget) and its Budgeting Commission, the latter of which makes proposals for each year's budget and the former determines ultimately the amount of money going to each state and federal government programme.

There are a range of tools for supporting regional development goals across levels of government, even with specific focus on clusters/ innovation systems. Shared responsibility for the selection and/or funding is a common vehicle for supporting policy coherence. In Mexico, some of the innovation-related programmes launched by the national level are based on a shared selection and financing arrangement, such as with FOMIX trust funds for S&T projects. In Germany, for example, the BioRegio and InnoRegio programmes were national competitions for projects in the *Länder*. The German federal government sees its role as that mainly of a facilitator by organising competitions and selecting regions but playing little active role in managing the programmes, which is either a *Länder* responsibility or assigned directly to NGO consortia or networks. In Sweden, the national government has asked that regional governments adopt regional growth plans that make explicit which areas of regional specialisation are the most important to the region's economic development. Only those projects prioritised by regions are then eligible for some of the national programme funds.

Box 4.5. Association of Mexican Economic Development Secretaries

One mechanism for co-ordination among states to communicate needs with the federal government is the Mexican Association of Economic Development Secretaries (AMSDE for its acronym in Spanish). Established in 1997, AMSDE is not the only formal association grouping state level secretaries, but is one that has been able to bring Secretaries of all 32 states together. Among the main objectives of the association are:

- Being a co-ordinating and working body of Secretaries of Economic Development (or their equivalents) in the different states with the aim of exchanging experiences, programmes and actions directed towards promoting economic development at the state, regional and national levels.
- Being an institution for consulting, mutual support, procedures, joint consultancy, co-ordination, co-operation or information sharing among Secretaries of Economic Development that allows them to be up-to-date with the situation of the economic groups in Mexican regions and the rest of the world.
- Offering mutual and institutional support to solve challenges in the economic sector in some state or region.
- Co-ordinating efforts and programmes with federal, state or municipal authorities that are part of the centralised administration, decentralised organisations, enterprises with state participation or decentralised organisations, participating with them in contracts or agreements.
- Being an institution that represents proposals before the federal government, and in other cases before the legislature and the judiciary, related directly or indirectly with economic development.

AMSDE's current agenda prioritises the following proposals:

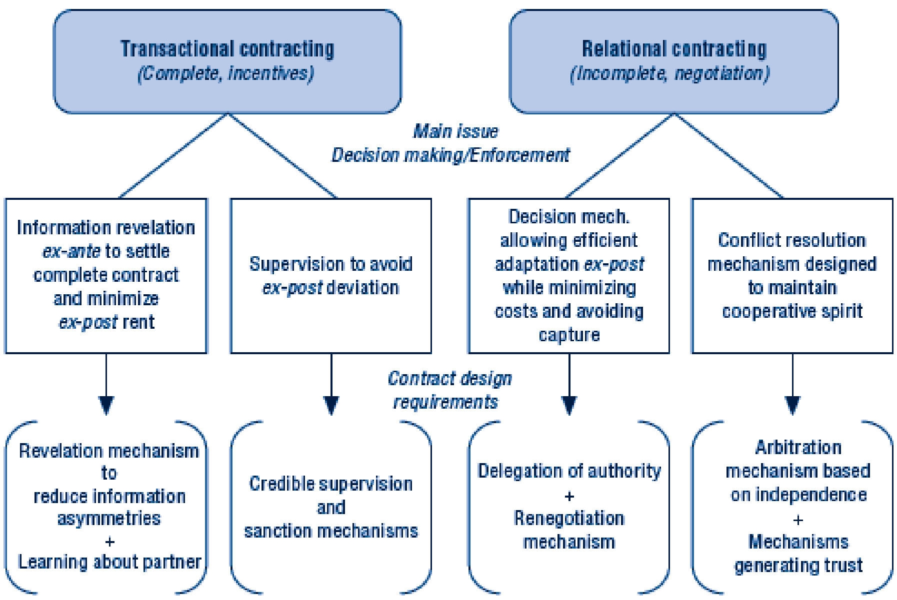
- The decentralisation of programmes and resources of funds aimed at promoting states under the premise that states may have greater knowledge of the demands of the local productive sectors and could make more dynamic SME support.
- The constitution of a National Fund of Promotion for Investment in strategic projects. The fund would be used as a tool to stimulate investments in strategic sectors of states and regions.
- To promote a national level supplier development programme that may allow SMEs to capitalise in specific opportunity areas.
- The creation of a fund to support industrial infrastructure projects in the states, that will be operated by the local entities of economic promotion, under the premise that resources will be used under a revolving loan scheme in order to support a greater number of projects.

Source: AMSDE

Contracts are another commonly used tool in OECD countries for joint action across levels of government. However, when the funds are to be used to improve regional competitiveness through factors such as supporting clusters and regional innovation systems, it is not always clear upfront from the national, or even regional level, what the best solutions are. In some states, the problem may be a need for intermediaries who support technology transfer to artisanal firms. In another state, the main challenge is to take advantage of strong scientific research infrastructure (HEIs, researchers) for economic growth. In yet another kind of state, the very powerful industrial base may not be accessing the needed innovation related resources available in a nearby state. While there are general challenges for supporting clusters and innovation systems, they are going to vary by type of cluster and type of region.

This is why the concept of relational contracting is best applied to regional development generally (see Figure 4.4). The sub-national level has better information about what is needed to support these regional needs. At the same time, the federal government has the resources and needs to ensure that funds are used efficiently and effectively. If the agreement between national and state governments were for a very specific target only, then a more transactional contract is appropriate. However, with regional development being more complex, a broader type contract is not suited to the transactional contract approach.

Figure 4.4. Contracting approaches for regional development



Source: OECD (2007), *Linking Regions and Central Governments: Contracts for Regional Development*, OECD Publishing, Paris.

Relational contracts serve to build capacity and inform both parties. Much of the benefit of the learning is in the nature of the discussion about the needs of the region and how to best support them. Unlike a general call for proposals, whereby the national government evaluates the responses, relational contracting is more interactive. It serves as a vehicle for managing a relationship that involves information sharing over time.

In Mexico, *convenios* serve as a contract between federal and state governments but there are several characteristics that could be improved to match OECD good practices. These arrangements were created prior to the 1998 reforms (reforms that improved public finance transparency) and are used to delegate the delivery of certain federal tasks. The *convenios* have a short timeframe. They are only annual and therefore provide limited long-term visibility for sub-national jurisdictions. The *convenios* are also bi-lateral between individual federal ministries and states. Therefore, they are not able to leverage funds across ministries to fulfil regional development needs nor are they co-ordinated. Finally, the rules concerning their initiation, execution and enforcement are vague[1] (OECD, 2007o). In 2005, *convenios* accounted for 6.3% of decentralised spending.[2]

There are a number of OECD examples that could serve as models for Mexico (see OECD, 2007g). In France, the *Contrats Plan Etat Region* have been used for several cycles (now seven-year cycles) as a framework for joint action to support regional development. The strategy for the contract is not as prominent and comprehensive as a Mexican state development plan but does include core initiatives for development. As the projects to be funded are decided jointly, these contracts go beyond the mere delegation of federal responsibilities and include a bottom-up approach. However, they also serve to support alignment, as different clusters supported by national policy (*systèmes de productifs locaux* and the *pôles de compétitivité*) are included. In Italy, the *Accordi di Programme Quadro* support joint action, sometimes with a time frame for projects up to ten years, that can cover a wide range of regional development issues including enterprise support for innovation and human capital. In Spain, *convenios* are used on both a bilateral and multilateral basis. The fact that such multilateral *convenios* are public ensures a high level of transparency.

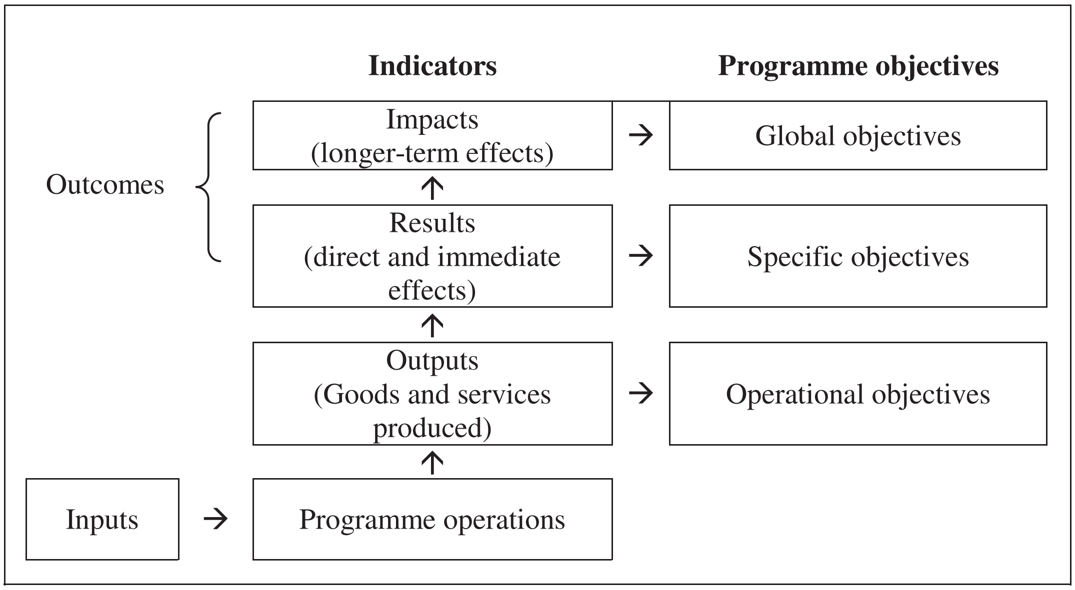
Monitoring performance: transparency, trust-building and programme effectiveness[3]

The effectiveness of contracts and other tools for multi-level governance arrangements to support regional competitiveness depends in part on the appropriateness of the corresponding indicators. In Mexico, there is a clear need to develop greater transparency with regard to use of public funds. The information is necessary to build greater trust between federal and state levels that would allow for increased sub-national participation in national programme goals. Given that the contracting relationships for regional development can be more towards the relationship form, as described above, indicators can be used for co-operation building and not only for monitoring. Experience in several OECD countries with monitoring systems has illustrated the importance of this relationship-building component.

In many programmes in Mexico, those indicators tend to be audit focused. The verification is mainly on whether the funds are spent. For the SME Fund, for example, this audit approach is extended to include proof of registration of new jobs created by the firm receiving support. However, in many programmes, there is no follow-up afterwards to see, for example, what has happened two years later to the firm that participated in a programme, or whether a sponsored research initiative has resulted in any commercial applications.

One helpful way of classifying possible indicators is to consider the different timeframes and their links with different stages of programme objectives. As illustrated in Figure 4.5, this can be broken out into inputs, outputs and outcomes. Using an SME example, an input target might be the capital invested for SME support. A short-term output measure could be the number of entrepreneurs receiving start-up funds. A short-term outcome indicator could be the number of SMEs created and still in business after two years. A medium-term outcome target could be the number of high-value-added jobs in the region. Ultimately, for many of the programmes to support RIS and clusters, the long-term result sought is increasing the GDP per capita for the given region. The Economic Development Administration in the US, for example, has three, six and nine-year outcome targets to take account of the importance of different timeframes for outcomes to appear and be measurable.

Figure 4.5. Linking indicators and programme objectives



Source: OECD (2009), *Governing Regional Development Policy: The Use of Performance Indicators*, OECD Publishing, Paris based on European Commission (1999), "Indicators for Monitoring and Evaluation: An indicative methodology", The New Programming period 2000-2006: Methodological working papers, Working Paper 3, Issued by Directorate-General XVI Regional Policy and Cohesion, Co-ordination and evaluation of operations, pg. 6.

A distinction should be made between monitoring and evaluation. Monitoring involves a system used continuously to track progress, whereas evaluation is more designed for a progress check at specific points in time. While both are of course valuable, monitoring is a critical first step. More sophisticated evaluation methodologies are available for the range of programmes that could support regional innovation systems and clusters.[4]

For regional competitiveness, there are a number of additional challenges to develop such indicator systems. The fact that different levels of government as well as public and private actors are involved makes causality difficult to attribute. There are also a number of direct costs (personnel, technology, data collection) as well as indirect costs (opportunity costs, inefficiency, administrative burden, unintended negative consequences) involved in complex subjects like economic development. There are country examples where the number and nature of indicators resulted in unacceptably high direct and indirect costs, which Mexico could learn from and avoid.

Notes

1. Information on *convenios* from "Annex: Background Notes on Expenditure Decentralization and Poverty Alleviation in Mexico," in *Decentralized Service Delivery for the Poor* (2006). Mexico City: World Bank.

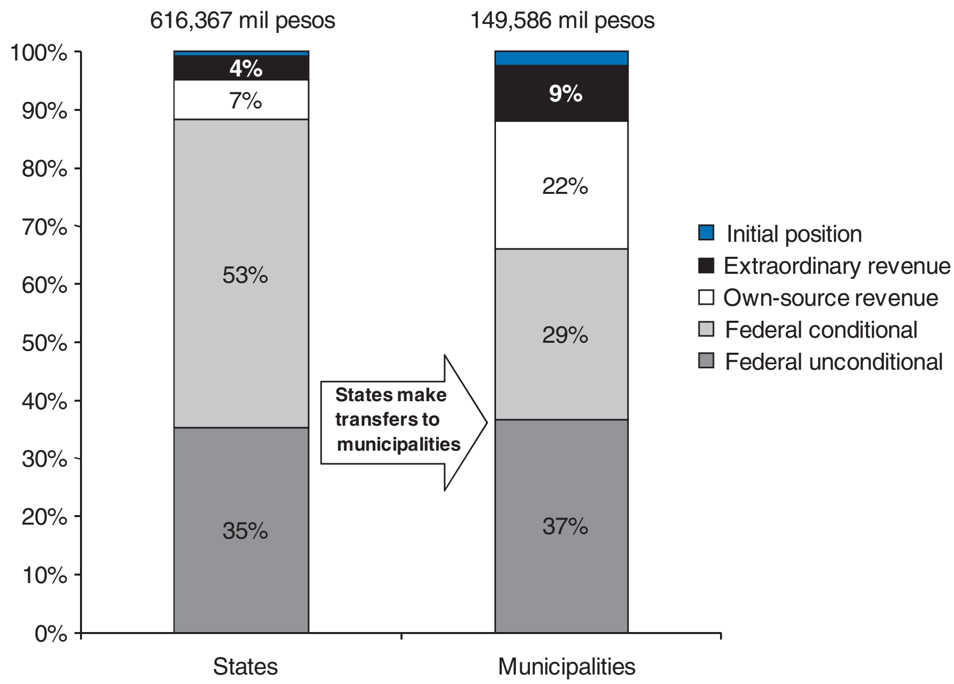
2. "*Gasto federal devengado transferido a los gobiernos locales como proporción del producto interno bruto y de la recaudación federal participable*." *Sexto Informe de Gobierno del C. Presidente Vicente Fox Quesada*, 2006, *Anexo Estadístico*.

3. This section is based on the publication OECD (2009), *Governing Regional Development Policy: The Use of Performance Indicators*.

4. For evaluation suggestions with respect specifically to SME policies, see OECD (2007), *OECD Framework for the Evaluation of SME and Entrepreneurship Policies and Programmes*.

Annex 4A.1

Figure 4.A1.1. Distribution of revenue sources for states and municipalities, 2004

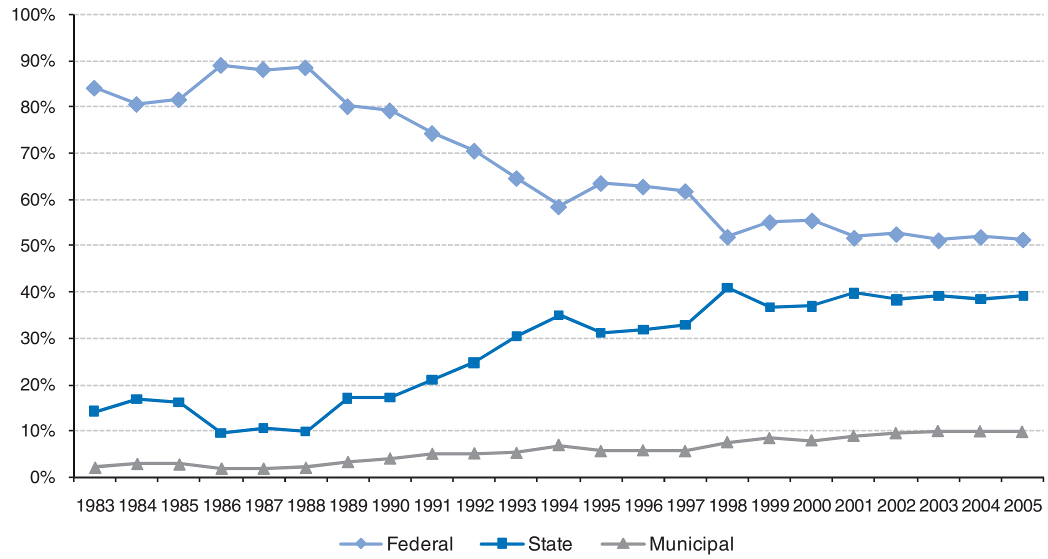


Notes: *i*) Unconditional federal revenue refers to *participaciones federales* and unconditional transfers refer to *aportaciones federales*. Own-source revenue refers to taxes, permits and licenses (*derechos*), products, fees (*aprovechamientos*) and betterment taxes. Extraordinary income refers to other revenue, financing, and third-party sources. *ii*) Excludes the Federal District. Financing of the Federal District is slightly different from the financing of the states.

Sources: OECD (2007), *OECD Territorial Policy Monitoring Review: Mexico* (unpublished) based on INEGI, *Finanzas Públicas Estatales y Municipales de México* 2001-2004, Annex tables 1.2.1, 2.2.1, and 1.3.9; and OECD (2004), *OECD Territorial Reviews: Mexico City.*

Figure 4.A1.2. Public expenditure by level of government

Percent



Notes: The author notes that important differences arise when comparing presented data with that from the Ministry of Finance (SHCP). According to this Ministry, sub-national authorities actually dispose of slightly over 60% of total expenditures; however, this figure is calculated considering only primary expenditures (*i.e.,* subtracting government public debt and social security contributions). The figures presented by the author include the aforementioned expenditure categories to elucidate a complete perspective of the distribution of final total expenditure competencies between levels of government.

Source: Cabrero (2008) "*La trampa del federalismo fiscal*" *Nexos* Volume 371, November 2008 based on data from INEGI, *El ingreso y gasto público en México* (2000-2007).

Part II: State Profiles

Chapter 5

Aguascalientes

Strengths
-Above average GDP per capita and GDP growth rate
-Low levels of marginalisation, more balanced income distribution and good results in terms of human development
-High quality of life
-High quality of education (PISA), relatively high rates of tertiary attainment
-Outstanding regulatory framework, good results in other general competitiveness indices
-High shares of manufacturing in mid-high and high tech sectors
-Ease of co-ordination given small size of state and dominance of main metropolitan region
-Larger share of employment in large firms
-Presence of INEGI

Weaknesses
-Low scientific capacity (relatively low number of scientific articles and SNI researchers)
-High levels of unemployment
-Increasing migration to the US

The state of Aguascalientes is in the Centre-West meso-region in the middle of Mexico with proximity to the large domestic markets in the North and Central regions of the country. It is one of the smallest states both in terms of size and population with approximately 1.1 million inhabitants. Given its high degree of urbanisation (81.2% *versus* a national average of 76.5%), and with 84% of the population concentrated in the metropolitan area of the City of Aguascalientes, it is the fifth most densely populated state. The population is growing at over twice the national rate (at 2.2% annually *versus* 1.0% nationwide). The state has a relatively higher level of education with a greater rate of tertiary educational attainment (18.2% *versus* 16.4% nationally). All this has contributed to the state having good performance on the Human Development Index, ranking eighth out of 32 states, one of the least marginalised populations in the country and the lowest income distribution disparities in the country, as expressed by the Gini coefficient.

While the overall economy is small given the state's size (1.2% of the national economy), its per capita GDP is above average and ninth in the country (USD 10 106 *versus* 8 241). The capital metropolitan area of the City of Aguascalientes concentrates most of the industry in the state, where more than 86% of the state's economic activity is registered. The economy is strongly industrialised with 35.3% in the industrial sector, the fourth highest in the country. It has one of the largest car plants in Mexico, with Nissan-Renault assembling more than 498 000 cars per year for the national, the Central and South American markets. During the last 30 years Aguascalientes developed some *maquiladora* production, mainly in the clothing confection and auto parts sectors, that represented exports of USD 912 million in 2004.

Table 5.1. Socio-economic snapshot: Aguascalientes

	State value	National average or % of national	Rank	Indicator	State value	National average or % of national	Rank
Population (million)	1.1	1.04	28	GDP (USD million)	10 620	1.2	27
Area (sq. km)	5 625	0.29	29	GDP per capita (USD)	10 106	8 241	9
Population density[1]	193.4	97.9	5	GDP yearly growth 1996-2006 (%)[4]	5.5	3.6	1
Population 0-14 (%)	33.6	31.1	4	Primary sector (%)	3.7	5.5	22
Population 15-64 (%)	62.0	63.7	23	Industrial sector (%)	35.3	27.5	4
Population 65+ (%)	4.4	5.3	25	Services sector (%)	61.0	67.1	28
Rural population (%)[2]	18.8	23.5	18	Employment rate (%)	60.6	62.9	26
Population annual growth (2000-2005) (%)	2.2	1.0	5	Unemployment rate (%)	4.9	3.0	31
Yearly migration to the US[3]	25 766	3.8	19	Participation rate (%)	62.8	64.9	27
Population with at most lower secondary education (%)	64.4	66.9	21	Average yearly FDI 1999-2007 (USD million)	102	0.5	18
Population with upper secondary education (%)	17.4	16.7	13	Exporting *maquiladora* industry production (2004 USD million)	912	1.1	10
Population with tertiary education (%)	18.2	16.4	7	Marginalisation index	-0.95	0	28
Households with a PC (%)	25	19	4	Gini coefficient	0.517	0.616	1
Municipalities (number)	11	0.4	27	Human Development Index	0.827	0.803	8

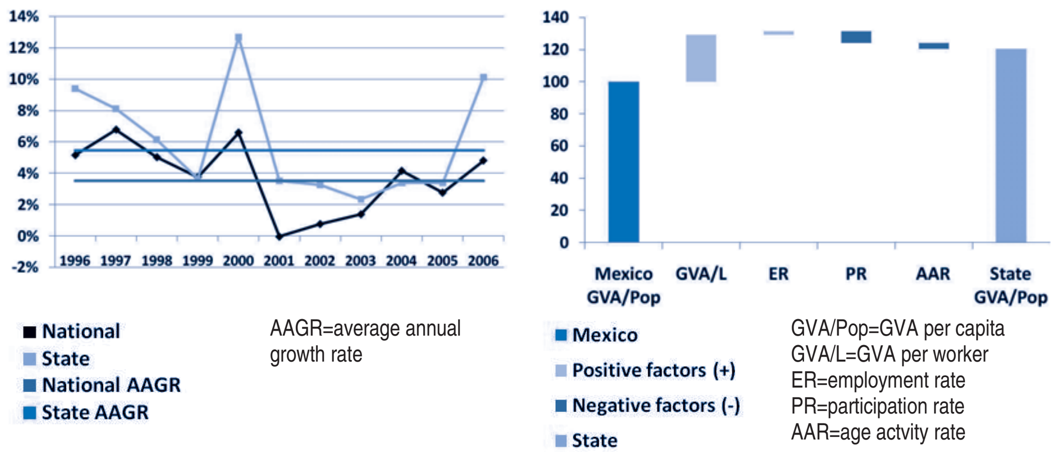
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 5.1. GDP growth and GVA per capita: Aguascalientes

% growth GVA per capita of state *versus* national average



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

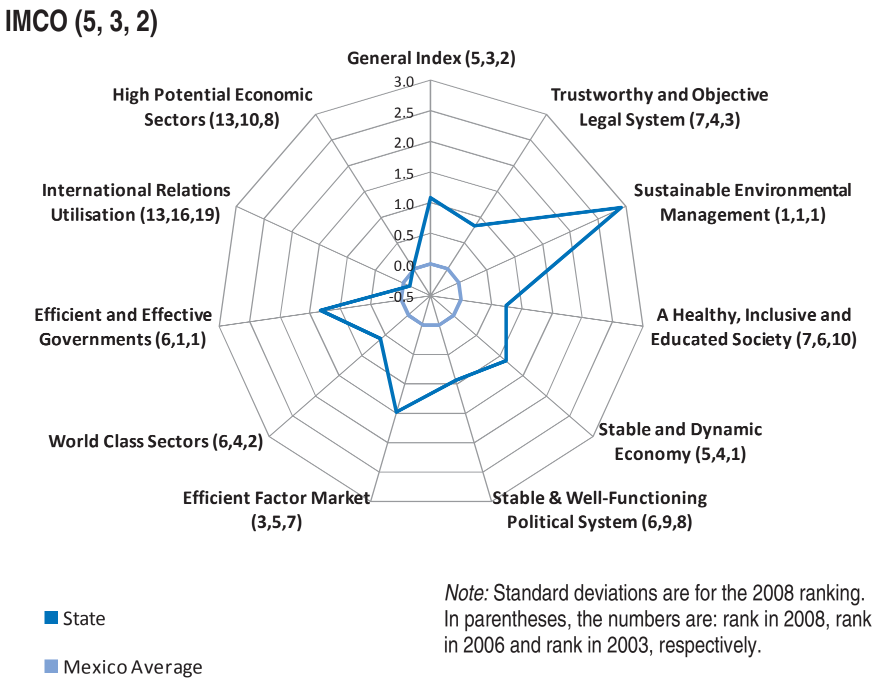
The state is first in the country in terms of GDP growth, at a rate of 5.5% per annum from 1996-2006 *versus* 3.6% for the nation as a whole, based in part on a couple of peak growth years in the period. Moreover, the state's real GDP per head increased significant in that same period. It is important to keep up these growth rates to reach those observed in higher income OECD countries.

Aguascalientes has a GVA per head that is 20.4% higher than the national average. The major contributor to this result is a GVA per worker that is 28.9% above the national average. This is showing that labour productivity is also above average in the state, which could be explained in part by a higher than average capital stock accumulation. Aguascalientes has higher average scores in the quality of education as well as higher levels of schooling years and secondary completion standards, all of which contribute to better human capital and increasing the value added of the workforce. The age activity rate contributes negatively for 3.5%. This is consistent with the larger than average share of the population under 14 and the higher dependency rate. Another factor contributing negatively to the state GVA per head, 7.4% of the national average, is the participation rate, in other words the percent of the working age population that is economically active.

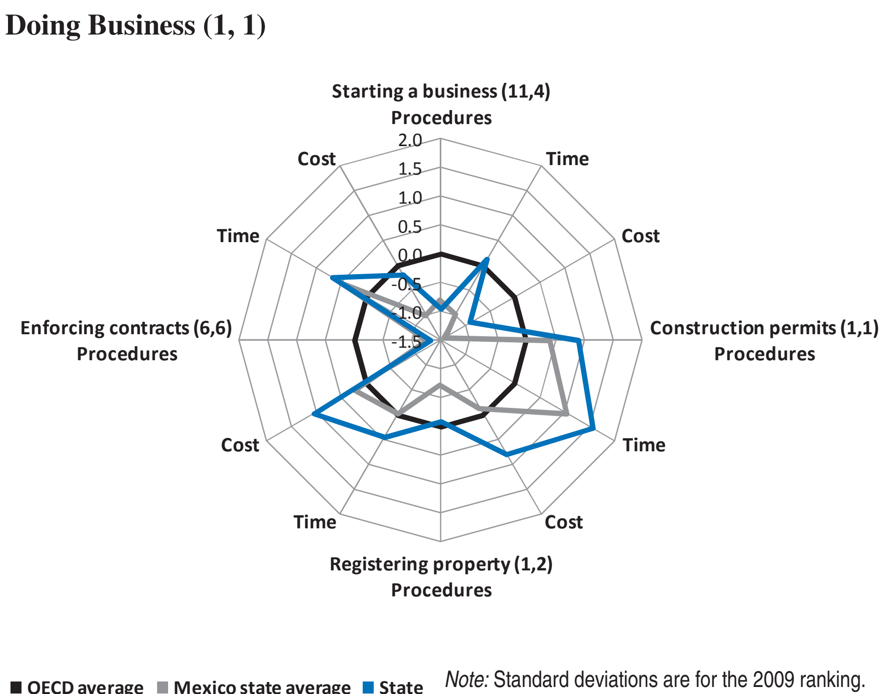
Competitiveness indices

Figure 5.2. Example competitiveness rankings: Aguascalientes

Standard deviations from the mean (0)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

One of the strengths of the state of Aguascalientes is relatively high rankings on several traditional competitiveness indicators. The state has consistently been ranked in the top five according to IMCO's ranking; however it has slipped from second in 2003 to third in 2006 to fifth in the 2008 ranking. Among the ten categories of the index, the state is above the national mean in all categories (often by at least a standard deviation) except International relations utilisation. The state consistently ranks first in the category Sustainable environmental management. In prior years it also ranked first in Efficient and effective government, but in the latest rankings slipped to sixth place. The strong performance on these two indicators is the result of long-term policies such as good government consultation and communication with constituents as well as good management of trash disposal. Categories where the state has shown continued improvements over the last three rankings include: Healthy, inclusive and educated society, International relations utilisation and Efficient factor markets. The City of Aguascalientes itself was the top ranked city by IMCO in the country in 2007. In terms of the Knowledge Economy Index, the state ranked sixth in the country.

Aguascalientes is the top ranked state for Doing Business in both 2007 and 2009. The state scores better than the OECD average in seven out of the 12 factors and better than the Mexico average for ten out of the 12. Recent improvements have occurred in performance for the Starting a business category, moving from position 11 to four among Mexican states. Aguascalientes could further improve on procedures when starting a business and enforcing contracts, as well as the cost of starting a business, where Aguascalientes ranks notably below the OECD average.

In terms of the federal SARE system to facilitate firm registration and development, one of 11 municipalities has a SARE office. Given the large rate of urbanisation, this one municipality covers almost 68% of the state's population. Other municipalities have programmed to establish SARE offices in the coming years.

Competitiveness committees and policies

- The state has constituted the Aguascalientes Institute for Firm Competitiveness which co-ordinates clusters and aims to increase productivity, value added and innovative content.
- The usage of the 2% state payroll tax is decided by a council that integrates members of the private sector to address specific needs or projects to promote and enhance the state's overall competitiveness.

Industrial structure and clusters

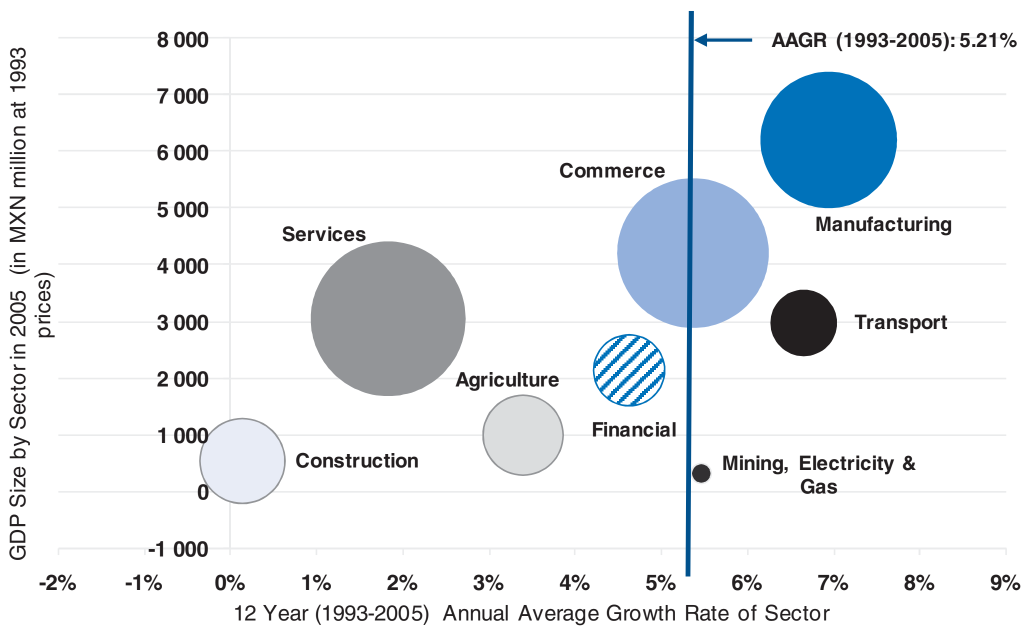
Table 5.2. Sectoral breakout: Aguascalientes

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants & Hotels	Transport Comm. & Storage	Financial Serv., Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	3.9	0.1	28.1	3.4	1.2	20.4	13.1	9.3	20.4
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	5.7	0.3	24.3	4.5	1.1	19.7	12.0	10.9	21.5
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

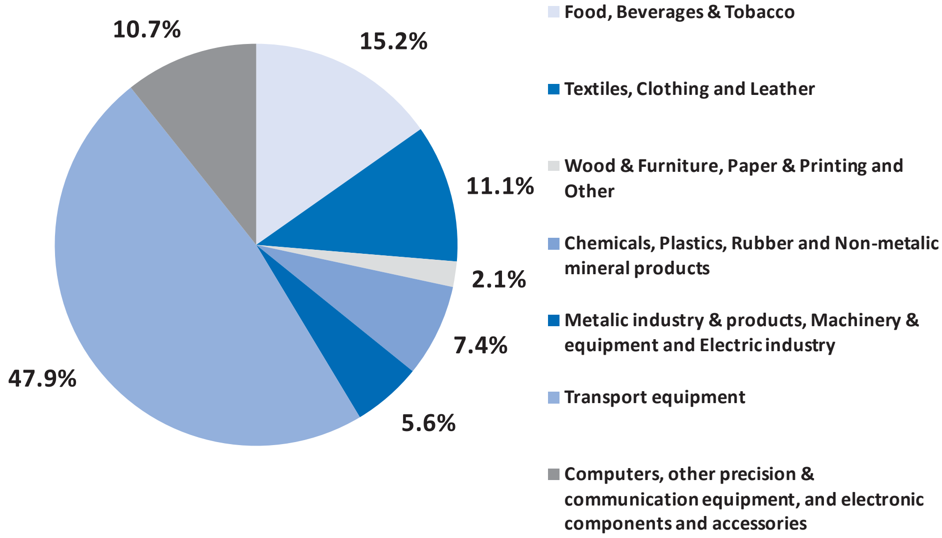
Figure 5.3. GDP by sector size and growth: Aguascalientes



Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

Figure 5.4. Breakout of manufacturing sectors: Aguascalientes



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 5.3. GVA by technology level: Aguascalientes

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	26.6	32.1	11.7	24.7	43.1	31.6	18.6	11.6	1 559
Number of firms	60.8	61.8	36.9	35.3	1.7	2.1	0.5	0.8	3 302
Employment	55.0	44.1	16.9	25.0	20.1	21.5	8.0	9.4	68 217
Total assets	19.6	29.4	13.5	36.8	60.6	29.6	6.3	4.2	2 791
Investment	43.0	30.2	5.8	22.0	48.3	41.1	2.9	6.8	68
FDI (2007)	2.3	9.8	-8.8	40.5	106.5	32.5	0.0	17.2	184

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

The structure of the economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its participation over 32%, representing 5.7% of the state's GDP in 1993 and 3.9% in 2005. Even though Aguascalientes has a higher proportion of its GDP coming from the primary sector as compared to the national average, it also has a larger urban population, likely indicating a higher productivity in agriculture. Although a small state, Aguascalientes is a major producer of guava (100% of national production), dried "ancho" chile (89% of national production), peaches (58%) "nopal" (49%) and a kind of black bean (50%).

Table 5.4. Firm demographics: Aguascalientes

	Employment	% of Employment	% of Employment (National Average)
Total	316 762	100.0	100.0
Micro	158 548	50.1	54.8
Small	70 230	22.2	20.3
Medium	38 977	12.3	13.5
Large	49 007	15.5	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing increased its participation 16% from 1993 to 2005, representing 28.1% of the state's GDP (*versus* 17.9% nationally), positioning the state as the seventh most industrialised in Mexico. While manufacturing grew at an annual average rate of almost 7% during this period, agriculture, forestry and fishing grew at an average annual rate of 3.4% and construction at 0.15%. The largest employer is the communal, social and personal services sector employing 108 563 people, followed closely by commerce, restaurants and hotels with 103 629. Manufacturing employs a total of 85 222 people and represents 21% of the state total employment while agriculture employs 29 919 people, representing only 35% of the total for industry. Manufacturing is the main activity, mainly due to the importance of the automobile and textile sectors. In 1993 it already represented the second largest proportion of the state's GDP with over 19% of the total economy, while in 2005 its relative size grew to over 28.1%. Within the manufacturing sector, four main activities can be identified: transport equipment; food, beverages and tobacco; textiles; and computers and other precision equipment. Almost 48% of Aguascalientes' manufacturing sector comes from the manufacturing of auto parts and car assembly or transport equipment. In addition, 15.25% of manufacturing is from foods, beverages and tobacco; 11.06% from textiles, clothing and leather and another 10.7% from computers and other precision instruments production.

Aguascalientes has a much higher share of its GVA in higher technology sectors than the national average. For example, 61.7% of the economy is in mid-high to high technology sectors *versus* 43.2% for the nation. This is explained in part by the intermediate capital intensive transport equipment manufacturing, where mainly foreign auto parts and car assembly companies are found. A recent and increasingly important niche of manufacturing development comes from the high tech sectors in IT, computers and high value added of textiles. In these areas, Aguascalientes is beginning to stand out. *Maquiladora* plants have also played an increasingly important role, accounting for 14.3% of the state's total exports.

The share of employment by firm size shows a higher representation in large firms relative to the national average, an advantage for technology upgrading and innovation. It has a lower percent of employment in the micro economic units, with 50.1% of employment *versus* the 54.8% national average. Employment in large economic units accounts for 15.4% of employment *versus* 11.45% nationwide.

Strategies and policies to support sectors and clusters

Sectors targeted: Food, Auto, Transport, Commerce, Electric/Electronic, Furniture, Robotics, Commerce, Textile & Clothing, IT

According to different sources, Aguascalientes' industry had the following specific characteristics:

- Aguascalientes possesses 11 industrial parks, cities and corridors (mainly encompassed around the City of Aguascalientes) (Source: Aguascalientes Economic Development Secretary, 2008)
- FDI flows for all sectors in the state between 1999 and September 2008 totalled USD 964.4 million for 0.5% of the national total (Source: Ministry of Economy 2008)

According to the local Economic Development Secretary, the 2007 profile of the auto and auto-parts industry was as follows:

- Assembled 498 000 vehicles (Source: Nissan)
- Employed 21 500 workers (Source: Federación de Trabajadores de Aguascalientes, FTA)
- Represented 14% of the state GDP (Source: Economic Development Secretary based on INEGI and the Ministry of Economy)

Aguascalientes has the third highest scores among Mexican states in the results from the last two PISA (Programme for International Student Assessment) evaluations, with recent improvements in math to second place nationally. However it is still almost two standard deviations below the OECD average in all three areas: reading, science and math. Although federal policies determine much of what can be done in the future to improve education quality, local policies could also promote greater rates of secondary and tertiary attainment.

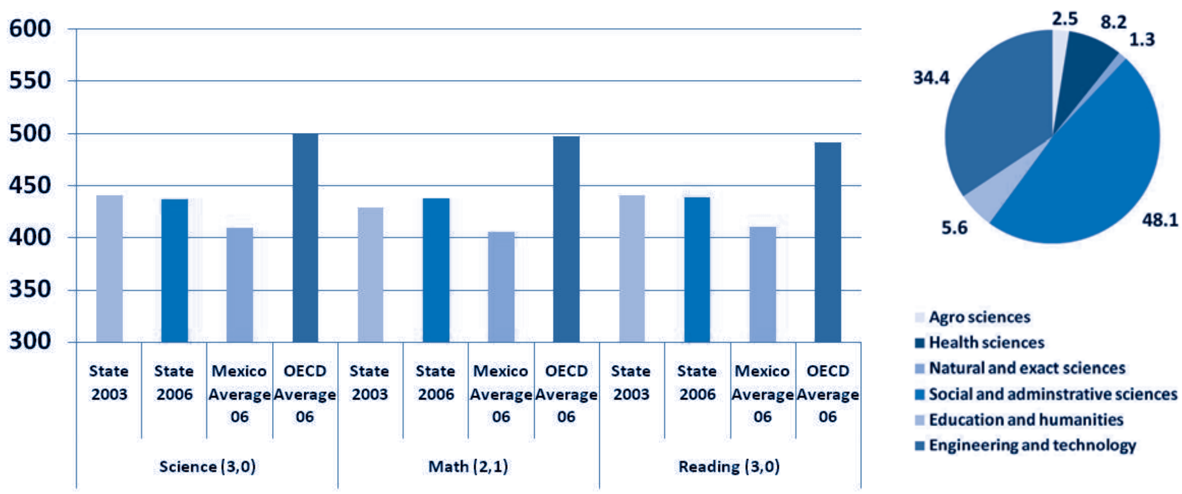
Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies little with respect to what is observed nationally. Approximately 48% are students in social and administrative sciences programmes (*versus* 46.9% nationally). Engineering and technology related programmes account for the second highest enrolment in the state with 34.4% of the total, slightly above the national average. Aguascalientes, like the rest of the country, has a relatively small student population in natural and exact sciences with 1.3%.

Innovation system

Figure 5.5. Education: Aguascalientes

PISA performance

Undergraduate education enrolment



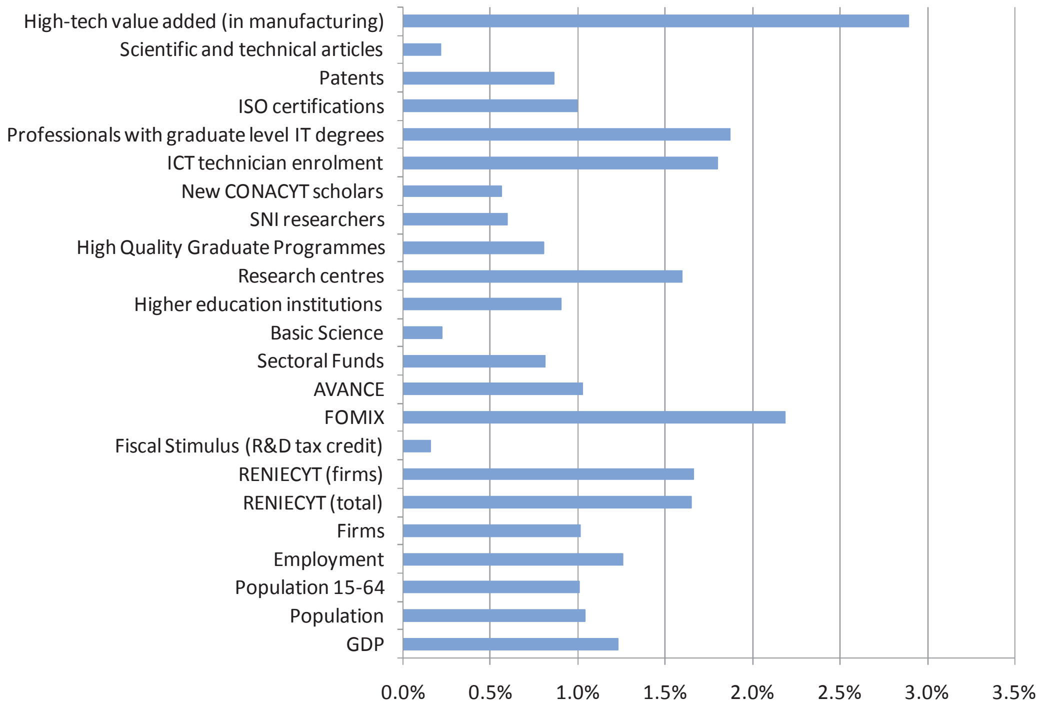
Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

The GDO of Aguascalientes accounts for just over 1.2% of the national total, however the state appears to be stronger with respect to industrial as opposed to scientific capacity. For example, the state has a disproportionately lower share of basic science funds (0.22%), new CONACYT scholars (0.56%), and SNI researchers (0.60%). It has been more successful at capturing joint national-state FOMIX funds (2.18% of the national total) and has a higher share of firms in the national science and technology registry, RENIECYT, than its GDP share. Particularly low is the share of the state in Fiscal Stimulus with only 0.15% of the national total, albeit this programme tends to be concentrated in a limited number of firms in certain industries. There is no national CONACYT research centre in the state, however (according to the ADIAT directory) there are three research centres within Aguascalientes, as well as the national statistical agency INEGI which is a very important asset to the state. Finally, the state exhibits a share of high-tech value added in manufacturing of 2.89%, well above what could be expected given the state's GDP size.

Figure 5.6. Innovation snapshot: Aguascalientes

Percent of national total



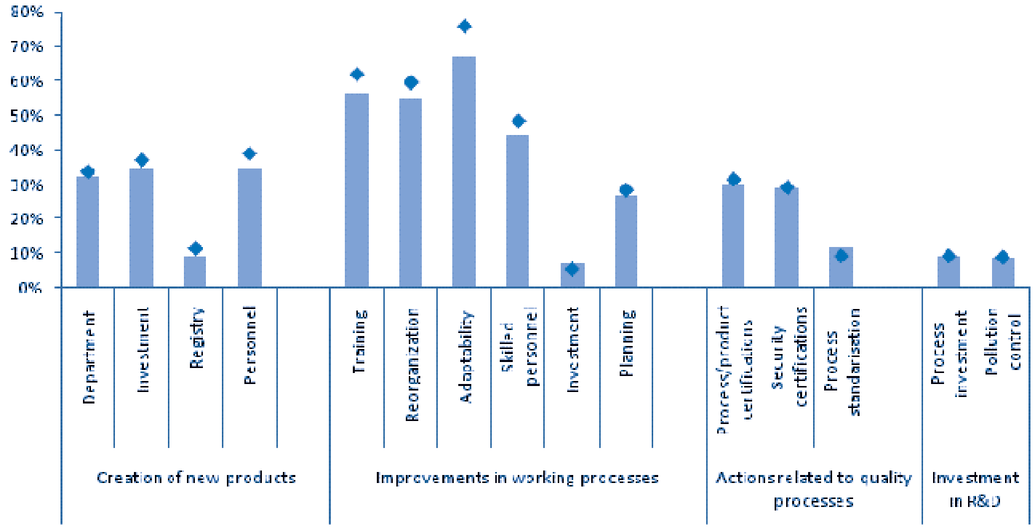
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. ix) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Regarding innovations among manufacturing firms, in Aguascalientes they generally show similar results to the nation as a whole. In terms of the creation of new products, the state ranks relatively higher than the national average, especially in terms of personnel dedicated to this task (39% *versus* 35% nationally). Investments for improvements of the working process are lower than the national average by 2 percentage points. Process certifications and investment in R&D show similar levels to the national average.

Figure 5.7. Innovation by manufacturing firms: Aguascalientes

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

State Science and Technology Council and other major innovation initiatives

- Significant investments in the state's technological park.
- The state provides assistance to firms for registration in the RENIECYT.
- The state has constituted an inter-institutional participation network for R&D and innovation projects with existing institutional funds to integrate firms, government and knowledge generators.

Chapter 6

Chihuahua

Strengths
-Above average GDP per capita and GDP growth rate
-Low marginalisation and inequality
-High productivity and low informality rate
-Very strong industrial sector
-Good quality of education (PISA)
-High specialisation in high and mid-high tech sectors
-Strong exporting *maquiladora* industry
-Significant FDI flows

Weaknesses
-Average in terms of schooling years
-Below average tertiary attainment rate
-Low number of SNI researchers
-Internal security issues

The state of Chihuahua is a Northern border (to the US) state located between the North-East and North-West meso-regions. It is big by Mexico standards, actually the largest state (larger than the United Kingdom) and has a population of just over 3.2 million inhabitants (3.1% of country). The state population is growing slightly faster than the national average (1.2% *versus* 1.0%). In terms of educational attainment, it is slightly ahead of the national average in schooling years and below the national average in terms of the proportion of its population over 15 years that completed secondary schooling.

The state's GDP of USD 37.4 billion is over 4.3% of the national economy (fifth largest). Its GDP per capita of USD 11 626 is significantly above the national average (USD 8 241) and ranks sixth in the country. With a well developed system of large (namely Chihuahua and Ciudad Juarez) and medium sized cities, Chihuahua is one of the most industrialized outward (globally) oriented states in the country. It has the most *maquiladora* plants of the country with exports of USD 24.1 billion (27.8% of the national total) that represent 93% of the state's exports. It is also a major mining state, being the largest producer of lead, the second producer of zinc and gold, the third producer of silver and fourth in terms of copper. All this contributes to the state's socio-economic indicators being ahead of most others in the Human Development Index, ranking fifth out of 32 states, but with a less marginalised population and a slightly better income distribution index than most of Mexico.

Table 6.1. Socio-economic snapshot: Chihuahua

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	3.3	3.1	11	GDP (USD million)	37 423	4.3	5
Area (sq. km)	247 487	12.6	1	GDP per capita (USD)	11 626	8,241	6
Population density[1]	13.3	97.9	30	GDP yearly growth 1996-2006 (%)[4]	4.8	3.6	5
Population 0-14 (%)	30.1	31.1	21	Primary sector (%)	4.5	5.5	18
Population 15-64 (%)	64.7	63.7	11	Industrial sector (%)	27.1	27.5	16
Population 65+ (%)	5.1	5.3	21	Services sector (%)	68.4	67.1	13
Rural population (%)[2]	15.5	23.5	20	Employment rate (%)	62.9	62.9	17
Population annual growth (2000-2005) (%)	1.1	1.0	16	Unemployment rate (%)	2.0	3.0	6
Yearly migration to the US[3]	49 722	2.3	13	Participation rate (%)	64.3	64.9	19
Population with at most lower secondary education (%)	69.1	66.9	13	Average yearly FDI 1999-2007 (USD million)	964	4.8	4
Population with upper secondary education (%)	15.6	16.7	19	Exporting *maquiladora* industry production (2004 USD million)	24 113	27.8	1
Population with tertiary education (%)	15.4	16.4	22	Marginalisation index	-0.68	0	22
Households with a PC (%)	21	19	10	Gini coefficient	0.597	0.616	18
Municipalities (number)	67	2.7	12	Human Development Index	0.834	0.803	5

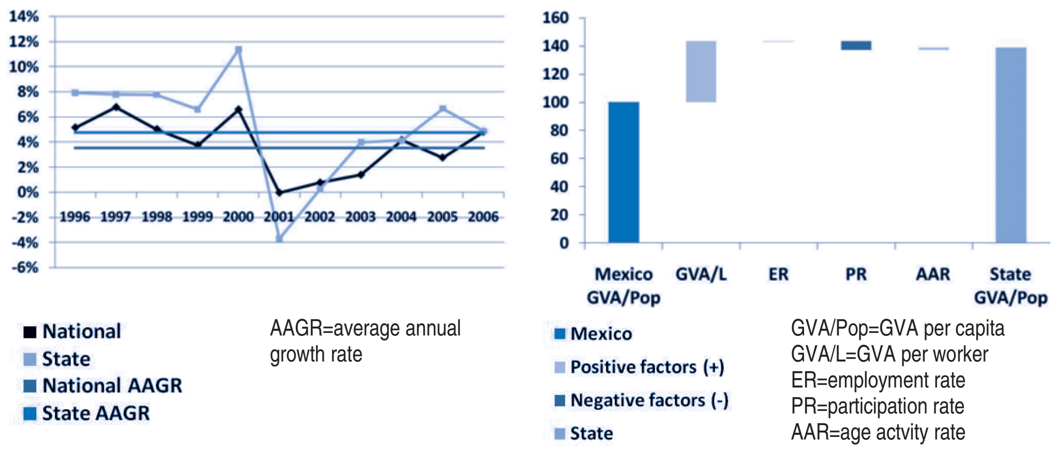
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 6.1. GDP growth and GVA per capita: Chihuahua

% growth | GVA per capita of state *versus* national average



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Chihuahua's GDP experienced a significantly above average growth rate of 4.8% from 1996-2006 (fifth highest in the country). Moreover, Chihuahua's real GDP per head increased significantly more than the national average. Given the state's strong economic ties with the US, its growth rate suffered even more significantly than the national average in 2001 but has recovered to be at or slightly above national growth rates since 2001.

Chihuahua has a GVA per head that is almost 39% higher than the national average. Labour productivity as measured by GVA per worker is 43% above the national average. Chihuahua has higher average scores in the quality of education, contributing to better human capital and increasing the value added of the workforce. The only negative factor to the state's per capita GVA is the lower than national participation rate, in other words, a lower share of the working age population that is economically active.

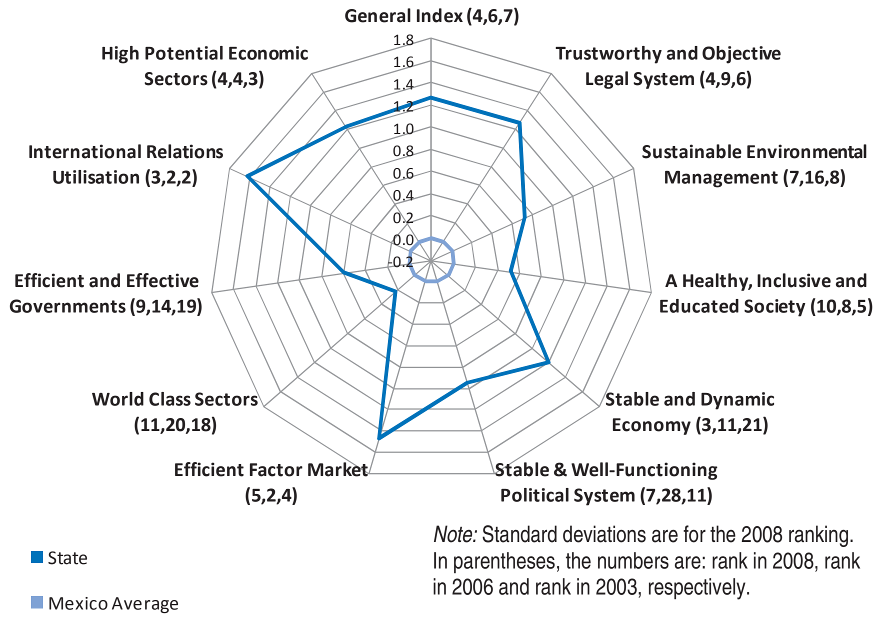
Chihuahua ranks relatively high on traditional competitiveness indicators. The state continues to improve on the overall IMCO ranking, climbing from seventh place in 2003, to sixth place in 2006 and then to fourth place in 2008. The state ranks above the national mean on all factors, and on most by at least one standard deviation. On several factors, the state's relative rank has made notable improvements, such as Stable and dynamic economy (up to three from 21), Efficient and effective governments (up to nine from 19) and Stable world class sectors (up to 11 from 18). The category Healthy, inclusive and educated society has show progressive decline over the last three rankings, with some major fluctuations in the category of Stable and well functioning political system. Two of its most important cities are currently ranked second (Chihuahua) and fourth (Ciudad Juarez) in Mexico. On the Knowledge Economy Index, it ranks somewhat lower at ninth place.

Competitiveness indices

Figure 6.2. Example competitiveness rankings: Chihuahua

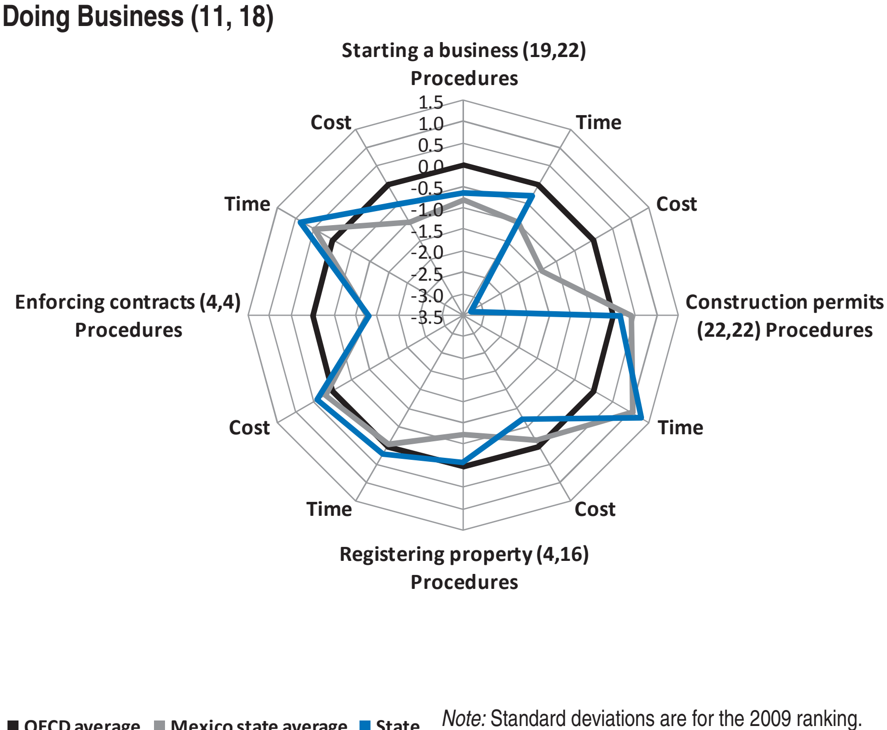
Standard deviations from the mean (0)

IMCO (4, 6, 7)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.

Doing Business (11, 18)



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

In terms of Doing Business, Chihuahua has significantly improved over time, moving up from 18th to 11th place between 2007 and 2009. The state ranks above the OECD average on five out of the 12 factors, and the national average on eight out of 12. Improvement is noted for registering property, as the state as jumped from 16th to fourth place nationally. Performance on the other three categories has remained relatively constant over the last two rankings. The cost of starting a business is an important area for improvement, as the state is far below OECD and Mexico averages.

In terms of the federal SARE system to facilitate firm registration and development, seven of 67 municipalities have a SARE office, covering over 78% of the population.

Competitiveness committees and policies

- The state's main competitiveness initiative Chihuahua towards Competitiveness has a long term perspective (2020) with its fundamental focus being education and innovation.
- Chihuahua has constituted regional and state committees aimed at promoting economic development that include all state level ministries, other government bodies and the private sector (through chambers and associations).
- The Chihuahua Centre for Quality and Competitiveness, a private initiative that receives public support, implements different measures to increase performance in education and among SMEs.

Industrial structure and clusters

Table 6.2. Sectoral breakout: Chihuahua

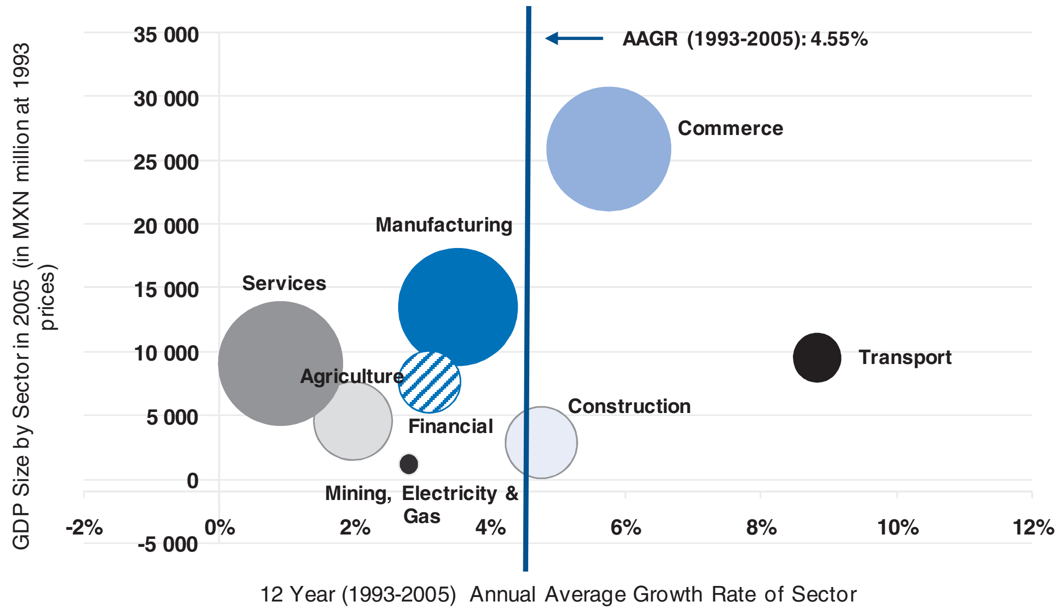
in %

	Agriculture Forestry & Fishing	Mining	Manufacturing	Construction	Electricity Gas & Water	Commerce Restaurants & Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	6.1	0.7	18.2	3.9	0.9	34.9	12.8	10.3	12.2
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	8.0	1.0	19.7	3.6	0.9	29.3	7.7	11.8	18.0
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

The structure of the economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its participation over 23%, representing approximately 8% of Chihuahua's GDP in 1993 and down to 6 % in 2005. Chihuahua has a significantly higher proportion of its GDP coming from the primary sector as compared to the national average. The state has developed extensive agriculture and has become the nation's largest producer of oats (over 93% of national total), cotton (57.8%), yellow corn (51.3%), alfalfa (59.9%), cattle raising pasture grass (46.6%), walnuts (59.3%), apples (70.7%) and jalapeño pepper (44.2%). It is the fourth largest producer of cow's milk, the fifth largest for goat's milk and the sixth largest beef producer in the country.

Figure 6.3. GDP by sector size and growth: Chihuahua



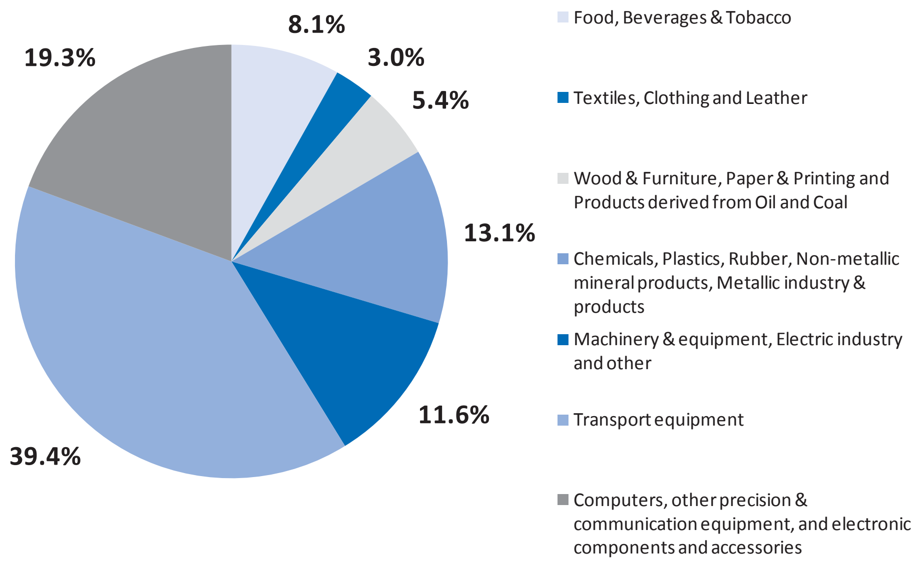
Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

Alongside the *maquiladora* plants, Chihuahua's economy is prosperous as compared to the Mexico average and has been able to receive an important number of migrants from other states of the country, not only as a border (to the US) crossing state, but also as a development pole by itself. Within the tertiary sector, the sector of commerce, restaurants and hotels increased by 29% with transport, communications and storage increasing by almost 35%. In contrast, personal, social and communal services (including government), also in the tertiary sector, reduced its participation to 12.22% in 2005, from 18.04% in 1993.

The sector that had the largest annual average growth was transport, communications and storage with 8.8%, while commerce, restaurants and hotels grew at an annual average of 5.7%. Manufacturing grew at 3.5% during this period, while construction grew at 4.8%. Agriculture, forestry and fishing grew at an average annual rate of almost 2% and financial services, insurance and real estate at 3%. The largest employer is commerce, restaurants and hotels with 326 520 followed closely by communal, social and personal services (including government) with 325 197 employees and manufacturing with total employment of 295 995 people representing 22.3% of the state's total employment. Agriculture employs 132 929, representing less than half the total of manufacturing (and 10% of the state's total employment).

Figure 6.4. Breakout of manufacturing sectors: Chihuahua



Source: INEGI Economic Census 2004 (Censos Económicos 2004).

Table 6.3. GVA by technology level: Chihuahua

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	10.3	32.1	13.7	24.7	53.4	31.6	22.5	11.6	6 451
Number of firms	54.6	61.8	39.3	35.3	4.1	2.1	2.0	0.8	6 779
Employment	13.4	44.1	11.3	25.0	55.3	21.5	20.1	9.4	352 191
Total assets	24.3	29.4	22.7	36.8	39.5	29.6	13.5	4.2	3 498
Investment	24.4	30.2	25.0	22.0	31.1	41.1	19.5	6.8	118
FDI (2007)	7.8	9.8	12.1	40.5	49.6	32.5	30.5	17.2	1 092

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 6.4. Firm demographics: Chihuahua

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	1 071 125	100.0	100.0
Micro	463 616	43.4	54.8
Small	210 924	19.7	20.3
Medium	138 970	13.0	13.5
Large	257 615	24.1	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing represented 18% of the state's GDP in 2005. The auto parts and transport equipment industries account for 39.4% of manufacturing, while computers and other precision equipment represent the second largest with 19.3% of manufacturing. According to the Industrial Development Secretary, in 2006, the state had 35 parks, cities and industrial corridors, and *maquiladora* plants that accounted for 93% of the state's exports. In 2003, *maquiladora* plants generated 62.7% of all the manufacturing sector income. The state is especially strong in *maquila* production and exports for transport equipment (representing 87.4% of this sector's income); machinery and equipment and other industries (81.6% of its total), where electrical equipment has the most significant share. In addition, *maquila* production in textiles, clothing and leather products industries account for 66.4% of the sector's income and for computers and other precision equipment 52.9%.

Chihuahua's GVA is particularly concentrated in intermediate-high and high technology sectors. They account for almost 76% of GVA, *versus* a national share of 43%. Consequently, GVA in low and medium-low tech sectors is only 24% of GVA, *versus* a national share of over 56%. At 21.05% employment in lower tech sectors is much lower than the national averages of 60.71%, representing only 34.67% of this national average. It is nevertheless important to increase the number and quality of domestic suppliers that will in turn increase the regional value added of the *maquiladora* sector permanently. This, of course, requires further analyses and should be done with close contact with regional universities and other technology fostering institutions such as CONACYT.

In terms of firm demographics, the state has a larger share of large firms and a smaller share of micro firms. The state has over 24% of employment in large economic units, *versus* a national share of 11.5%. In turn, micro economic units accounted for 43%, *versus* almost 55% nationwide.

Strategies and policies to support sectors and clusters

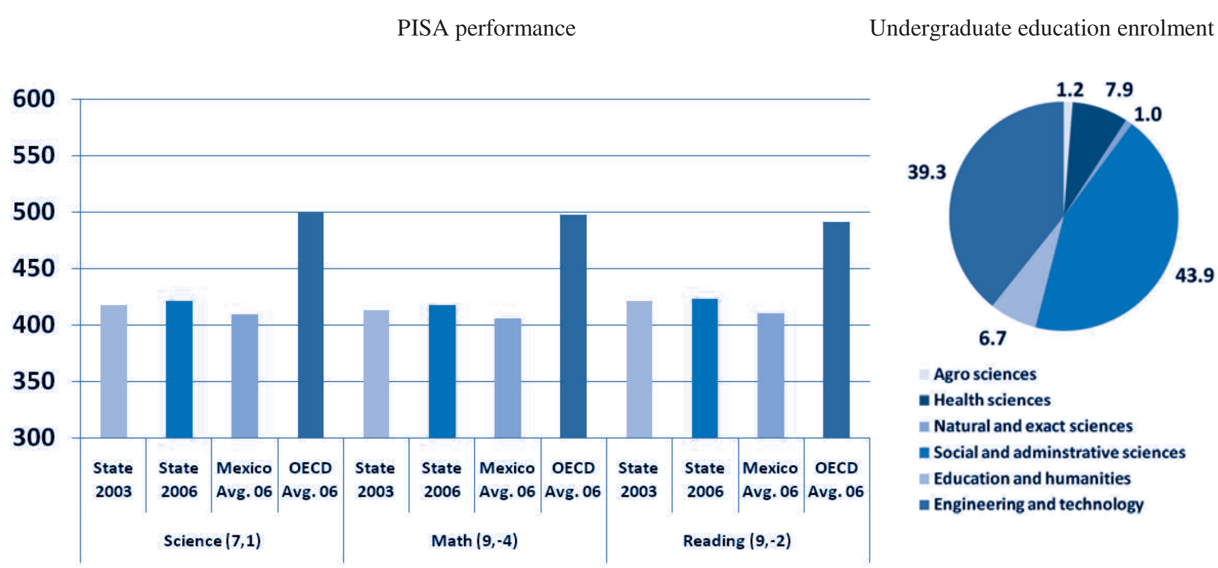
Sectors targeted: Electronics, Aeronautics, *Maquila*, Nanotech, Auto, ICT/Software, Agro and Food Industry, Mining and Building Materials, Wood and Furniture (Source: Chihuahua Competitiveness Committee)

According to different sources, Chihuahua’s industry (including mining) had the following characteristics:

- Metallic minerals: first producer of lead, second producer of zinc and gold, third producer of silver and fourth in terms of copper (Source: Industrial Development Secretary 2008)
- Non-metallic minerals: fourth national producer of barite (Source: CONACYT 2006)
- Has 35 industrial parks, cities and corridors (Source: Industrial Development Secretary 2008)
- Possesses 425 maquiladora plants, 12.47% of the national total (Source: CONACYT 2006)
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 9.518 billion for 4.5% of the national total (Source: Ministry of Economy 2008)

Innovation system

Figure 6.5. Education: Chihuahua



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Even though Chihuahua has the eighth highest scores among Mexican states in the results from the last two PISA evaluations, it is still behind by more than 2.5 standard deviations from the OECD average in two areas: science and math, and just under 2.5 standard deviations in reading. Compared to the Mexico average, Chihuahua did not improve its scores in the 2006 PISA evaluation from those observed in the 2003 evaluation, advancing one place only in science but turning back two places in reading and four places in math.

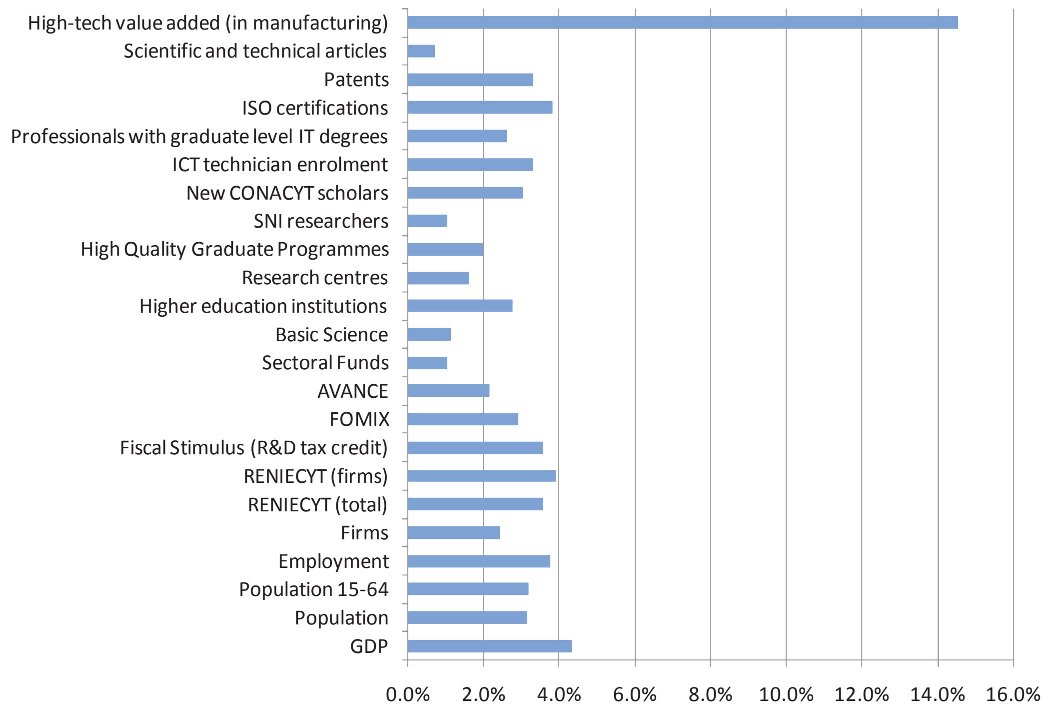
Current enrolment for undergraduate degrees (in universities and technological institutes) varies little with respect to what is observed nationally. The state does have a somewhat lower share of students in social and administrative sciences programmes relative to the national average (43.9% *versus* 46.9%), whereas engineering and technology related programmes account for the second highest enrolment in the state with 39.3% of the total, significantly above the Mexico average of 33.4% and showing the current vocation of Chihuahua with engineering related industrial sectors. Enrolment in sciences is below national averages for health (7.9% *versus* 9.4% nationally) and natural and exact sciences (1.0% *versus* 1.9% nationally). To achieve the state's goals in terms of higher technology sectors, increases in science enrolment may be required.

While Chihuahua's GDP accounts for over 4.3% of the national total, in an innovation context, Chihuahua ranks lower than expected (as compared to its relative GDP importance). The state appears stronger in industrial than scientific capacity. This may be the sign that many of its economic sectors, especially *maquiladora* industry and auto parts industry, are more dependent on global technology and market trends, leaving less room for domestic participants to innovate. There are opportunities for greater spillovers from FDI in the state. Particularly high is the state's ISO certifications, with 3.8% of the national total, as an instrument to improve the quality of production processes. Also high is the use by state firms of the R&D tax incentive (Fiscal Stimulus) at 3.6% of the total, but this is concentrated within a few firms—as is the trend nationally. One exception in terms of innovation indicators is patents (although lower than the state's national share of GDP) which account for almost 3.3% of overall patents in the country. Particularly low are most issues related to product innovation or creation, such as, basic science funds (1.11%), SNI researchers (1.03%), and AVANCE programme and Sectoral Funds (2.13% and 1.03%). While the state has been very active in the development of new industrial parks and corridors, innovation related infrastructure is now gaining more importance. The state has one CONACYT research centre headquarters and recently attracted CONACYT's Research Centre in Advanced Materials (CIMAV), the first national lab for nanotechnology. One private example of an important innovation resource for research in the state is the Delphi design centre. Chihuahua's long-standing industrial tradition in combination with a recent shift towards more innovation oriented practices has resulted in the state having a disproportionately large share of the country's high-tech value added in manufacturing at more than 14% of the national total.

Regarding innovations among manufacturing firms, Chihuahua's firms generally show better results than the nation as a whole. In terms of the creation of new products, the state ranks relatively higher than the national average, especially in terms of investment (41% *versus* 34% nationally). Investments on improvements of the working process are also higher than the national average by three percentage points. Process certifications are much better ranked than the nation as a whole, and investment in R&D shows a similar, but lower, level as compared to the national average.

Figure 6.6. Innovation snapshot: Chihuahua

Percent of national total

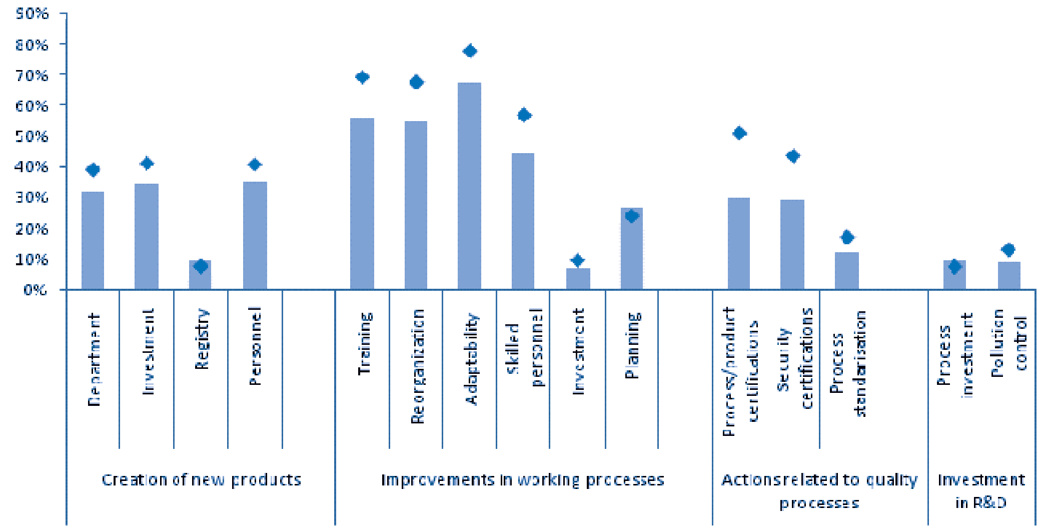


Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-05. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Figure 6.7. Innovation by manufacturing firms: Chihuahua

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

State Science and Technology Council and other major innovation initiatives

- The state has developed a programme for supporting applied research and technological development (PIADET for its Spanish acronym) that complements FOMIX but is aimed at smaller firms.
- CENALTEC, the state's high technology training provider, offers programmes developed in co-ordination with existing industries having specialisations in high technology sectors.
- The state is developing an aerospace park to include Original Equipment Manufacturers (OEM) and an important supplier base.
- The state's S&T council is under development and is expected to be fully functional in 2009.

Chapter 7

Coahuila

Strengths
-Very low marginalisation
-Above average GDP per capita
-Low poverty and inequality
-High productivity
-High average schooling, tertiary attainment and outstanding recent improvements in education quality (PISA)
-Good overall competitiveness index results
-Relatively high patenting activity for Mexico

Weaknesses
-High levels of unemployment
-Below average in S&T expenditure (from national programmes)
-Average number of SNI researchers

The state of Coahuila, located on the US border in the North-East meso-region, is the third largest state in terms of surface area. But with only 2.5 million inhabitants, it is the16th state in terms of population and one of the least densely populated. The state has a much lower share of its population in rural areas, only 10% in cities with under 2 500 inhabitants *versus* 23.5% nationally. The state population is growing somewhat above the national average at 1.5% *versus* 1.0% nationwide. The state also has a very small indigenous ethnic population. In terms of educational attainment, it is ahead the national averages with 19% having a tertiary education (fifth ranked).

Although bordering the US, the state has a relatively lower share of migration to the US. The state's GDP of USD 29.1 million is 3.4% of the national economy (tenth largest). The GDP per capita is significantly higher than the national average (fifth ranked) at USD 11 730 *versus* a national average of 8 241. With a well developed system of medium-sized cities, Coahuila is one of the most industrialised states in the country. It is the major producer of coke, and second in terms of iron, fluorite and barite. It also has 7.6% of the *maquiladora* plants of the country with exports of USD 5.5 billion (6.4% of the national total). The state has a higher than average rating on the Human Development Index (fourth place) and a better income distribution than most of Mexico.

Table 7.1. Socio-economic snapshot: Coahuila

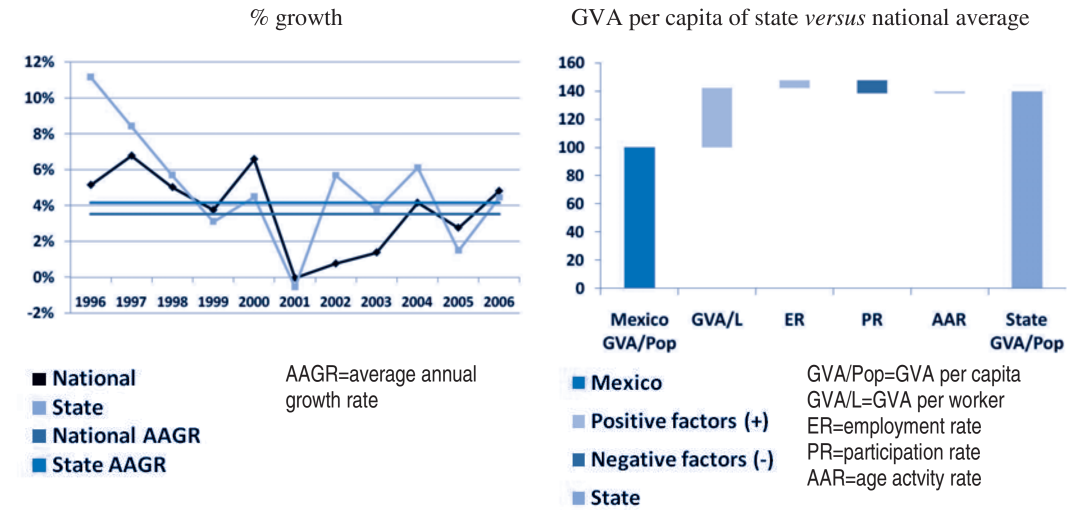
Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	2.5	2.4	16	GDP (USD million)	29 143	3.4	10
Area (sq. km)	151 445	7.7	3	GDP per capita (USD)	11 730	8 241	5
Population density[1]	16.8	97.9	27	GDP yearly growth 1996-2006 (%)[4]	4.2	3.6	13
Population 0-14 (%)	30.6	31.1	18	Primary sector (%)	3.2	5.5	25
Population 15-64 (%)	64.4	63.7	13	Industrial sector (%)	42.6	27.5	2
Population 65+ (%)	4.9	5.3	23	Services sector (%)	54.2	67.1	31
Rural population (%)[2]	10.0	23.5	29	Employment rate (%)	61.2	62.9	24
Population annual growth (2000-2005) (%)	1.5	1.0	12	Unemployment rate (%)	4.5	3.0	30
Yearly migration to the US[3]	21 581	1.3	23	Participation rate (%)	64.7	64.9	16
Population with at most lower secondary education (%)	62.6	66.9	28	Average yearly FDI 1999-2007 (USD million)	201	1.0	11
Population with upper secondary education (%)	18.4	16.7	11	Exporting *maquiladora* industry production (2004 USD million)	5538	6.4	6
Population with tertiary education (%)	19.0	16.4	5	Marginalisation index	-1.14	0	29
Households with a PC (%)	21	19	11	Gini coefficient	0.562	0.616	8
Municipalities (number)	38	1.5	20	Human Development Index	0.836	0.803	4

Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 7.1. GDP growth and GVA per capita: Coahuila



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Coahuila's GDP had an average growth rate of 4.2% from 1996 to 2006, above the national average of 3.6%. While in the late 1990s the growth rate was above national averages, from 1999-2001 it was below the national average but quickly recovered since 2001. In 2005 and 2006, the state's growth rate was slightly below the national average.

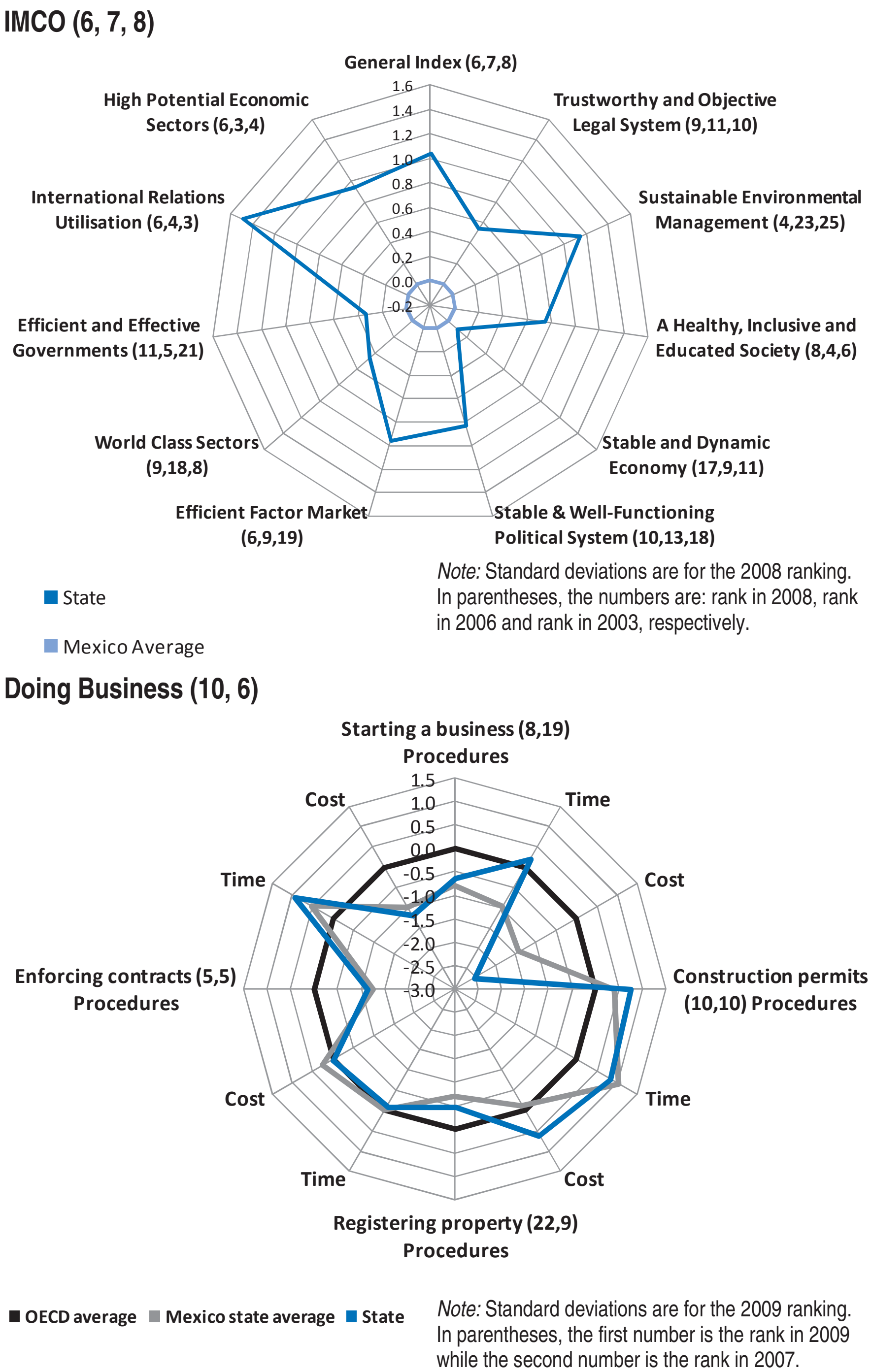
Coahuila's GVA per head is almost 40% higher than the national average. Clearly, the major contributor to this result is GDP per worker that is 42% above the national average. Coahuila's higher than average scores in the quality and level of education contribute to better human capital and increasing the value added of the workforce. The only negative factor to the state's per capita GVA is the participation rate, in other words a lower share of the working age population that is economically active.

Coahuila ranks relatively high on several traditional competitiveness indicators. On the most recent overall IMCO ranking, the state is sixth, improving progressively from seventh in 2006 and eighth in 2003. The state is more than one standard deviation above the overall Mexico average. Categories with the most significant improvement include Sustainable environmental management (up to four from 25) and efficient factor markets (up to six from 19). Other areas of strength for the state include International relations utilisation and High potential economic sectors, both in sixth place. IMCO ranked several of the state's cities much lower than the state overall, including La Laguna (13), Piedras Negras (38) and Saltillo (41). In terms of the Knowledge Economy Index, the state is ranked around the same order as its IMCO ranking, seventh in the country.

Competitiveness indices

Figure 7.2. Example competitiveness rankings: Coahuila

Standard deviations from the mean (0)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.

Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

On the Doing Business rankings, Coahuila performs well but has slipped from sixth to tenth place. The state's performance is better than the OECD average on six out of 12 factors and better than the national average on seven out of 12. While the national ranking for starting a business has improved from 19th to eighth position, that of registering property has dropped notably from ninth to 22nd place. The cost of starting a business remains significantly below both OECD (2.5 standard deviations below) and national averages.

In terms of the federal SARE system to facilitate firm registration and development, only two of 38 municipalities have one (Saltillo with approximately 650 000 inhabitants and Torreón with approximately 577 000 inhabitants). Therefore, only 49% of the state's population is located in a municipality with a SARE office, a smaller share than several other states.

Competitiveness committees and policies

- Coahuila has performed an insightful evaluation of the state's economic conditions and its challenges in terms of competitiveness.
- The state has set a long-term vision (2020) for its economic development strategy and consequently devises strategies with long-term goals.
- The state's Economic Development Ministry supports regional organisations and civil committees that include HEIs and the private sector. Such committees seek to analyse the competitiveness conditions and consequently generate projects to address specific needs.

Industrial structure and clusters

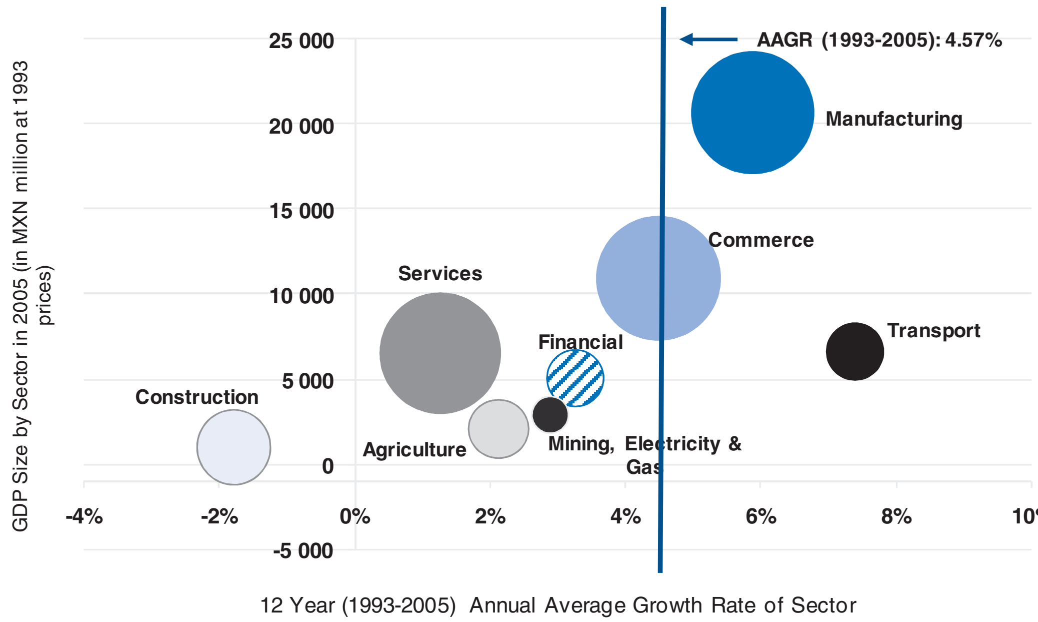
Table 7.2. Sectoral breakout: Coahuila

in %

	Agriculture Forestry& Fishing	Mining	Manufacturing	Construction	Electricity Gas & Water	Commerce Restaurants & Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	3.2	2.7	34.9	2.5	1.5	21.0	8.9	8.0	17.2
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	4.9	3.7	30.9	3.8	2.5	19.1	8.4	10.1	16.6
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

Figure 7.3. GDP by sector size and growth: Coahuila



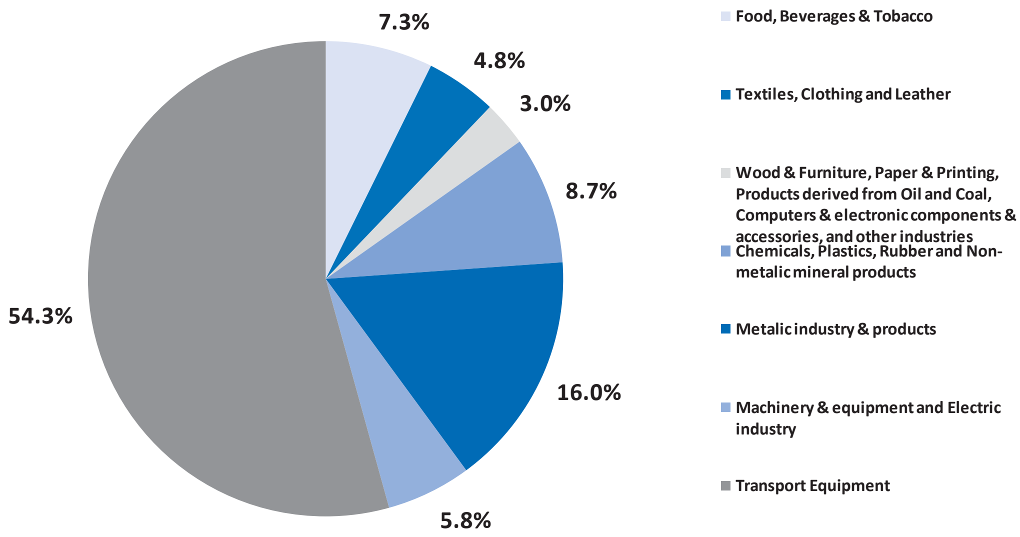
Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The structure of the economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share by a third, representing 4.9% of Coahuila's GDP in 1993 and only 3.2% in 2005. Coahuila has a slightly lower proportion of its GDP coming from the primary sector as compared to the national average. Coahuila has developed agriculture in certain sectors and has become the national major producer of two different kinds of grass for cattle raising (over 86% of national total), sorghum (25.2%), melon (20%), walnut (17.2%) and green oat (15.2%), and is the second largest producer of cow's milk (10.8%) and the largest producer of goat's milk (34.3%). The state has developed its agriculture intensively in specific sectors, where cattle raising is also important.

The sector that had the largest annual average growth was transport, communications and storage with 7.4%, while manufacturing grew at an annual average rate of 5.9% during this period. Also, commerce, restaurants and hotels grew at 4.5%; agriculture, forestry and fishing at an average annual rate of 2.1% and construction shrank by at – 1.79%. The largest employer is commerce, restaurants and hotels with 240 402, followed closely by manufacturing that employs a total of 233 977 people and represents 24.2% of the state total employment, while agriculture employs 53 732 people, representing just over a fifth of the manufacturing sector.

Figure 7.4. Breakout of manufacturing sectors: Coahuila



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 7.3. GVA by technology level: Coahuila

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	25.2	32.1	24.7	24.7	45.3	31.6	4.9	11.6	4 524
Number of firms	48.3	61.8	46.5	35.3	4.2	2.1	0.9	0.8	5 730
Employment	34.4	44.1	19.8	25.0	42.7	21.5	3.1	9.4	213 947
Total assets	14.5	29.4	37.3	36.8	47.1	29.6	1.1	4.2	7 977
Investment	7.0	30.2	9.4	22.0	82.5	41.1	1.1	6.8	543
FDI (2007)	8.1	9.8	27.7	40.5	40.0	32.5	24.2	17.2	178

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 7.4. Firm demographics: Coahuila

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	830 555	100.0	100.0
Micro	345 914	41.7	54.8
Small	162 587	19.6	20.3
Medium	129 290	15.6	13.5
Large	192 764	15.2	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing, that had a significant percentage of the state economy already in 1993, increased its share 12.7% from 1993 to 2005, representing 34.9% of the state's GDP (*versus*17.9% national average). Coahuila is therefore one of the most industrialised states in Mexico. The auto parts and transport equipment industries account for 54.3% of manufacturing, while metallic minerals and products industries represent the second largest share with 16% of all manufacturing. According to CONACYT in 2006, the state had 213 *maquiladora* plants (7.6% of the national total), that accounted for USD 5 538 in exports in 2004 (6.4% of national total). Especially outstanding in *maquila* production and exports is the textiles, clothing and leather products industries where 72% of its income is derived from *maquiladora* plants. Also important in the area is machinery and equipment, where 17.8% of the state's income in the sector comes from *maquila* plants.

Coahuila has a very high concentration of its GVA in mid-high technology sectors. In low tech, the state is significantly under the national average in terms of GVA, 25.2% *versus* 32.1% nationally. The share in mid-low tech is approximately the same as the national average. However, the state has 45.3% of its GVA in mid-high tech industries, significantly more than the national share of 31.6%. The state has less than half the share of high tech GVA relative to the national average, at 4.9%*versus* 11.6% nationally.

In terms of firm demographics, the state has a higher percentage of employment in medium and large economic units, supporting the state's development. Approximately 30.8% of total employment is in medium and large sized firms *versus* a national average of approximately 25%. The share in micro firms is thus notably lower than the national average, with only 41.7% of employment, *versus* 54.8% nationwide.

Strategies and policies to support sectors and clusters

Sectors targeted: Auto, IT/Software, Textile, Aeronautic, Agro-industrial, *Maquila*, Biotech, Metals and Mining (Source: Economic Development Secretary)

According to different sources, Coahuila's industry had the following specific characteristics:

- The major national producer of coke, and second in terms of iron, fluorite and barite (Source: CONACYT 2006).

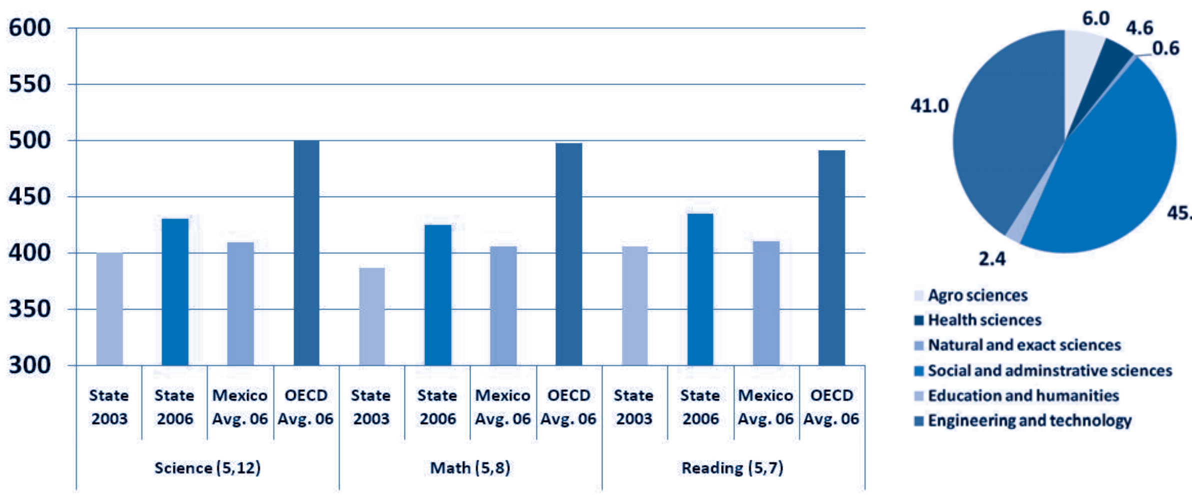
- 213 *maquiladoras* (7.6% of national total) (Source: CONACYT 2006).
- 27 industrial parks, cities and industrial corridors (encompassed mainly in Saltillo, Torreón, Monclova, Ciudad Acuña, Piedras Negras and Ramos Arizpe) (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 2.387 billion for 1.1% of the national total (Source: Ministry of Economy 2008).

Innovation system

Figure 7.5. Education: Coahuila

PISA performance

Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

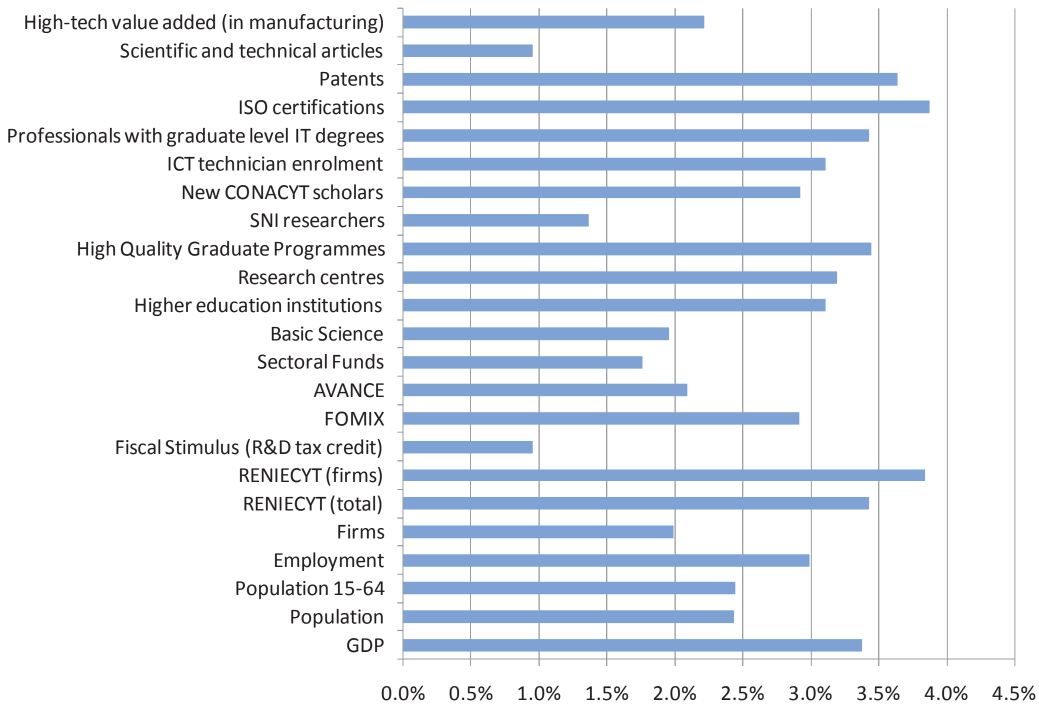
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Coahuila has the fifth highest scores among Mexican states in the results from the last two PISA (Programme for International Student Assessment) evaluations. However it is still behind the OECD average by more than two standard deviations in two areas: science and math, and somewhat less than two standard deviations in reading. Compared to the Mexico average, it is outstanding how Coahuila significantly improved its scores in the 2006 PISA evaluation from those observed in the 2003 evaluation, advancing 12 places in science, eight in math and seven in reading.

Current enrolment for undergraduate degrees (in universities and technological institutes) shows some variations with national trends. Coahuila has a strong share of students in social and administrative sciences programmes with rates similar to the national average (45.4% *versus* 46.9%). However, engineering and technology related programmes account for 41% of enrolment *versus* only 33.4% nationally, indicating the current vocation of Coahuila with engineering related industrial sectors. The state also has higher than average enrolment in agro sciences, but a lower share in health as well as natural and exact sciences.

Figure 7.6. Innovation snapshot: Coahuila

Percent of national total



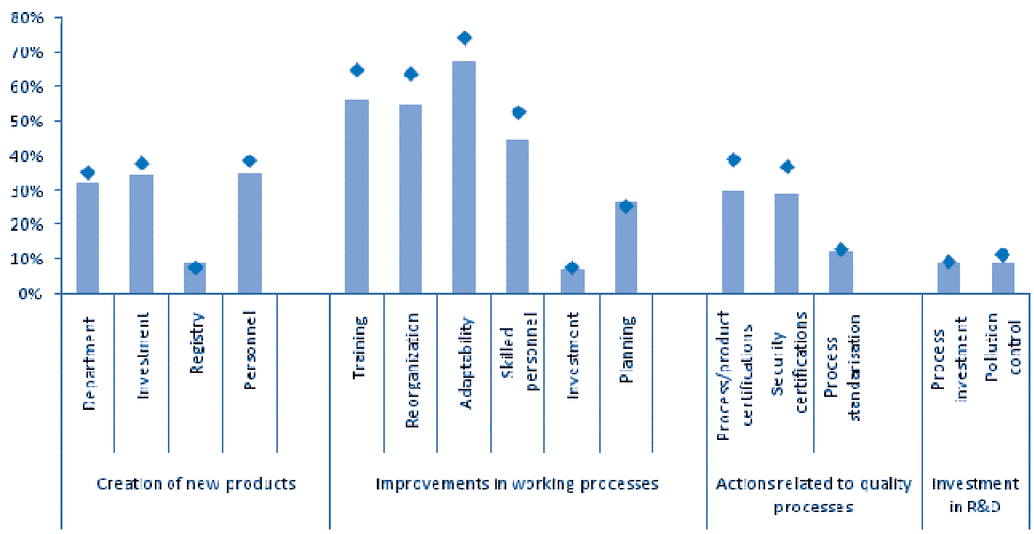
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. viii) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Coahuila's GDP accounts for almost 3.4% of the national total, however on several innovation related statistics it represents a smaller share of the national total. The state's ISO certifications, with 3.9% of the national total, is slightly higher than would be expected from the economy's size, and is an instrument to improve the quality of production processes. Also relatively higher is the number of high quality graduate programmes and the number of patents registered, both significant areas for Coahuila to continue fostering if it is to develop high tech sectors and increase value added and overall competitiveness. On the other hand, particularly low are the number of SNI researchers with 1.36%, the R&D tax incentive programme (Fiscal Stimulus) at less than 1% and scientific articles with just under 1% of the national total. The state does have two national CONACYT research centres that are innovation assets and six total research centres (according to ADIAT's directory), but perhaps greater spillovers from these assets are required to increase innovation performance.

Figure 7.7. Innovation by manufacturing firms: Coahuila

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, Coahuila's firms generally show better results than the nation as a whole. In terms of the creation of new products, the state ranks relatively higher than the national average, especially in terms of personnel dedicated to it (38% *versus* 34% nationally). Investments on improvements of the working process are similar to the national average (greater by one percentage point). Process certifications are better ranked than the average, and investment in R&D shows a similar level to the national average.

State Science and Technology Council and other major innovation initiatives

- The state has instituted several local offices whose main objective is to facilitate linkages between HEIs, Public Research Centres and firms.
- The state has set the clear objective of finalising a local law to promote and foster innovation.
- The state has set up a small fund aimed at responding to specific S&T needs.

Chapter 8

Colima

Strengths
-Low levels of inequality and good territorial distribution
-High employment and participation rates
-Low informality rates
-High per capita number of SNI researchers
-Good performance in terms of patenting activity
-Largest Pacific coast port of Mexico (port infrastructure)
-High quality of life

Weaknesses
-Low FDI flows
-Below average GDP growth rates
-Low levels of industrialisation

The state of Colima is a small coastal state, the fourth smallest in the whole of Mexico, located in the Centre-West meso-region. It has the most active Pacific coast port of Mexico, Manzanillo, that with Colima City concentrate most of the state's economic activity. It is well connected with other larger bordering states such as Jalisco and Michoacan. With a population of almost 578 000 inhabitants it is the second smallest state in Mexico in terms of population. The state is the tenth most dense, and has a relatively higher share of the population in urban areas. The state population is growing lower than the nation, at a rate of 0.8% from 2000-2005 *versus* 1.0% nationally. The state has somewhat higher education levels than the national average.

The state's GDP of USD 4.6 billion makes Colima the smallest state economy in Mexico (32nd place). Its annual GDP per head is just under the national average at USD 8 204 (13th). The state has two medium sized cities, and government and port services are the most important economic sectors of the state. It is the national major producer of Valence and Cantaloupe melons (86% and 54% of national totals), the largest producer of tamarind (37%) and by far, the largest lime producer (46% of national total) with important lime processing plants. In mining it is the major producer of iron. The state is above average for the country in terms of the Human Development Index, ranking 12th out of 32 states. It has a low level of marginalisation and one of the least unequal income distributions in the country (third).

Table 8.1. Socio-economic snapshot: Colima

Indicator	State value	National average or % of national	Rank	Indicator	State value	National average or % of national	Rank
Population (million)	577 575	0.6	31	GDP (USD million)	4 613	0.5	32
Area (sq. km)	5 627	0.3	28	GDP per capita (USD)	8,204	8 241	13
Population density[1]	102.6	97.9	10	GDP yearly growth 1996-2006 (%)[4]	2.8	3.6	22
Population 0-14 (%)	28.7	31.1	30	Primary sector (%)	4.8	5.5	16
Population 15-64 (%)	65.9	63.7	6	Industrial sector (%)	23.9	27.5	22
Population 65+ (%)	5.4	5.3	16	Services sector (%)	71.2	67.1	8
Rural population (%)[2]	12.4	23.5	28	Employment rate (%)	67.7	62.9	2
Population annual growth (2000-2005) (%)	0.8	1.0	21	Unemployment rate (%)	3.1	3.0	19
Yearly migration to the US[3]	12,581	3.3	25	Participation rate (%)	70.0	64.9	2
Population with at most lower secondary education (%)	63.5	66.9	23	Average yearly FDI 1999-2007 (USD million)	13	0.1	28
Population with upper secondary education (%)	18.5	16.7	10	Exporting *maquiladora* industry production (2004 USD million)	0	0.0	26
Population with tertiary education (%)	18.0	16.4	8	Marginalisation index	-0.74	0	25
Households with a PC (%)	20	19	12	Gini coefficient	0.526	0.616	3
Municipalities (number)	10	0.4	29	Human Development Index	0.810	0.803	12

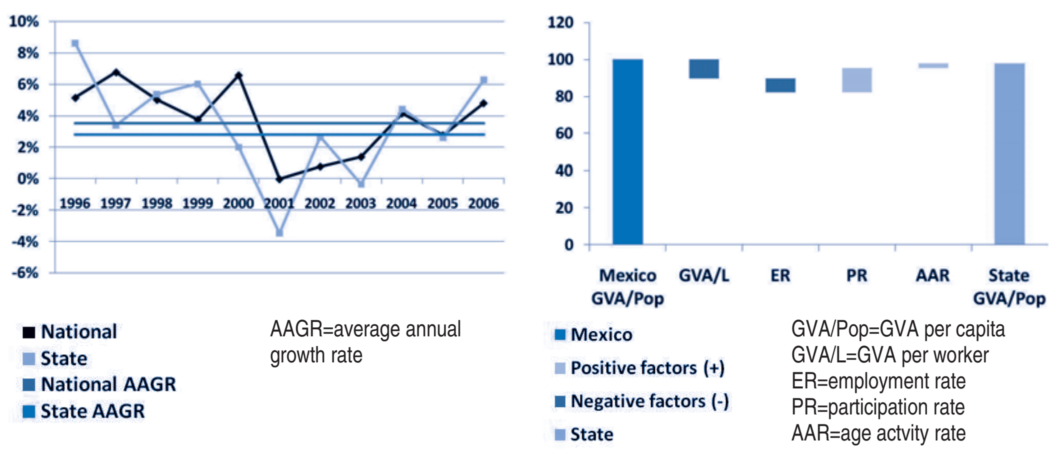
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 8.1. GDP growth and GVA per capita: Colima

% growth GVA per capita of state *versus* national average



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Colima's GDP had an average annual growth rate of 2.8% from 1996 to 2006, notably lower than the national average annual growth rate of 3.6%. The state is therefore only 22nd out of 32 in terms of growth. Colima's real GDP per head also increased below the national average. Colima's growth rate will need to increase more rapidly so as to maintain competitiveness. The importance of the port of Manzanillo (the largest Mexican Pacific coast port) and its proximity to large markets (Jalisco and Michoacan have combined almost 11 million inhabitants) can facilitate this growth.

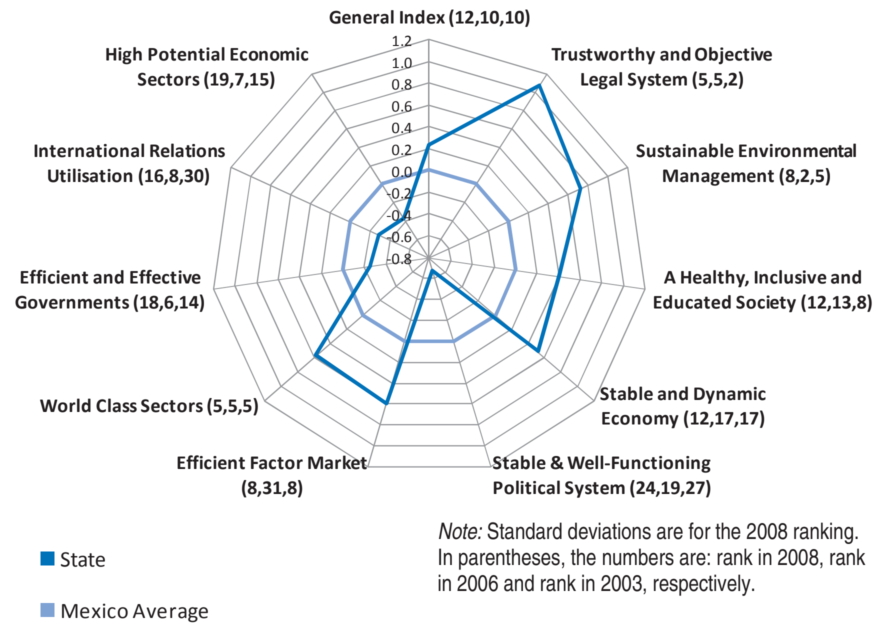
Colima's GVA per head is close to that observed nationally at approximately 98% of the country's average. GVA per worker is lower than the national average at – 10.2% and the employment rate (share of the economically active population employed) is below the national average at – 7.7%. However, the higher than national average participation rate at +13.1% (share of working age population that is economically active) and the age activity rate is slightly higher at +2.49%. The economy of Colima, except for some lime juice processing plants that are export oriented and some other mainly primary sector produce, is mainly oriented towards the domestic market for manufacturing (chemicals and foods and beverages) and its service sectors (major Pacific coast port). The *maquiladora* industry is recent and still small.

Competitiveness indices

Figure 8.2. Example competitiveness rankings: Colima

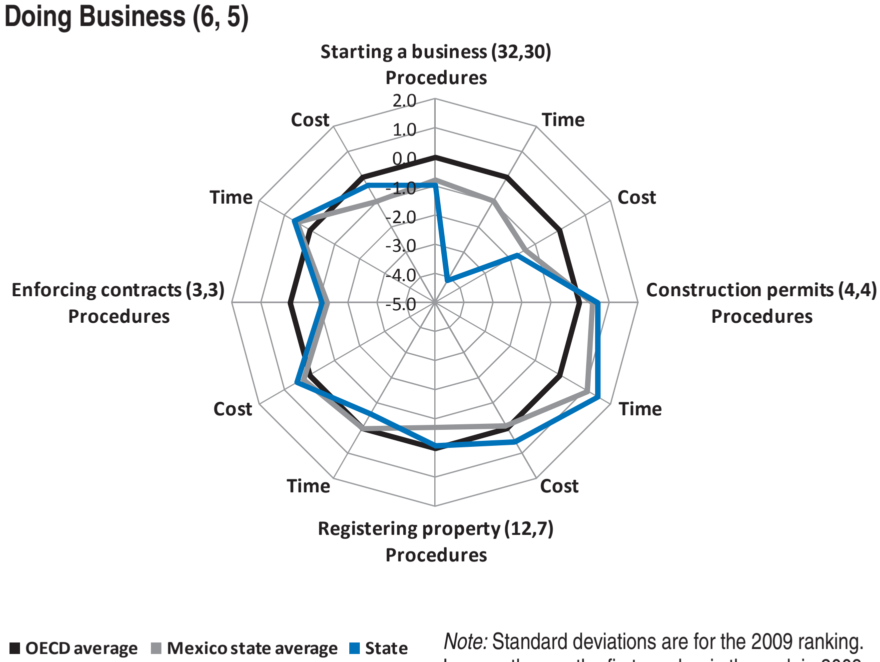
Standard deviations from the mean (0)

IMCO (12, 10, 10)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.

Doing Business (6, 5)



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

Colima ranks relatively high on IMCO and Doing Business competitiveness indicators. For IMCO, the state is currently ranked 12th, having previously been ranked tenth in both 2003 and 2006. Overall, the state is slightly above the Mexican average by 0.23 standard deviations. It is above the national average on six out of the ten component indices. There have been considerable fluctuations in the ranking of the state on several indicators. Indicators that consistently rank well include World class sectors (fifth in the last three rankings) and Trustworthy and objective legal system (fifth in the last two rankings). International relations utilisation has improved several positions, likely related to the port. The state's main cities of Colima and Manzanillo are ranked 12th and 16th respectively, and show relatively strong performance. On the Knowledge Economy Index, the state performed in the middle range at 15th out of 32.

With respect to Doing Business indicators, Colima has strong and steady performance, being ranked sixth in 2009 and fifth in 2007. The state's performance varies widely by indicator. It is the last ranked state in Mexico for starting a business but has strong performance for enforcing contracts (third in 2009 and 2007) and construction permits (fourth in both years). State and local governments can do much to improve the performance in the time it takes for new business to open.

In terms of the federal SARE system to facilitate firm registration and development, three of ten municipalities have a SARE office. Those cities include Colima (132 273 inhabitants), Villa de Álvarez (100 121) and Coquimatlán (17 363). However, recent efforts by local governments are expected to translate into three new SARE offices (including Manzanillo) in the state which would take the total up to six, covering around 90% of the total population. The opening of a SARE office in Manzanillo Port could bring further benefits for the state.

Competitiveness committees and policies

- Colima has a major long term initiative, *Colima Competitivo*, involving several relevant stakeholders to improve overall competitiveness. An interesting feature of this initiative is that private sector stakeholders are directly involved in the implementation of specific actions.
- A key element of the competitiveness strategy is integrating value chains and the formation of economic clusters as means to boost local competitiveness.
- Colima has constituted an executive commission in charge of the supervision of competitiveness related actions and policies that groups industry chambers and associations from different sectors, along with the Federal Ministries, the Secretariat for Economic Development and HEIs.

Industrial structure and clusters

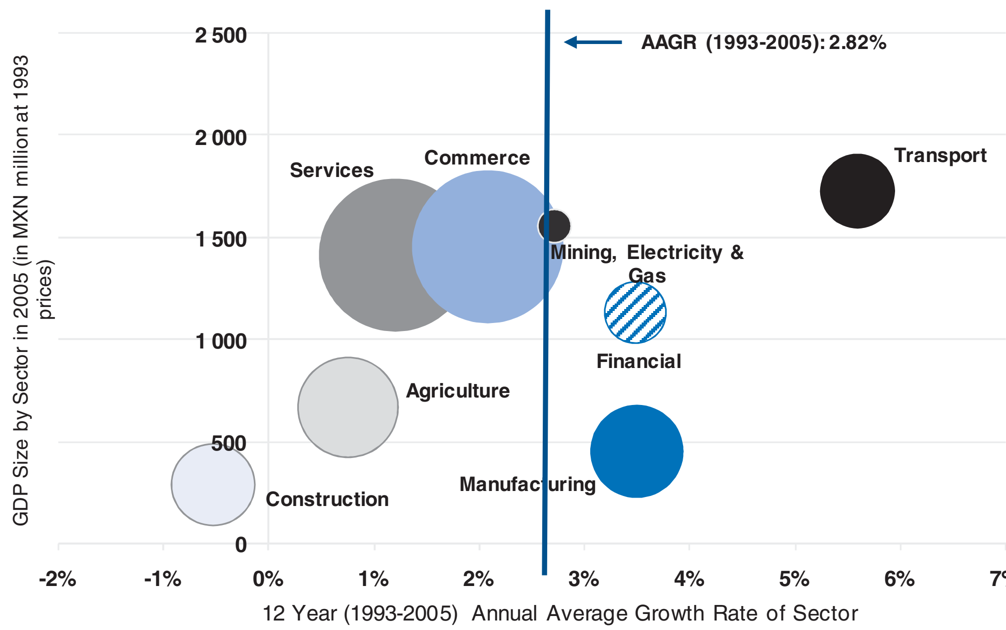
Table 8.2. Sectoral breakout: Colima

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants & Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	5.1	4.1	6.3	4.3	8.9	19.4	16.2	11.3	24.5
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	9.6	4.7	4.7	4.8	13.1	17.8	14.1	11.9	19.3
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

Figure 8.3. GDP by sector size and growth: Colima

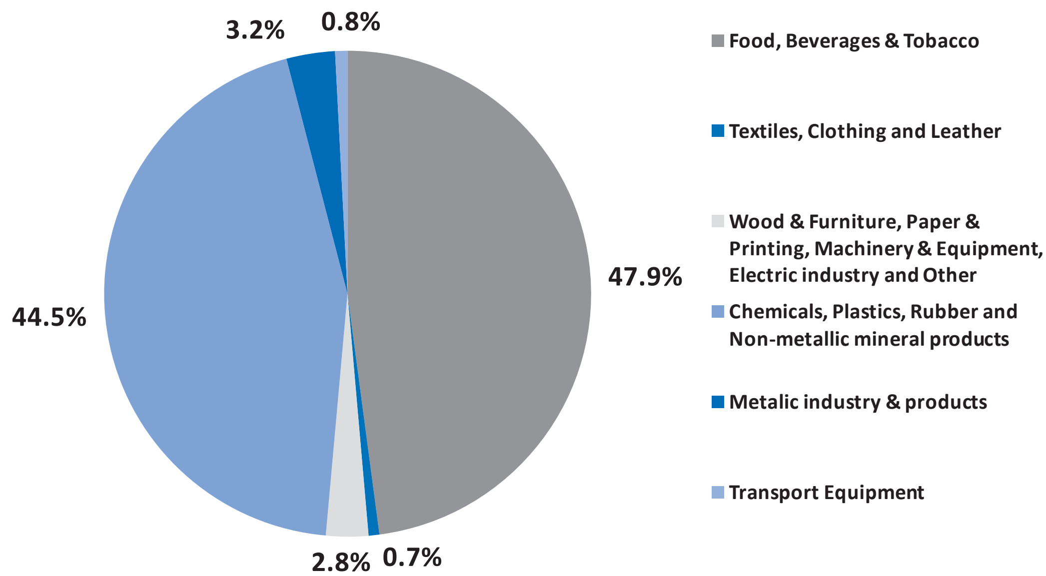


Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The structure of the economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share of the economy from 9.6% in 1993 to 5.1% in 2005, a drop of almost 50%. Colima has a higher proportion of its GDP coming from the primary sector as compared to the national average. Colima has started to develop higher value added agriculture and is the national major producer of two different kinds of melons and the largest producer (almost 50% of national production) of lime, lime juices and oils, much of which is industrialised and exported to many countries. Mining is important to the state, especially for iron, being Colima the national largest producer. In the tertiary sector, after commerce, restaurants and hotels, the income derived from the port of Manzanillo (largest port activity of the Pacific coast in Mexico) translates into a significant proportion of its GDP coming from transport, communications and storage (16.5%).

Figure 8.4. Breakout of manufacturing sectors: Colima



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 8.3. GVA by technology level: Colima

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	33.7	32.1	62.2	24.7	4.1	31.6	0.0	11.6	285
Number of firms	62.9	61.8	36.5	35.3	0.0	2.1	0.7	0.8	1 804
Employment	69.7	44.1	26.1	25.0	4.0	21.5	0.2	9.4	10 948
Total assets	37.1	29.4	58.6	36.8	4.3	29.6	0.0	4.2	410
Investment	38.7	30.2	59.1	22.0	2.2	41.1	0.0	6.8	13
FDI (2007)	0.0	9.8	0.0	40.5	0.0	32.5	0.0	17.2	(

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 8.4. Firm demographics: Colima

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	192 850	100.0	100.0
Micro	103 718	53.8	54.8
Small	39 533	20.5	20.3
Medium	14 627	7.6	13.5
Large	34 972	18.1	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

The sector that had the largest annual average growth was transport, communications and storage with 5.6%, while manufacturing grew at an annual average rate of 3.5% during this period. Also, financial services, insurance and real estate grew at 3.5%; commerce, restaurants and hotels at an average annual rate of 2.1% and agriculture, forestry and fishing at 0.8%. The largest employer is communal, social and personal services (that includes government) with 73 055, 28.4% of the state total, followed closely by commerce, restaurants and hotels with 71 535; while agriculture employs 31 643 people, representing 12.3% of the state total, manufacturing accounts for 27 006 workers (10.5% of total).

Manufacturing is not a major contributor to Colima's GDP; it represented only 6.3% of GDP in 2005, which is significantly lower than the national average of 17.9%. Manufacturing is concentrated mainly in two areas: food, beverages and tobacco with 48% of all manufacturing gross production in 2003, and chemicals, plastics, rubber and non metallic minerals with 44.5% of it that same year, with non-metallic minerals standing out as it alone represented 39.6% of the state's total manufacturing.

Colima's economy is almost entirely concentrated in low and mid-low tech industries. The GDP in low-tech industries is 33.7% *versus* a national average of 32.1%, however the mid-low tech industries account for 62.2% of the economy, *versus* only 24.7% nationally. This is explained in part by the importance agriculture, agro-businesses, food, beverages and tobacco manufacturing sectors in the state's economy. However, such low-tech industries per this classification can certainly benefit from innovation. There is virtually no activity in high-tech industries and only a very small share in mid-high tech (4.1% *versus* 31.6% nationally).

Colima has a similar share of employment in micro and small firms as the national average. However there is a smaller share of medium-sized firms (7.6% *versus* 13.5%) with a more significant share of employment in large firms (18.1% *versus* 11.5%).

Strategies and policies to support sectors and clusters

Sectors targeted: Agro, biotech, ICT, Logistics, Energy (Source: *Plan Estatal de Desarrollo 2004-2009 y Programa Regional de Competitividad para el Desarrollo Sustentable del Estado de Colima*, 2007)

According to different sources, Colima's industry had the following specific characteristics:

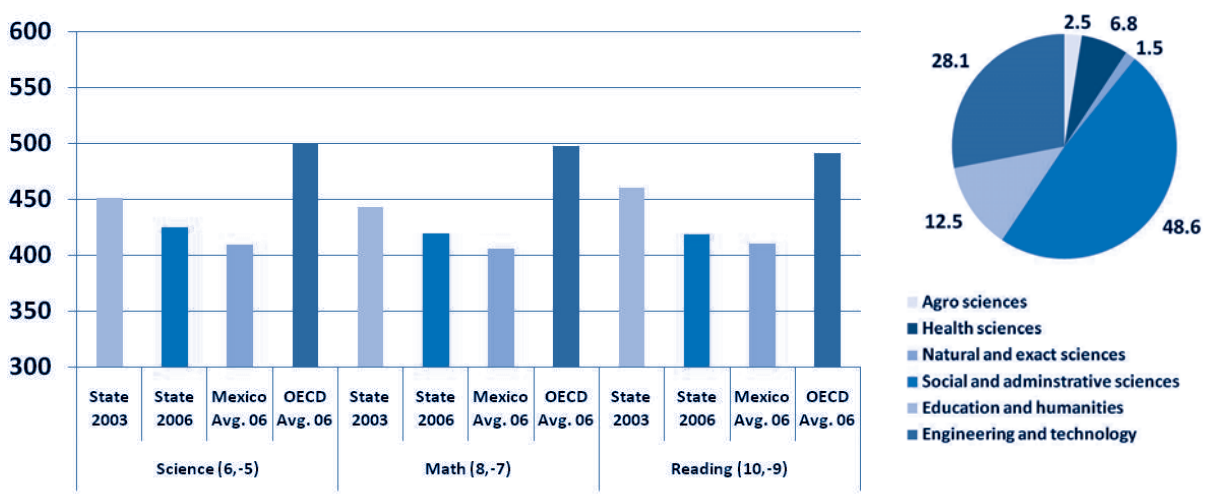
- The major iron producer in the country (Source: CONACYT 2006).
- Two industrial parks, cities and corridors (encompassed in Manzanillo and Colima City) (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 120.8 million for 0.1% of the national total (Source: Ministry of Economy 2008).

Innovation system

Figure 8.5. Education: Colima

PISA performance

Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

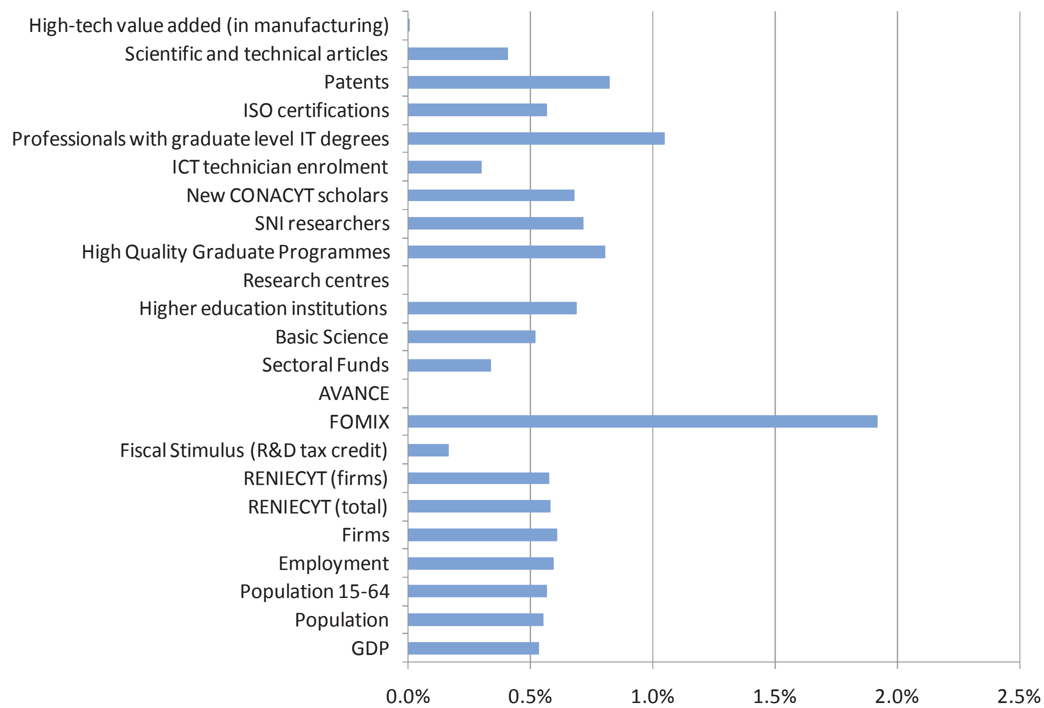
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Colima performed well in the last two PISA (Programme for International Student Assessment) evaluations. However, like Mexico generally, it lags significantly behind OECD averages at 2.5 standard deviations below in all three areas: science, math and reading. While the state was in the first place of all the Mexican states in the 2003 PISA evaluation, a significant achievement, its performance has subsequently declined. In the last 2006 PISA evaluation, Colima slipped back five places in science, seven in math and nine in reading.

Current enrolment for undergraduate degrees (in universities and technological institutes) by subject is similar to what is observed nationally. The main differences include a higher share enrolled in humanities and education (12.5% *versus* 6.0% nationally) and a lower share in engineering and technology (28.1% *versus* 33.4% nationally).

Figure 8.6. Innovation snapshot: Colima

Percent of national total



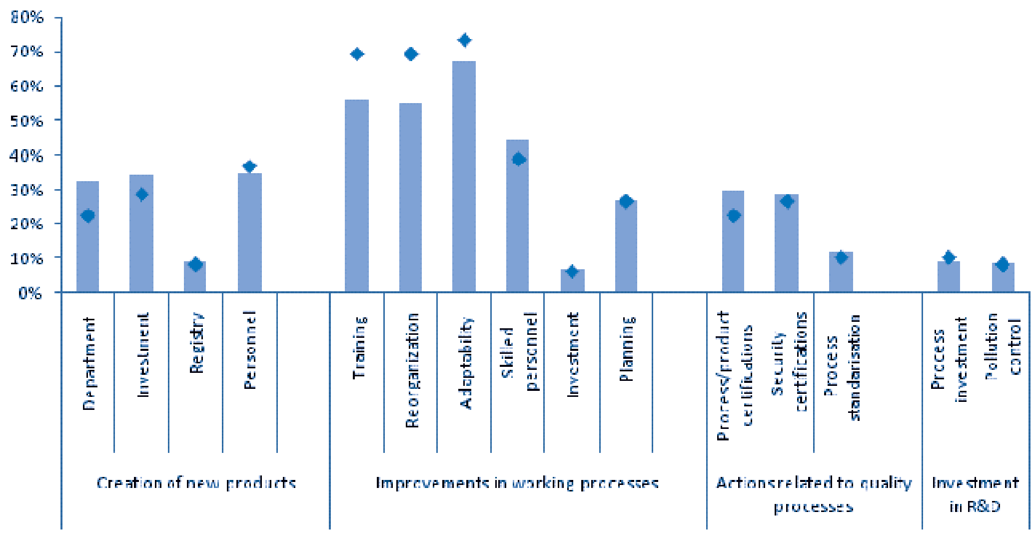
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Colima's innovation performance is relatively proportionate to its GDP, which accounts for 0.53% of the national total. Relatively high is the percentage of national FOMIX funds obtained by the state, 1.38 percentage points over the corresponding percentage of GDP (1.92% of national FOMIX). On the other hand, AVANCE programme participation, the number of research centres and high-tech value added in manufacturing are nil. However the state does have a slightly higher share of the country's CONACYT scholars, SNI researchers, patents and high quality graduate programmes relative to GDP. There lies an area of opportunity where the state could foster the creation of private companies in any of the outstanding productive areas (such as agro-business, logistics or mining) to take advantage of its qualified graduates.

Figure 8.7. Innovation by manufacturing firms: Colima

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, Colima's firms generally show lower results than the nation as a whole. In terms of the creation of new products, the state ranks lower than the national average, especially in terms of the number of firms that have a department for this purpose (22% *versus* 32% nationally). Investments on improvements of the working process are also lower than the national average by a percentage point. Process certifications are much lower than those of the nation as a whole, and investment in R&D shows a similar, but higher, level to the national average.

State Science and Technology Council and other major innovation initiatives

- Comprehensive approach to using the S&T Council in the interest of the needs of all state ministries. The Governor's Office gets requests for needs across all state departments and ministries, which participate in the board of the S&T Council and contribute in terms of financial resources. All ministries with S&T&I projects present them to the S&T Council.

- The state has shown an interesting approach in terms of upgrading e-government capabilities through a state department in charge of technological innovation for government. Additionally, this policy seeks to promote greater access for the state's population to the internet, while promoting a culture of greater usage of this tool to comply with governmental procedures.

Chapter 9

Guanajuato

Strengths
-Outstanding in terms of ease of starting a business (regulatory)
-High propensity of manufacturing firms to innovate
-Outstanding in terms of usage and expenditure of national S&T programmes (federal)
-Well designed and developing regional innovation system
-Good territorial distribution and interconnection of economic activity (well developed intermediate cities)
-Important flows of remittances
-Increasing specialisation

Weaknesses
-High migration rates
-Low levels of schooling years and tertiary attainment
-High levels of income inequality
-Below average GDP per capita

The state of Guanajuato is in the geographic centre of the country, part of the Centre-West meso-region. It is the 21st largest in size (about the size of Belgium) and with a population of approximately 4.9 million is the sixth largest in terms of population. While the state is the sixth most densely populated in the country, it does have a higher than average rural proportion of 30.3% (23.5% national average). Economic activity is dispersed across a network of several important cities: León, Irapuato, Celaya, Salamanca, Silao, San Miguel de Allende and Guanajuato City. The state population is growing slightly slower than the national average at only 0.9% due in part to migration to the US (third highest state in terms of overall migration flows). As a result, Guanajuato also receives large amounts remittances. In terms of educational attainment, it is behind the national averages in terms of both average schooling years and tertiary educational attainment.

The state's GDP of USD 31 billion is 3.6% of the national economy, seventh ranked in terms of size. However, the annual per capita GDP of 6 327 USD is significantly lower than the national average of 8 241, putting the state in 20th place. The state is the third producer of sulphur and the seventh and eighth for gold and silver, respectively. It is the largest producer of soft grain wheat, strawberries, broccoli, barley and onion. Guanajuato has been developing its industry, mainly in the auto parts and car assembly areas. In the last decade 41 *maquiladora* plants have been established in the state, representing 1.5% of the nation's plants. The state is below the national average in the Human Development Index, ranking 22nd out of 32 states, and having a medium level (fourth place) score on the marginalisation index.

Table 9.1. Socio-economic snapshot: Guanajuato

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	5.0	4.7	6	GDP (USD million)	31 072	3.6	7
Area (sq. km)	30 621	1.6	22	GDP per capita (USD)	6 327	8 241	20
Population density[1]	162.2	97.9	6	GDP yearly growth 1996-2006 (%)[4]	3.9	3.6	14
Population 0-14 (%)	33.4	31.1	5	Primary sector (%)	4.1	5.5	19
Population 15-64 (%)	61.3	63.7	27	Industrial sector (%)	35.0	27.5	5
Population 65+ (%)	5.3	5.3	18	Services sector (%)	60.8	67.1	29
Rural population (%)[2]	30.3	23.5	12	Employment rate (%)	61.2	62.9	23
Population annual growth (2000-2005) (%)	0.9	1.0	18	Unemployment rate (%)	3.8	3.0	25
Yearly migration to the US[3]	163 338	5.4	3	Participation rate (%)	63.4	64.9	24
Population with at most lower secondary education (%)	74.9	66.9	4	Average yearly FDI 1999-2007 (USD million)	148	0.7	13
Population with upper secondary education (%)	12.7	16.7	29	Exporting *maquiladora* industry production (2004 USD million)	750	0.9	12
Population with tertiary education (%)	12.4	16.4	29	Marginalisation index	0.09	0	14
Households with a PC (%)	16	19	20	Gini coefficient	0.629	0.616	25
Municipalities (number)	46	1.9	17	Human Development Index	0.778	0.803	22

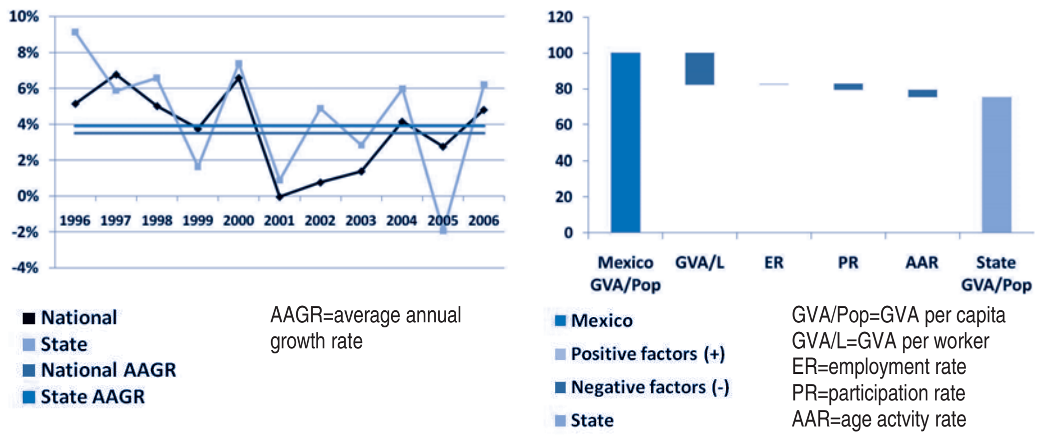
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the % of population living in cities of under 2,500 inhabitants. *iii*) The yearly migration is the percentage of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The growth rate corresponds to the average growth rate of all states and not to the country's AAGR.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 9.1. GDP growth and GVA per capita: Guanajuato

% growth GVA per capita of state *versus* national average



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Guanajuato's GDP had an average annual growth rate of 3.9% from 1996 to 2006, slightly higher than the national annual average of 3.6%. The state's real GDP per head has also increased more than the national GDP per capita. It is important to increase Guanajuato's average growth rate in order to accelerate its development and make it possible to reduce its lagging position within Mexico, especially in terms of poverty, income distribution and human development.

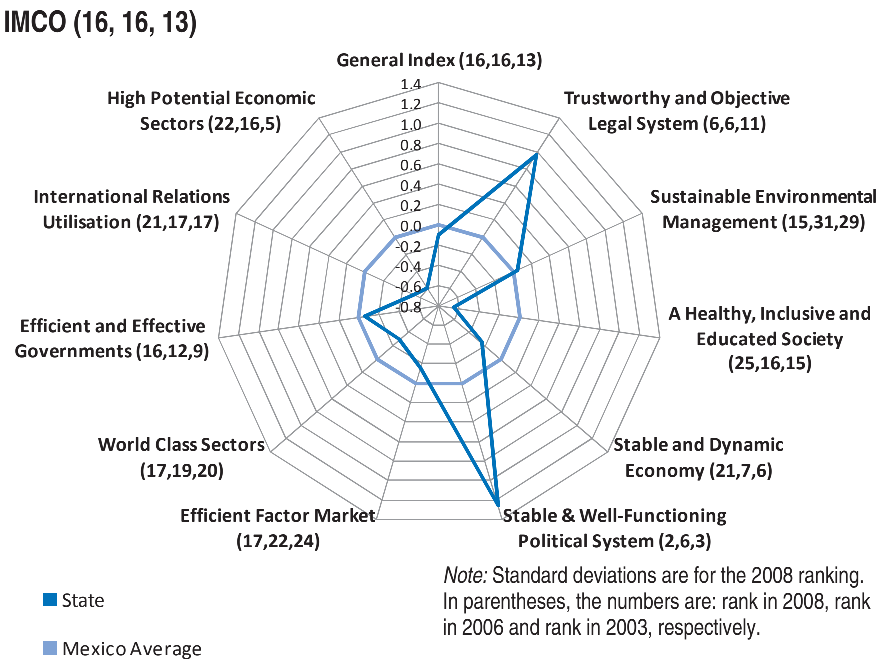
Guanajuato has a GVA per head that is 75.4% of the national average. The major difference with the national average is a GVA per worker that is 18% lower. Furthermore, the state has a lower age activity rate at – 3.96% relative to the national average and this is due to having a relatively larger share of the population under 14 or over 65 years of age, which in turns is explained in part by the outward migration of individuals between 14 and 65.

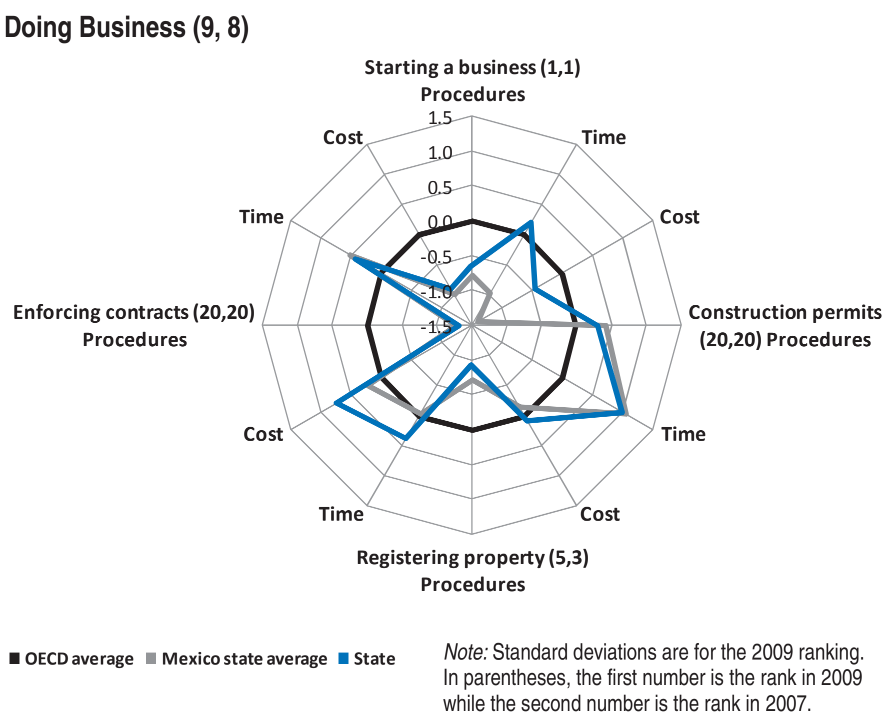
Guanajuato ranks about average on traditional competitiveness indicators but performs less strongly on knowledge indicators despite an active regional innovation system. For IMCO, the state was ranked 16th overall in 2008 and 2006, almost at the Mexican average score, having declined from 13th in 2003. Of the ten component indices, the state is below the national average on seven. One area where the state excels is in Stable and well functioning political system (currently second). Factors where the state's performance has slipped include High potential economic sectors (down to 22 from five in 2003) and Stable and dynamic economy (down to 21 from six in 2003). The area with the most improvement has been Sustainable environmental management (up to 15 from 29 or 31 in prior years). Major cities in Guanajuato are ranked fourth (Leon) and 31st (Irapuato, Celaya, Salamanca). On the Knowledge Economy Index, the state ranked significantly lower at 21st place.

Competitiveness indices

Figure 9.2. Example competitiveness rankings: Guanajuato

Standard deviations from the mean (0)





Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

With respect to Doing Business, Guanajuato has consistent performance above the Mexico average being ranked ninth in 2009, down one from eighth place in 2007. The state performs above the OECD average on seven out of 12 factors as well as above average for seven out of 12 relative to the Mexico average, albeit not the same seven. Especially strong are the results in the cost and time in starting a business, though the number of procedures in this category remains high. A clear area for improvement is in the enforcement of contracts, but this is a problem for Mexico overall.

In terms of the federal SARE system to facilitate firm registration and development, half of the state's municipalities have a SARE office (23 out of 46). Already over 80% of the population lives in municipalities with a SARE office, including not only urban but also smaller municipalities. The distribution of such offices around the state (which is well above the national average) has positively impacted the regulatory framework especially in terms of the ease of firm start up.

Competitiveness committees and policies

- The state of Guanajuato created the Guanajuato Institute for Quality and Competitiveness, a decentralised government agency that brings together HEIs, firms and government whose aim is to increase overall competitiveness through specific actions such as specialised trainings and certifications.
- The state has a local observatory and a council for competitiveness matters. The observatory's objective is to produce systematic quantitative and qualitative indicators and evaluations of the state's competitiveness status. That council is directly related to the decision making process of policies aimed at increasing competitiveness (again HEIs, firms and government are involved).

Industrial structure and clusters

Table 9.2. Sectoral breakout: Guanajuato

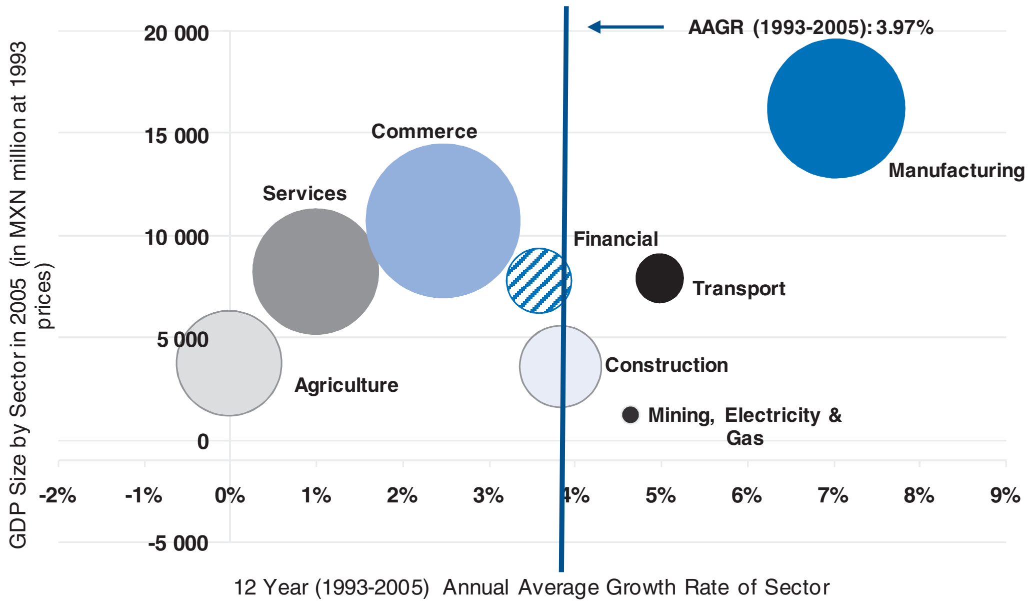
in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants & Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	4.3	0.2	24.6	7.9	1.2	25.6	11.6	11.8	20.8
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	9.6	0.4	18.5	5.9	1.4	20.6	11.38	13.2	18.9
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

The structure of the economy varied substantially by sector between 1993 and 2005. Agriculture, forestry and fishing halved its share of the economy from 9.6% of Guanajuato's GDP in 1993 to 4.3% in 2005, albeit this is still higher than the national average of 3.4%. The state is an important national producer of the following agricultural products: soft grain wheat (67.1% of national production), strawberries (72.5%), broccoli (67%), barley grain (41.9%), onion (17.1), asparagus (22.7%), green alfalfa (17.8%), sorghum grain (24.1%) and white grain corn (11.4%). It is also a large producer of pork, chicken, eggs and cow's milk.

Figure 9.3. GDP by sector size and growth: Guanajuato

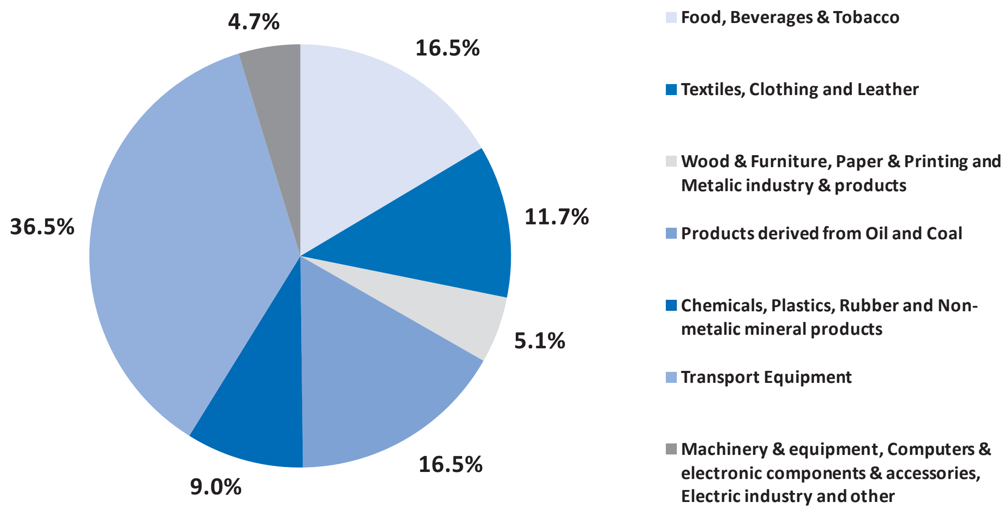


Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The sector that had the largest average annual growth was in manufacturing with 7%, illustrated increased industrialisation in the state since NAFTA. The transport, communications and storage sector grew at 5%, while mining, electricity, gas and water grew at an annual average rate of 4.7% during this period. Furthermore, construction grew at an average rate of 3.8% and financial services, insurance and real estate at 3.6%. On the other hand agriculture, forestry and fishing had no growth over the 12-year period. The state's largest employer is commerce, restaurants and hotels with 531 583 followed by manufacturing that employs a total of 432 807 and represents 23% of the state's total employment. Agriculture employs 256 133 people, representing only 59% of what manufacturing does (and 13.6% total employment).

Figure 9.4. Breakout of manufacturing sectors: Guanajuato



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 9.3. GVA by technology level: Guanajuato

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	34.4	32.1	20.9	24.7	44.5	31.6	0.2	11.6	4 968
Number of firms	63.5	61.8	34.1	35.3	1.9	2.1	0.4	0.8	17 745
Employment	66.5	44.1	20.1	25.0	13.1	21.5	0.3	9.4	223 352
Total assets	22.9	29.4	39.7	36.8	37.3	29.6	0.1	4.2	6 156
Investment	33.7	30.2	37.6	22.0	28.6	41.1	0.1	6.8	325
FDI (2007)	14.5	9.8	1.9	40.5	66.9	32.5	16.8	17.2	193

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 9.4. Firm demographics: Guanajuato

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	1 463 426	100.0	100.0
Micro	822 855	56.2	54.8
Small	310 392	21.2	20.3
Medium	211 237	14.4	13.5
Large	118 942	8.1	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing has grown to account for almost 25% of the state's GDP in 2005. By far, the tertiary sector is the dominant one with almost 70% of the state GDP and with commerce, restaurants and hotels alone being 26% of GDP. Its level of industrialisation is high with the secondary sector being the fifth largest out of 32 in the country. In manufacturing, the dominant industry is transport equipment at 36.5%, while petroleum coal and derivatives produces 16.5%. These two industries show the importance that the Silao General Motors assembly plant has, in the first case, and the PEMEX refinery in Salamanca for the second case. Also important is the food, beverages and tobacco industry, with 16.5% of total manufacturing and the textiles, clothing and leather industry with 11.7%, where the largest shoe manufacturers in Mexico are located.

In terms of the state's output by industry technology level, there is a stronger share in the mid-high tech industries and lower share in the high tech industries than for the country as a whole. The state's low tech share is approximately the same as the national share (34.4% *versus* 32.1%) and a somewhat lower mid-low tech share (20.9% *versus* 24.7%). The state's strength is in mid-high tech industries at 44.5% of GVA (*versus* a national share of 31.6%). And while there is virtually no GVA in high technology industries, there have been important FDI flows as of late to higher tech sectors.

Guanajuato has rather similar firm demographics to the Mexico averages. It has a slightly higher percentage of employment in micro firms, with 56.2% (54.8% national average) and fewer in large economic units, where 8.1% of employment is concentrated (11.5% national average).

Strategies and policies to support sectors and clusters

Sectors targeted:

- Existing sectors: Footwear, Textile and clothing, Auto, Agro, Mining, Construction, Crafts
- Targeted: Nanotech, Renewable energies, Aeronautic, IT, Biotech

According to different sources, Guanajuato's industry and mining sectors had the following specific characteristics:

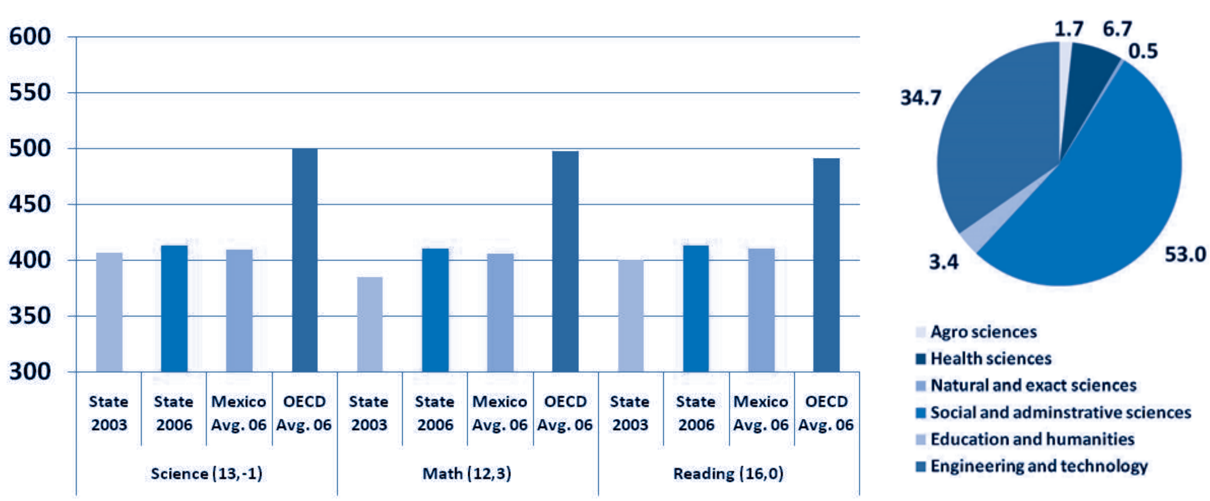
- Third, seventh and eighth national producer of sulphur, gold and silver respectively (Source: CONACYT 2006).
- 16 industrial parks, cities and corridors (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 1.414 billion for 0.7% of the national total (Source: Ministry of Economy 2008).

Innovation system

Figure 9.5. Education: Guanajuato

PISA performance

Undergraduate education enrolment



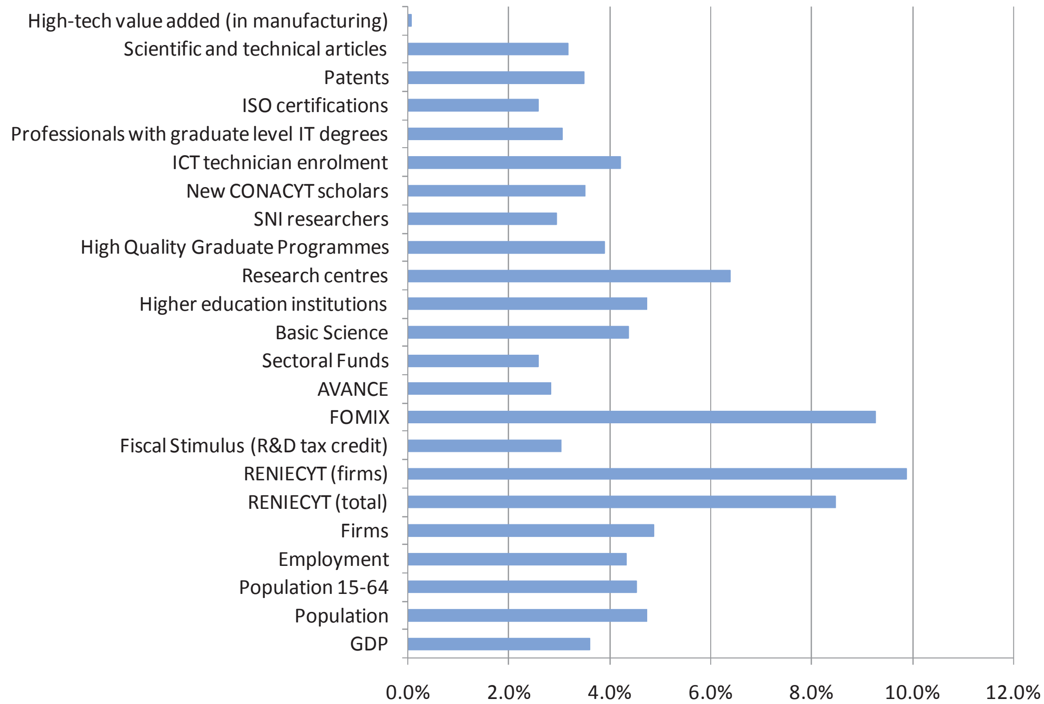
Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

In the 2006 PISA, Guanajuato ranked 13th, in science, 16th in reading, and 12th in math, out of 32 states. The state maintained its national rank in reading, improved three places in math and lost one in science. Nevertheless, the state is between 2.7 and 2.9 standard deviations below the OECD average. Even though Guanajuato has lower schooling years and tertiary attainment than the Mexico average, the quality of its education is slightly better than the national average, albeit being far from most other OECD countries.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state shows a greater share in social and administrative sciences (53% *versus* almost 47%). The share in engineering and technology is almost the same as at national level, however the differences are in the state's lower share enrolled in agro sciences, health sciences, and natural and exact sciences. For several of the targeted industries in the state, greater enrolment in these latter sciences may be required to achieve stated goals.

Figure 9.6. Innovation snapshot: Guanajuato



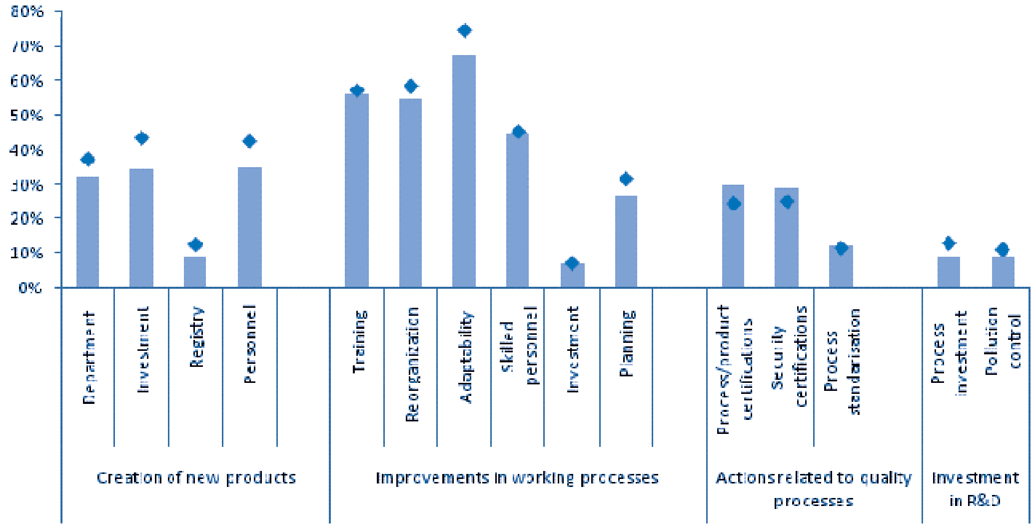
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

On the innovation snapshot, Guanajuato tends to perform very well relative to its GDP share of the country (3.6% of the national total). Particularly high are the state's use of FOMIX funds at 9.27% and the number of entities (firms and others) registered in the national science and technology council registry (RENIECYT) at 8.5% and 9.9% of national totals respectively. The state also ranks high in terms of HEIs (4.7%), research centres (6.38%) and high quality graduate programmes (3.9%). Indicators of technological development are about the average and show the state's effort to develop its manufacturing sector. These indicators include the number of patents, AVANCE funds and the ISO certifications (at 3.5%, 2.84%, and 2.6%, respectively). Lower than expected is the state's use of sectoral funds. The presence of three CONACYT public research centres has a positive impact on the state's innovation performance, however (acknowledging potential application in more traditional sectors) this has yet to translate into high tech manufacturing activity.

Figure 9.7. Innovation by manufacturing firms: Guanajuato

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, Guanajuato's firms generally show stronger results than the nation as a whole. In terms of the creation of new products, the state ranks relatively higher than the national average, especially in terms of investment (43% *versus* 34% nationally). Investments in improvements of the working process are similar to the national average. Process certifications are lower than the nation as a whole, while investment in R&D shows a higher level than the national average.

State Science and Technology Council and other major innovation initiatives

- The state's S&T Council funds regional Innovation Networks in different industries. However, government serves only as a facilitator for actors to interact and build necessary linkages for innovation. In the medium term, these networks are intended to be (and have generally been) self sustainable.
- Guanajuato has constituted a special commission for attracting FDI to the state that includes the active participation of the local S&T Council and relevant HEIs and research centres as part of the economic development strategy.
- The state has constituted a special venture capital fund in order to finance (under different modalities) and promote successful firms that have been formed in local incubators.

Chapter 10

Jalisco

Strengths
- Strong local market
- Relatively high quality of education (PISA) and solid structure of higher education institutions
- High competitiveness of main city (Guadalajara)
- High patenting activity (for Mexico)
- Strong agricultural sector with low marginalisation
- Well developed electronic and high tech sector (software and multimedia)
- Outstanding usage of PROSOFT federal programme

Weaknesses
- High migration rates
- Below average GDP growth rates
- Strong regional disparities

The state of Jalisco on the Pacific coast of Mexico is located in the Centre-West meso-region. Its capital city, Guadalajara, is the second most populous in the country. The state is the seventh largest in surface area (about the size of the BENELUX) and has a population of approximately 6.8 million inhabitants (fourth largest in the country). Jalisco has a higher share of its population in urban areas than the national average and most of its economic activity and population is encompassed in the metropolitan area of the capital city of Guadalajara, which includes several municipalities. The state population is growing at a slightly higher rate than the national average (1.2% *versus* 1.0%). However, that growth rate is diminished by high levels of out migration, as it is the state that sends the most immigrants to the US annually. Education levels of the population overall are slightly above averages for the nation as a whole.

The state's GDP of USD 54.5 billion makes Jalisco Mexico's fourth largest economy. However, the state's GDP per capita is slightly lower than the national average (USD 8 113 *versus* 8 241). Alongside Nuevo Leon and the Federal District (Mexico City), it has a long-standing industrial tradition. In mining, it produces barite, silver, lead and gold. Culturally it represents Mexico through many of its traditions and products, being the home of mariachi, tequila and charros. It also has 103 *maquiladora* plants with exports of USD 4 billion (4.6% of the national total) and representing over half of the state's total exports. Jalisco has about the average Human Development Index score for the country but a slightly better income distribution than most of Mexico as represented by the Gini coefficient.

Table 10.1. Socio-economic snapshot: Jalisco

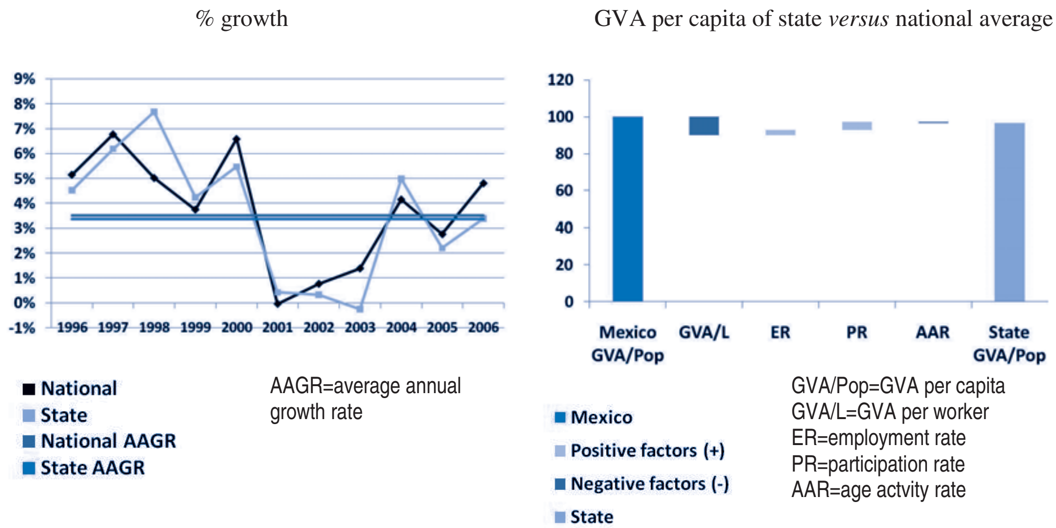
Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	6.8	6.5	4	GDP (USD million)	54 518	6.3	4
Area (sq. km)	78 630	4.0	7	GDP per capita (USD)	8 113	8 241	14
Population density[1]	87.0	97.9	12	GDP yearly growth 1996-2006 (%)[4]	3.4	3.6	19
Population 0-14 (%)	30.7	31.1	17	Primary sector (%)	5.5	5.5	13
Population 15-64 (%)	63.8	63.7	18	Industrial sector (%)	24.5	27.5	21
Population 65+ (%)	5.5	5.3	14	Services sector (%)	70.0	67.1	10
Rural population (%)[2]	13.9	23.5	24	Employment rate (%)	64.8	62.9	10
Population annual growth (2000-2005) (%)	1.2	1.0	14	Unemployment rate (%)	2.8	3.0	17
Yearly migration to the US[3]	170 793	3.9	1	Participation rate (%)	67.2	64.9	6
Population with at most lower secondary education (%)	67.1	66.9	16	Average yearly FDI 1999-2007 (USD million)	595	2.9	6
Population with upper secondary education (%)	15.4	16.7	20	Exporting *maquiladora* industry production (2004 USD million)	3 999	4.6	7
Population with tertiary education (%)	17.5	16.4	12	Marginalisation index	-0.77	0	27
Households with a PC (%)	23	19	7	Gini coefficient	0.563	0.616	9
Municipalities (number)	124	5.1	5	Human Development Index	0.806	0.803	14

Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 10.1. GDP growth and GVA per capita: Jalisco



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

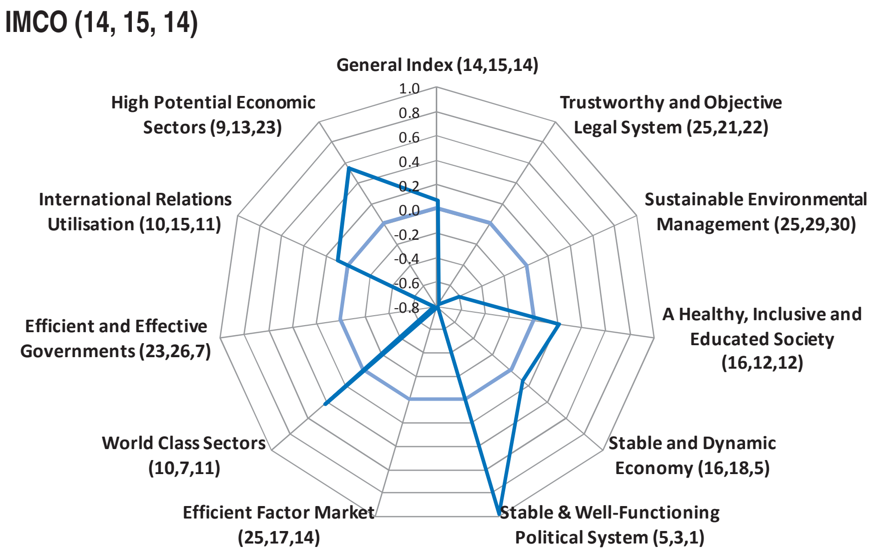
Jalisco's GDP had an average growth rate of 3.4% from 1996 to 2006, just below the national average of 3.6%. The state's growth rate pattern follows those of the national growth rates with a couple of years being more than a percentage point above or below national rates. The state's real GDP per capita increased over the period, but not as much as the national average. Jalisco's growth rate will need to increase not only to maintain competitiveness within Mexico, but also to reach the levels observed in higher income OECD countries.

Jalisco has a GVA per head that is 96.7% the national average. GVA per worker, a proxy for labour productivity, is driving this difference as it is 10% below the national average. While Jalisco has higher than average scores in the quality of education, it performs at about the national average in both schooling years and secondary education completion, contributing to its human capital and the value added of the workforce. Positive drivers for the state's GVA per capita include the participation rate that is 4.2% above the national average (the share of the working age population that is economically active) and the employment rate that is 2.9% higher (the share of the economically active that are employed).

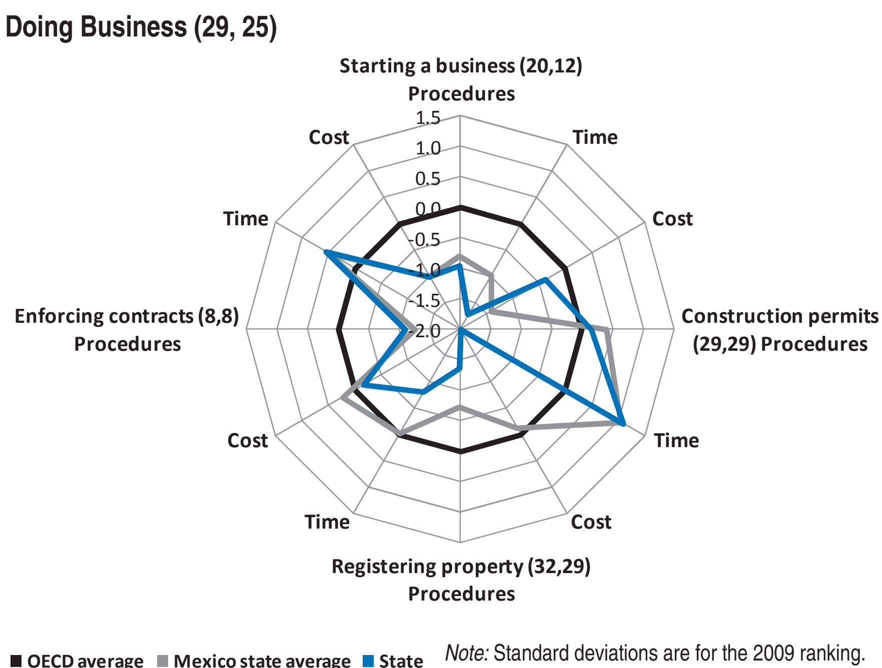
Competitiveness indices

Figure 10.2. Example competitiveness rankings: Jalisco

Standard deviations from the mean (0)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

Jalisco ranks average or below average on several traditional competiveness indices. It is currently ranked fourth by IMCO (15^{th} in 2006, fourth in 2003). The state is only 0.07 standard deviations above the Mexico average. Among the ten component indicators, the performance is highly variable. The state is generally low ranked in Sustainable environmental management, Efficient and effective government, Trustworthy and objective legal system and Efficient factor market. One area of relative strength is the category Stable and well functioning political system that is almost one standard deviation above the national average (in the top five states over the last three rankings). Jalisco shows a more mature political system where different parties have been able to govern alternatively in the local and state levels with no significant transitional political conflicts for more than 20 years. Two of the cities in the state ranked by IMCO are the competitive Guadalajara (third) and the much lesser ranked touristic destination Puerto Vallarta (39^{th}). Despite a strong IT and electronics sector, the state's ranking on the Knowledge Economy Index is only slightly above average (13^{th}).

With respect to the Doing Business rankings, Jalisco ranks very low (29^{th} out of 32, having slipped four places since 2007). An effort to harmonise regulations across all municipalities in the state is underway in part to address this relatively poor performance, as the state has 124 municipalities across which to co-ordinate. The state performs better than the OECD average in only three out of 12 factors: procedures and time for construction permits and time for enforcing contracts. Jalisco performs better than the national average on four out of 12 factors. In terms of starting a business, the state's national ranking dropped from 12^{th} to 20^{th} place and while poorly ranked on many other factors remained in eighth place nationally for enforcing contracts.

In terms of the federal SARE system to facilitate firm registration and development, only seven of the state's 124 municipalities have an office. While these seven cover almost 64% of the state's population, the below average performance in starting a business could be partially attributable to these gaps.

Competitiveness committees and policies

- The state's main initiative to promote competitiveness is The Great Alliance for Jalisco in which several committees or working parties in specific topics have gathered to identify needs and priorities that impact the state's ability to compete. All relevant actors are included with private sector and HEIs being fundamental to this major initiative. The results of meetings are expected to produce concrete actions, projects and policies aimed at positively impacting different variables of competitiveness.
- The state is currently working with IMCO to increase its competitiveness ranking.
- The state has an Economic and Social Council (CESJAL for its acronym in Spanish) that is autonomous and integrates actors from different sectors of society and has the objective of promoting actions and policies to improve the state's economic and social performance.

Industrial structure and clusters

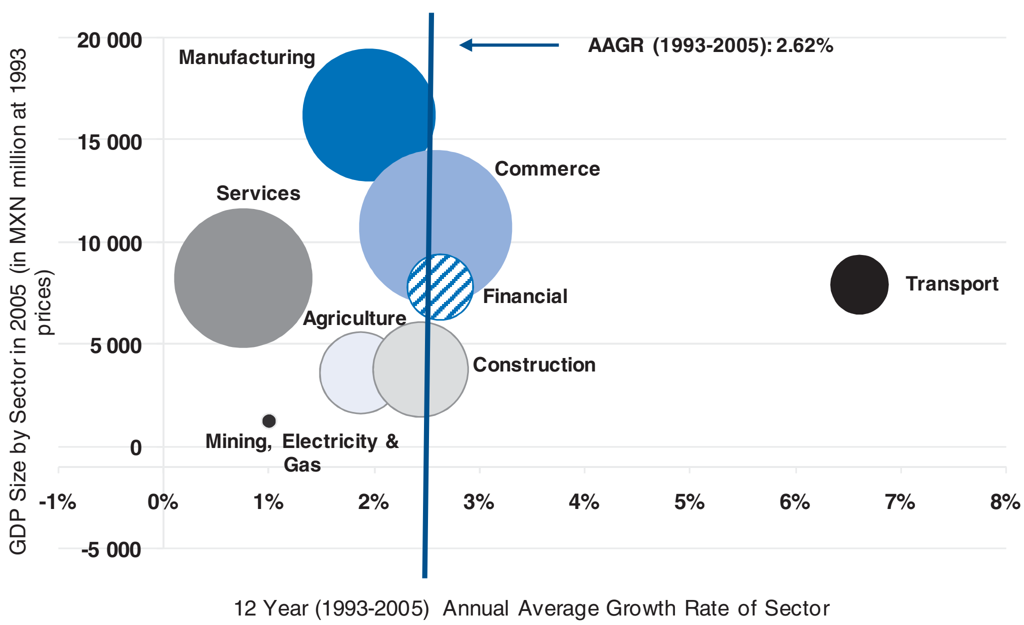
Table 10.2. Sectoral breakout: Jalisco

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants & Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	5.0	0.4	19.6	4.7	0.4	25.6	11.6	10.8	21.9
National2 005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	7.9	0.5	21.5	4.2	0.6	25.4	8.8	12.2	18.8
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

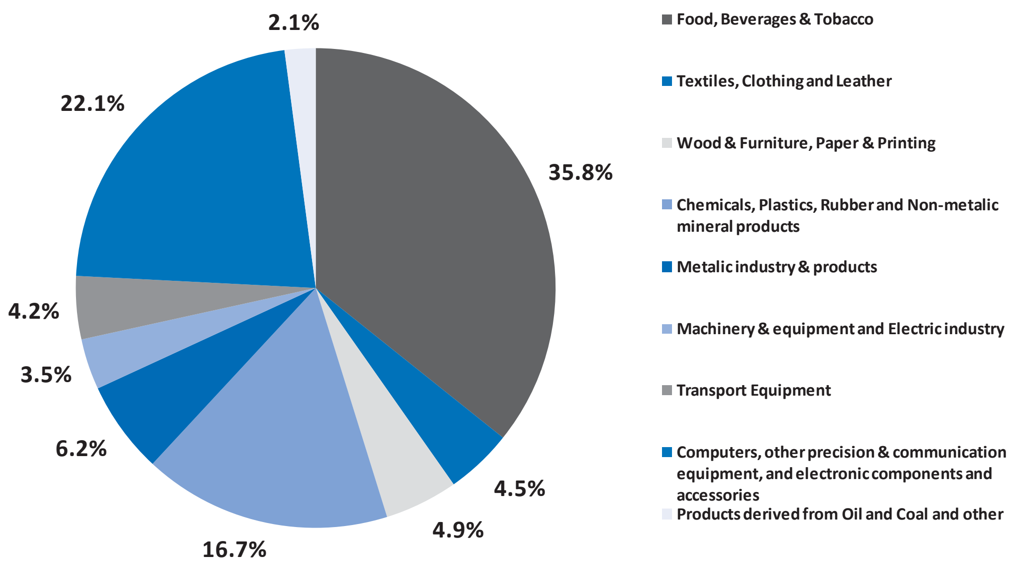
Figure 10.3. GDP by sector size and growth: Jalisco



Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

Figure 10.4. Breakout of manufacturing sectors: Jalisco



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 10.3. GVA by technology level: Jalisco

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	51.1	32.1	21.1	24.7	12.7	31.6	15.1	11.6	5 940
Number of firms	53.6	61.8	41.8	35.3	3.6	2.1	0.9	0.8	23 852
Employment	45.6	44.1	30.2	25.0	10.3	21.5	13.9	9.4	325 887
Total assets	48.9	29.4	26.6	36.8	12.2	29.6	12.3	4.2	7 304
Investment	46.5	30.2	20.7	22.0	15.7	41.1	17.1	6.8	444
FDI (2007)	2.1	9.8	19.3	40.5	5.9	32.5	72.7	17.2	283

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 10.4. Firm demographics: Jalisco

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	2 254 202	100.0	100.0
Micro	1 282 114	56.9	54.8
Small	486 667	21.6	20.3
Medium	273 100	12.1	13.5
Large	212 321	9.4	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

As observed in most states, the structure of Jalisco's economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share by over a third, representing 7.9% of GDP in 1993 and only 5% in 2005. Jalisco has a larger proportion of its GDP coming from the primary sector compared to the national average (46.5% higher than the national 3.4%). Jalisco has developed extensive agriculture to become the nation's first or second producer of various products: weber agave for tequila (98.2% of national total), cherry tomato (44.3%), green corn (34.1%), forage grass (24.4%), watermelon (20.2%), yellow grain corn (28%), red salad tomato (30.2%), sugar cane (11.7%), white grain corn (17.5%), mango (12.6%) and green tomato (10.1%). Being a Pacific-coastal state it produces 24.1% of the national total of a kind of anchovy (charal) and 23.4% of lobina fish (similar to catfish). It is also the largest producer of chicken, egg and cow's milk and the second largest beef and pork producer.

The sector that had the largest annual average growth was transport, communications and storage with 6.6%. Manufacturing grew at a much lower average annual rate of approximately 2% during this period. Commerce, restaurants and hotels (the largest employer with 28% of the total) grew at an average rate of 2.6%; agriculture, forestry and fishing at 2.5% and construction at 1.9%. Commerce, restaurants and hotels (where tourism plays an important role) employed 804 097 followed by communal, social and personal services (including government) employing 653 861. Manufacturing employs a total of 601 335 and represents just over a fifth of the state's employment. Jalisco's agriculture, forestry and fishing activity remains significant (as compared to national levels) employing 309 027, albeit representing half the size of the workforce in manufacturing.

While manufacturing was a significant percentage of the state economy in 1993 with 21.5% of GDP, that share did decline by 9% to 19.6% in 2005. This is just above the national average of 17.9%. The state has a diversified manufacturing sector as it began its industrialisation more than 100 years ago, when the first cement, sugar cane, textile and large scale food processing factories began. Industrialisation continued with more food processing plants, soap, glass, clothing, leather and footwear, rubber, plastics, chemicals and other industries. During the second half of the 20th century, Jalisco developed other industrial sectors, such as pharmaceuticals, printing companies, and furniture manufacturing. More recently, during the last 25 years, the state has developed car assembly and in a larger scale, the auto part industry with 8% of the national production in 2006. Jalisco has also been developing a considerable amount of electronics and software for the export market. As of 2003, *maquiladoras* represented almost 4% of the state manufacturing value added.

Given the large primary sector, Jalisco's GVA has a much higher share of low technology industries relative to the national average. Such industries represent just over 51% of the state's GVA while for the nation as a whole it is only 32.1%. While the share in mid-low technology industries is similar to the national average, the state has a significantly smaller share of GVA in mid-high technology industries (12.7% *versus* 31.6% nationally). However, the state does have above average rates in high technology industries with respect to GVA, total assets, number of firms, employment and FDI flows. This shows the strength of Jalisco for certain higher value added sectors such as electronics and software.

Jalisco's employment by firm size is relatively similar to the national average. Nevertheless, it has a slightly higher share of employment in micro and small economic units, with 78.5% *versus* 75.1% nationally. The state therefore has a slightly below average share of employment in medium-sized (12.1% *versus* 13.5%) and large (9.4% *versus* 11.5%) firms.

Strategies and policies to support sectors and clusters

Sectors targeted

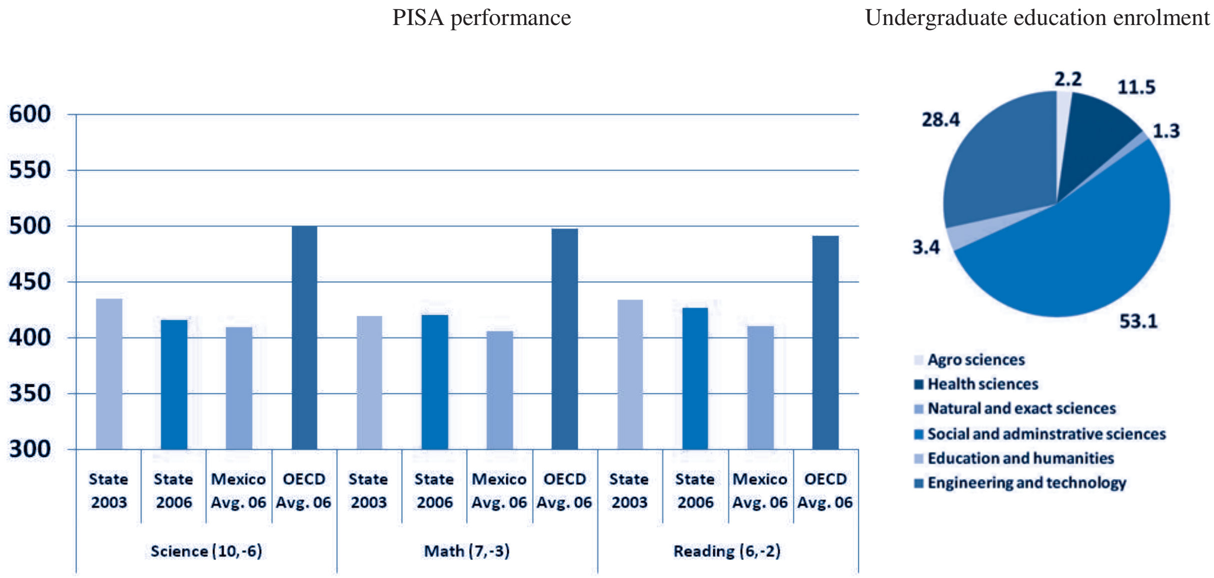
Industry: Food and Beverage, Machinery and Equipment, Chemical, Plastics, Textile, Clothing and Footwear, Wood and Furniture; Services: those related to manufacturing, tourism, education and finance (Source: *Plan Estatal de Desarrollo 2030 del Estado de Jalisco*)

According to different sources, Jalisco's industry had the following specific characteristics:

- Fourth largest auto part manufacturer with 8% of national total (after the Federal District, the State of Mexico and Nuevo Leon).
- First in Mexico for fabrication of computers, communication, measurement and other equipment, electronic components and accessories (Source: INEGI 2004).
- In mining: sixth, eighth, tenth and 11th nationally in terms of barite, silver, lead and gold respectively (Source: CONACYT 2006).
- 13 industrial parks, cities and industrial corridors (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 5.284 billion for 2.5% of the national total (Source: Ministry of Economy, 2008).

Innovation system

Figure 10.5. Education: Jalisco



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

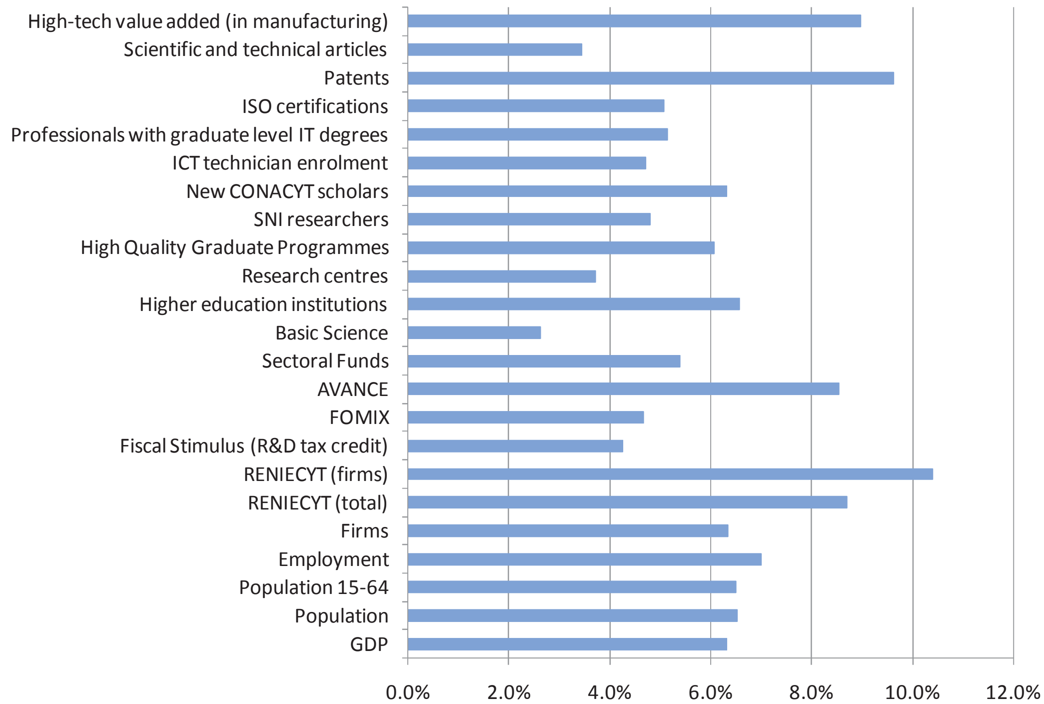
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Jalisco is in the top ten best scores in all three PISA areas, but it is still behind OECD averages in science, reading and math by more than two standard deviations. Compared to the Mexico average, Jalisco's position in the 2006 PISA has declined relative to the 2003 evaluation, losing six places in science, three in math and two in reading. This trend will need to be reversed to ensure long term state competitiveness.

Current enrolment for undergraduate degrees (in universities and technological institutes) shows a very high share of students in social and administrative sciences. In Jalisco these disciplines represent 53.1% of enrolment, *versus* 46.8% nationally. In contrast, engineering and technology related programmes are relatively underrepresented in Jalisco, with only 28.4% of enrolment *versus* 33.4% nationally. This data suggests that further specialisation in programmes related to industry, and especially innovation and higher technology, could be pursued.

Figure 10.6. Innovation snapshot: Jalisco

Percent of national total



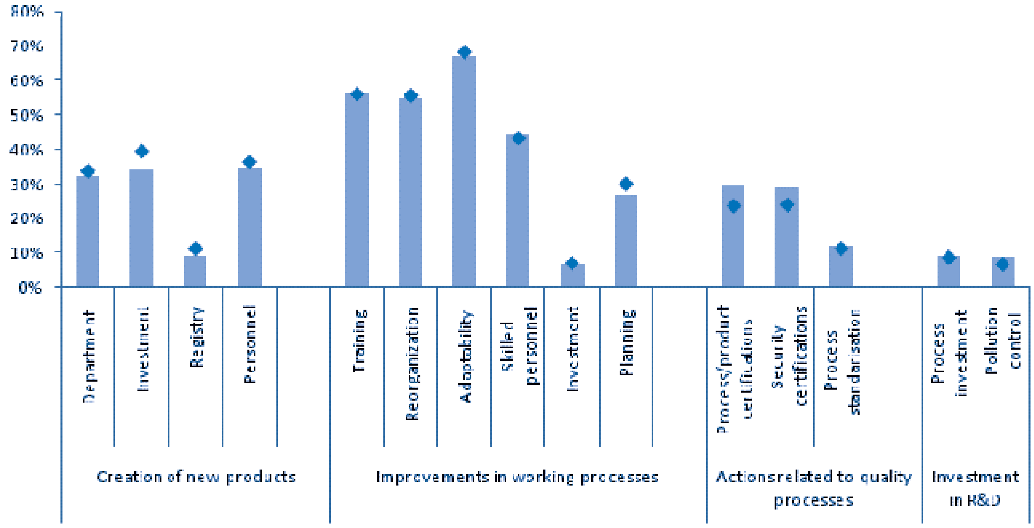
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Jalisco's GDP accounts for 6.3% of the national total, and in several programmes and assets related to innovation the state performs at what would be expected given its GDP share. Particularly high is the state's AVANCE funds with 8.5% of the national total. Also relatively higher is the number of patents with 9.6% of the national total. Entities and firms in the S&T registry RENIECYT are disproportionately high when compared to GDP at 8.7% and 10.4% of the national total; similarly the state has a higher share in terms of value added in high-tech manufacturing with almost 9% of the total. Other innovation indicators are at or below what could be expected considering the state GDP as a benchmark. The state has only one CONACYT public research centre (seven overall according to ADIAT's directory) but is developing other innovation related assets such as the CENALTEC which incorporates the higher tech sectors including electronics, IT and software. Three areas where improvements could be pursued refer to the usage of FOMIX and Fiscal Stimulus (R&D tax credit) programmes, as well as the number of scientific and technical articles, as these indicators are below what would be expected given the size of Jalisco's economy.

Figure 10.7. Innovation by manufacturing firms: Jalisco

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, Jalisco's firms generally show results similar to those of the nation as a whole. In terms of the creation of new products, the state ranks relatively higher than the national average, especially in terms of investment (40% *versus* 34% nationally). Investments on improvements of the working process are also similar to the national average. Process certifications are much lower than those of the nation as a whole, and investment in R&D shows a similar level to the national average.

State Science and Technology Council and other major innovation initiatives

- The state of Jalisco is the only one in Mexico that measures innovation performance at the sub-national level using international standards such as the Oslo Manual.
- The state S&T Council has its primary focus on innovation through development and application of knowledge.
- Jalisco constituted an executive branch of the state S&T Council which implements policies in the IT, multimedia and software sectors that has supported development of the state as a hub in this area.
- The state has an outstanding usage of the PROSOFT federal programme that has further promoted the development of these sectors.
- In Jalisco, over 80% of S&T expenditures come from the private sector.

Chapter 11

Mexico

Strengths
-Large local market and proximity to Mexico City
-Strong flows of FDI
-High propensity of manufacturing firms to innovate
-Important increases in terms of state spending in S&T
-Strong industrial sector and infrastructure
-Co-ordination across government levels and with surrounding regions
-Solid structure of higher education institutions

Weaknesses
-Below average GDP growth rates
-Important regional disparities
-High unemployment and informality rates

The State of Mexico is located in the Centre meso-region. Alongside Mexico City (Federal District), its populous municipalities encompass the largest metropolitan area in the country with over 18.8 million inhabitants. Because of its proximity to the national capital, the State of Mexico followed the industrial growth of this city for most of the last century and more recently has attracted other manufacturing industries. It is the 25th largest state in surface area, but with a population of over 14 million inhabitants it is the most populous state (13.6% of the nation) and after Mexico City, the most densely populated. Most of the state's economic activity and population is encompassed in the metropolitan area of Mexico City (national capital) including 40 of its 125 municipalities. The state population is growing at a somewhat higher rate than the national average (1.2% *versus* 1.0%). In terms of overall rates of educational attainment, the state is slightly above the national averages.

The state's GDP of USD 81.9 billion represents 9.5% of the national economy (second largest). However GDP per capita is significantly below the national average (ranked 21st) with USD 5 935 compared with a national average of 8 241. With an integrated system of metropolitan municipalities, Mexico is one of the most industrialised states in the country. In mining, it produces silver, lead and gold. It also has 35 *maquiladora* plants with exports of USD 333 million representing 8.1% of the state's total exports, albeit this is a small share of the national total (0.38%). The state has about the average score on the Human Development Index for the country (18th), this being an important indicator of general welfare, and has a slightly better income distribution than the average for a Mexican state (13th).

Table 11.1. Socio-economic snapshot: Mexico

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	14.2	13.6	1	GDP (USD million)	81, 903	9.5	2
Area (sq. km)	22 333	1.1	25	GDP per capita (USD)	5 935	8 241	21
Population density[1]	637.1	97.9	2	GDP yearly growth 1996-2006 (%)[4]	3.8	3.6	16
Population 0-14 (%)	29.8	31.1	24	Primary sector (%)	1.3	5.5	28
Population 15-64 (%)	66.0	63.7	5	Industrial sector (%)	32.3	27.5	7
Population 65+ (%)	4.2	5.3	28	Services sector (%)	66.4	67.1	15
Rural population (%)[2]	12.9	23.5	26	Employment rate (%)	60.6	62.9	25
Population annual growth (2000-2005) (%)	1.2	1.0	14	Unemployment rate (%)	4.1	3.0	27
Yearly migration to the US[3]	127 425	1.4	4	Participation rate (%)	63.6	64.9	21
Population with at most lower secondary education (%)	64.5	66.9	19	Average yearly FDI 1999-2007 (USD million)	1,132	5.6	3
Population with upper secondary education (%)	20.1	16.7	5	Exporting *maquiladora* industry production (2004 USD million)	333	0.4	15
Population with tertiary education (%)	15.5	16.4	20	Marginalisation index	-0.62	0	21
Households with a PC (%)	22	19	9	Gini coefficient	0.581	0.616	13
Municipalities (number)	125	5.1	4	Human Development Index	0.787	0.803	18

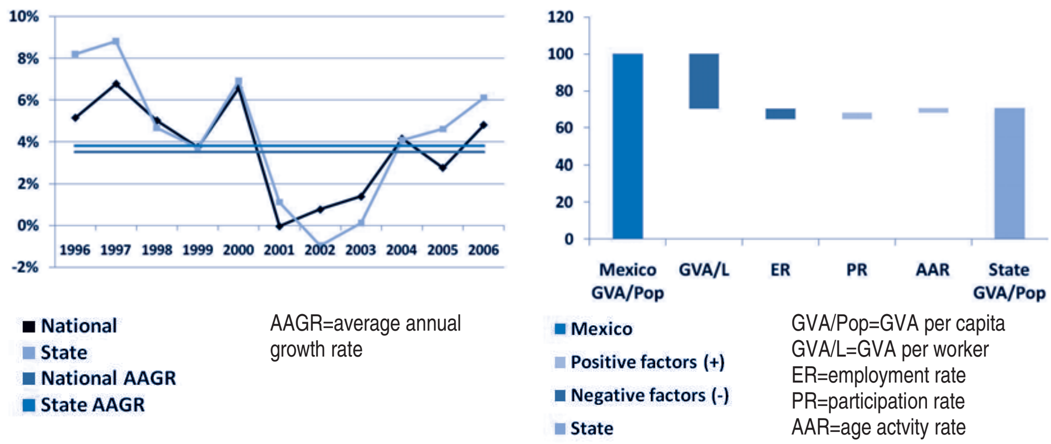
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 11.1. GDP growth and GVA per capita: Mexico

% growth GVA per capita of state *versus* national average



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Mexico's GDP had an average annual growth rate of 3.8% from 1996 to 2006, just about the national average of 3.6%. However, the state's real GDP per head increased less than that of the national level. That state's growth rates were at or below national levels between 1998-2004 (except for 2001), but have increased relatively more over the last two years.

Mexico's GVA per capita is only 70.7% of the national average. A lower GVA per worker, a proxy for labour productivity, is the main driver of this differential as it is 29.7% below the national average. The state has somewhat higher than average scores in the quality of education and only about the national averages in schooling years and secondary completion standards, all of which contributes to the human capital and the value added of the workforce. The employment rate relative to the national average (share of economically active adults who are employed) is another driver of a lower GVA per head for the state (-5.5%).

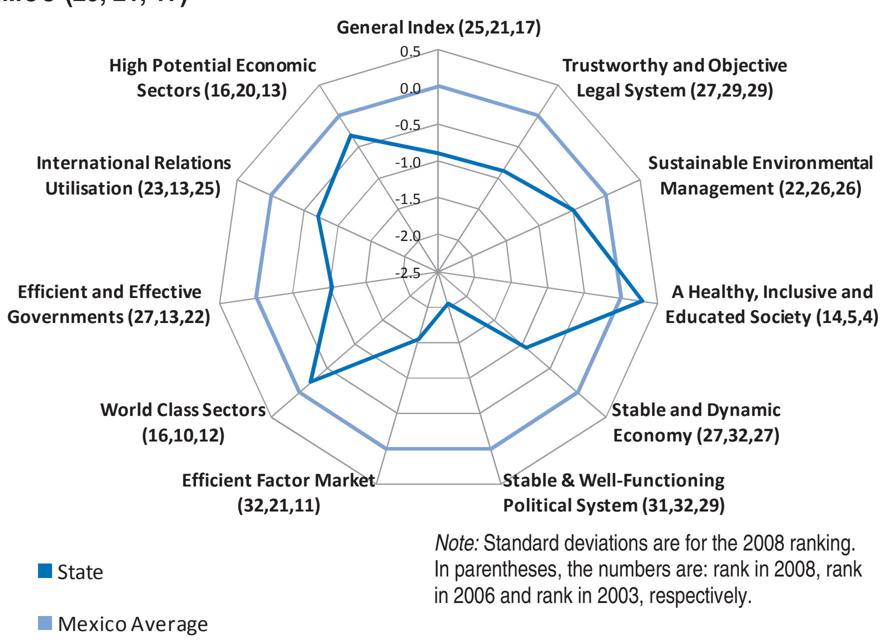
The State of Mexico ranks below average on traditional competitiveness indicators. Per IMCO, the state is ranked 25th, down from 21st place in 2006 and 17th place in 2003. The state is almost one standard deviation below the national average. Of the ten component indicators, it is above the national average on only one, Healthy inclusive and educated society (albeit down to position 14 from four in 2003). The least performing indicator is Stable and well functioning political system that is over two standard deviations below the national average. The state has also lost considerable ground on Efficient factor market (down to 32—last—from 11 in 2003). The manufacturing sector has an impact on the indicator of average pollutant areas, decreasing performance in the Sustainable environmental management area. The cities ranked by IMCO in the state are Valle de Mexico (25) and Toluca (56). The State of Mexico is ranked 27th on the Knowledge Economy Index.

Competitiveness indices

Figure 11.2. Example competitiveness rankings: Mexico

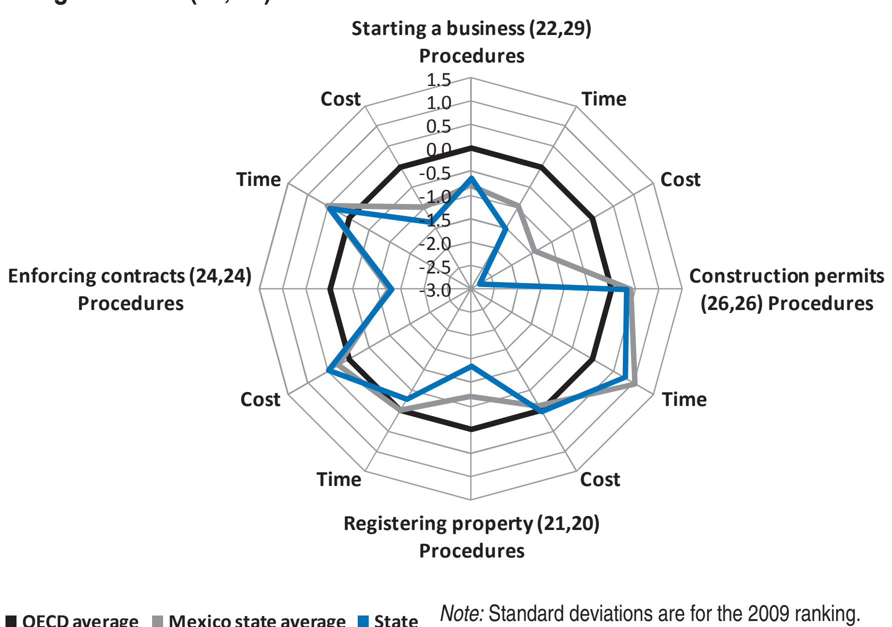
Standard deviations from the mean (0)

IMCO (25, 21, 17)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.

Doing Business (28, 30)



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

For the Doing Business rankings, the state has below average performance (ranked 28th) although this is up two places from 2007. Mexico ranks above the OECD average on five out of 12 factors. Especially poor is the cost of starting a business at almost three standard deviations below the OECD average. The state performs better than the national average on only three out of 12 factors. The national rankings have remained consistent on three of the four categories between 2007 and 2009, with an improvement noted in starting a business (up to 22nd from 29th place). There is significant margin to improve the business environment at both state and municipal levels.

In terms of the federal SARE system to facilitate firm registration and development, only five out of 125 municipalities in the state have an office. They are concentrated around Mexico City and the capital of the state Toluca. Only a very small share of the population lives in a municipality with a SARE at 17.2%. This could serve as a barrier for promoting firm start-ups.

Competitiveness committees and policies

- The state has constituted a co-ordinating commission to address competitiveness issues that includes seven working groups.
- The state has incorporated a strategic line of action that seeks to upgrade its competitiveness through strengthening linkages between HEIs and the private sector.
- The state has defined upgrading infrastructure as a high priority to improve competitiveness, and has carried out several projects to do so.

Industrial structure and clusters

Table 11.2. Sectoral breakout: Mexico

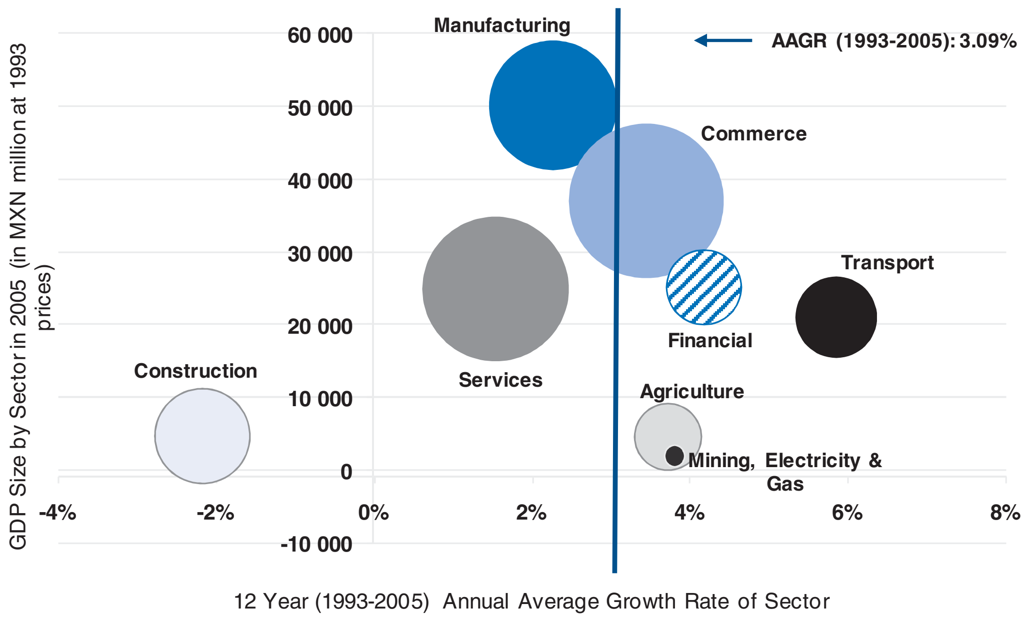
in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	1.3	0.4	27.7	3.5	0.5	21.3	9.3	14.4	21.6
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	2.5	0.3	31.9	5.3	0.8	20.5	8.9	12.9	17.2
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

The structure of the state's economy by sector has changed somewhat between 1993 and 2005. The share of the economy in the primary sector (agriculture, forestry and fishing) halved from 2.5% of GDP in 1993 to 1.3% in 2005. Nevertheless, the State of Mexico has developed some agriculture and has become the top national producer of several products: carnation flower (100% of national total), chrysanthemum flower (99.3%), rose flower (76.7%), prickly pear (54.8%), peas (66.6%), green forage oats (35.5%) and corn grain (13.8%). It has developed some fresh water fisheries where carp and trout are raised. It is also a relevant producer of chicken, egg, cow's milk, beef and pork.

Figure 11.3. GDP by sector size and growth: Mexico

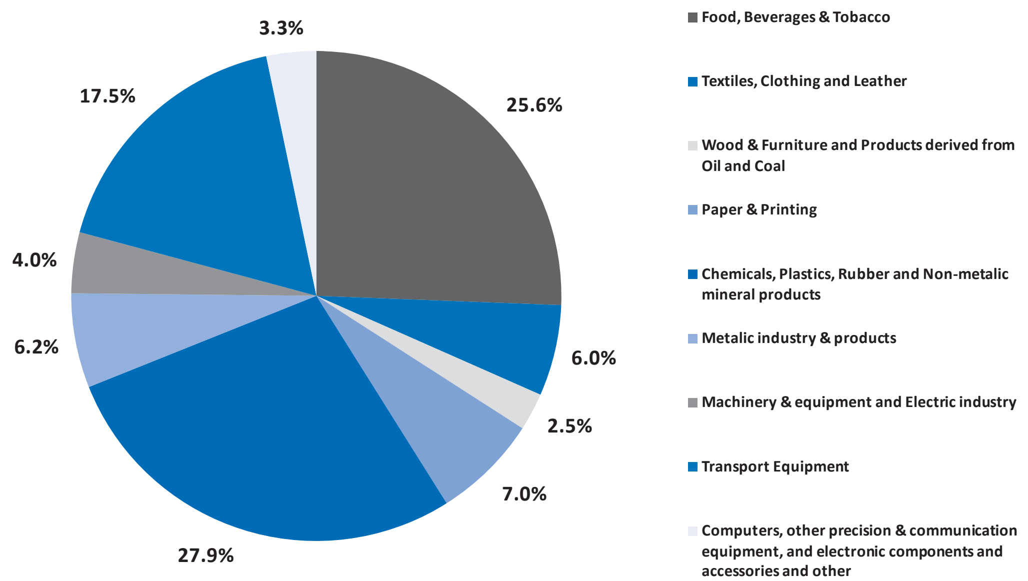


Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The sector of the economy that had the largest annual average growth was transport, communications and storage with 5.9%, while manufacturing grew at an annual average rate of 2.3% during this period. Also, commerce, restaurants and hotels (the largest employer with 27% of total employment) grew at an average 3.5%; agriculture, forestry and fishing at 3.73% and construction decreased at an average rate of 2.2%. Commerce, restaurants and hotels employs over 1.5 million employees followed by communal, social and personal services (including government) employing 1.3 million, while manufacturing, that employs over 1 million, represents 18.9% of the state total. Agriculture, forestry and fishing activities employ 286 078 people, representing only 27% of what manufacturing does (5.2% of the state's total employment).

Figure 11.4. Breakout of manufacturing sectors: Mexico



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 11.3. GVA by technology level: Mexico

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	41.9	32.1	23.3	24.7	25.9	31.6	8.8	11.6	11 480
Number of firms	65.0	61.8	31.1	35.3	3.3	2.1	0.7	0.8	34 258
Employment	44.2	44.1	30.9	25.0	20.6	21.5	4.3	9.4	453 832
Total assets	37.9	29.4	29.7	36.8	27.7	29.6	4.7	4.2	12 611
Investment	48.2	30.2	22.2	22.0	19.9	41.1	9.6	6.8	591
FDI (2007)	30.6	9.8	-10.7	40.5	45.3	32.5	34.8	17.2	268

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 11.4. Firm demographics: Mexico

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	4 599 483	100.0	100.0
Micro	2 570 529	55.9	54.8
Small	863 482	18.8	20.3
Medium	782 147	17.0	13.5
Large	383 325	8.3	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing, that had a significant percentage of the state economy in 1993 with 31.9% of the state's GDP, decreased its share by 13% from 1993 to 2005. It now represents 27.7% of the state's GDP, albeit this is notably higher than the national average of 17.9%, positioning the state above average in its level of industrialisation within the country. The state has a diversified manufacturing base with some well developed industries, a characteristic not very common in Mexico and one that reflects early industrialisation in the state that began more than 60 years ago. The largest manufacturing sector is in the chemicals, plastics, rubber and non-metallic minerals sector and in the food, beverages and tobacco industries, both domestic market oriented. Another important player that is inward and outward (world market oriented) is the transport equipment sector in its two areas: auto parts and car assembly. The auto part industry accounted for 20% of the national production in 2006 (second largest after the Federal District at the national level), while the car assembly industry represented USD 1.5 billion that same year (9.5% of the total national value). As of 2003, *maquiladoras* represented 2.3% of the state manufacturing value added.

The state's GVA is in industries that are more in low to mid-low technology sectors. For example, low technology industries represented 41.9% of GVA (32.1% nationally) and the share in mid-low technology is about the same as the national average. The state is under-represented in mid-high technology industries at 25.9% of GVA (31.6% nationally). High technology industry GVA is only at 8.8% (11.6% nationally), however in terms of FDI it represents a much larger share.

The State of Mexico has a similar employment structure by firm size relative to the national average. The percentage of employment in micro and small economic units is only slightly lower at 74.7%, compared to a national average of 75.1%. Medium-sized firms account for 17% of employment *versus* 13.5% nationally, while there is an under-representation of employment in large firms at 8.3% *versus* 11.5% nationally.

Strategies and policies to support sectors and clusters

Sectors targeted:

- Generally: Food and Beverage, Chemical, Pharmaceutical, Textile and Clothing;
- For Foreign Investment: Metal-Mechanic, Auto, IT, Aerospace (Source: Economic Development Secretary)

According to different sources, the State of Mexico's industry had the following specific characteristics:

- Second largest auto-part manufacturer with 20% of national total (after the Federal District) (Source: CONACYT, 2006).
- Fifth largest car assembly manufacturer in the country (9.5% of the national total) (Source: CONACYT, 2006).
- 84 industrial parks, cities and corridors (Source: Economic Development Secretary).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 11.211 billion for 5.3% of the national total (Source: Ministry of Economy 2008).

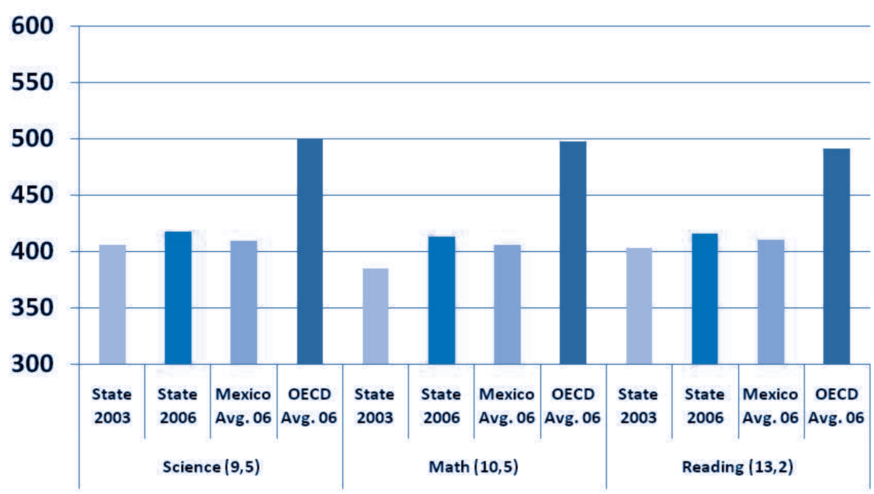
The State of Mexico has had better scores than most Mexican states in the results from the last two PISA (Programme for International Student Assessment) evaluations. Nevertheless, it is still behind the OECD average by more than 2.5 standard deviations in all three areas: science, reading and math. Compared to the national average, the state improved its scores in the 2006 PISA evaluation from those observed in the 2003 evaluation, gaining five places in science, five in math and two in reading. Hopefully this positive trend shall continue.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies little with respect to what is observed nationally. As is the case in most of the country (48.6%), the State of Mexico (51.1%) shows a relatively high concentration of students in social and administrative sciences programmes. Engineering and technology related programmes account for the second highest enrolment in the state with 31.2% of the total, below the national average of 33.4%. This data suggests that further specialisation in programmes related to industry needs, and especially innovation and higher technology, could be pursued.

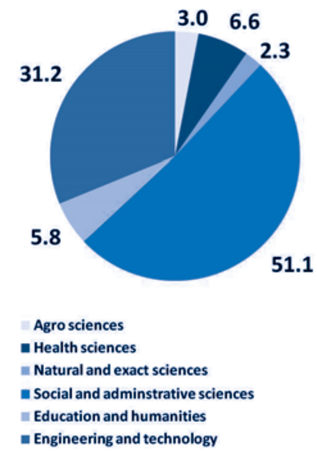
Innovation system

Figure 11.5. Education: Mexico

PISA performance



Undergraduate education enrolment



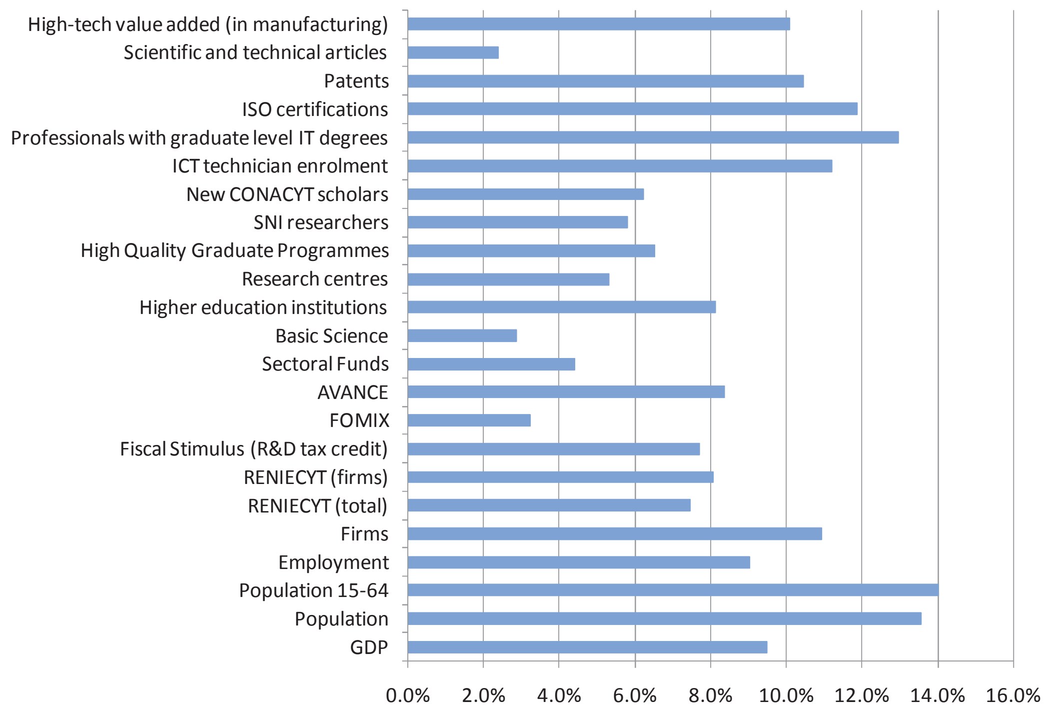
Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

The State of Mexico's GDP accounts for 9.5% of the national total. Using this as a benchmark, the state performs particularly well with respect to ISO certifications, ICT technician enrolment, graduates with IT degrees and patents at 11.9%, 11.2%, 13% and 10.5% of the national totals respectively. Similarly the state exhibits above average value added generated in the high-tech manufacturing sector at over 10%. However, particularly low relative to GDP are FOMIX and Sectoral Funds with 3.23% and 4.4%, respectively and the Basic Science indicator with 2.9% of the total. The State of Mexico does not house one of the country's 27 CONACYT public research centres, but in overall terms hosts ten research centres according to ADIAT's directory. Other innovation infrastructure has been developed, such as the recently opened Research Centre of Sustainable Chemistry joint between the National Autonomous University of Mexico (UNAM) and the Autonomous University of the State of Mexico (UAEM)—an initiative that responds to the state's important industrial needs in this and related fields.

Figure 11.6. Innovation snapshot: Mexico

Percent of national total



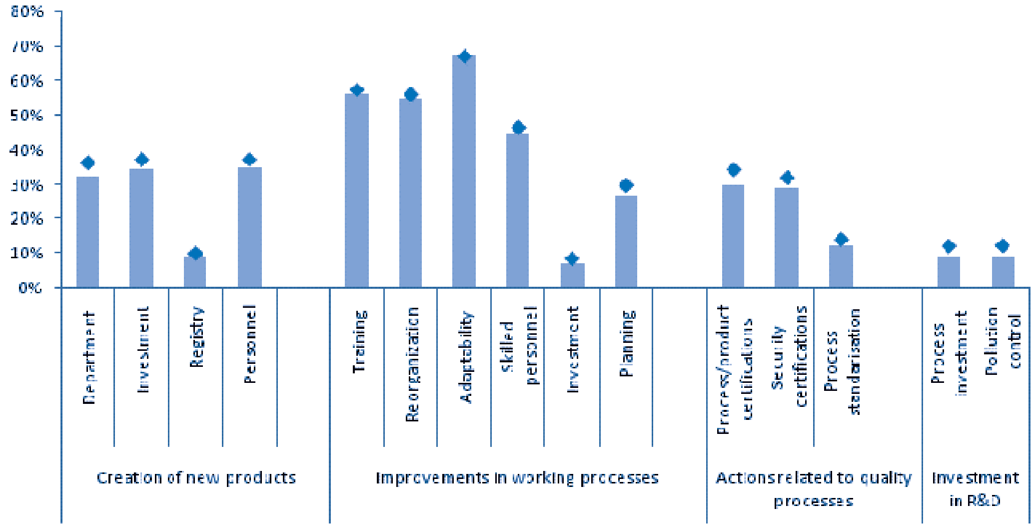
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Regarding innovations among manufacturing firms, Mexico's firms generally show better results than the nation as a whole. In terms of the creation of new products, the state ranks relatively higher than the national average, especially in terms of the number of firms that have a department for this purpose (36% *versus* 32% nationally). Investments for improvements of the working process are also higher than the national average by one percentage point. Process certifications are better ranked than the nation as a whole, and so is investment in R&D.

Figure 11.7. Innovation by manufacturing firms: Mexico

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

State Science and Technology Council and other major innovation initiatives

- The state's S&T Council has shown very large budget increases and is now able to fund considerably more projects related to R&D and innovation.
- The state is one of the most active in terms of its usage of the federal Economia-CONACYT Innovation Fund.
- The state S&T Council places a priority on cultivating a culture of intellectual property. It has implemented a policy that covers 100% of the cost of registering industrial property with IMPI. It has also created a local version of the federal IMPI called the Centre for Technical Assistance and Innovation (CEATI for its acronym is Spanish) that helps firms in branding, patenting and other industrial property protection.

Chapter 12

Michoacan

Strengths
-Strategic location for shipping (port infrastructure)
-Climatic conditions (wide variety within the state)
-Strong flows of remittances
-Agricultural specialisation with strong branding culture
-Collaborative state-level governance approaches
-Important improvements in terms of regulatory framework

Weaknesses
-High out-migration rates
-Low levels of industrialisation
-High marginalisation
-Low levels of schooling and human capital

The state of Michoacan in central Mexico (the Centre-West meso-region) is the 16th largest state in terms of land size. With a population of just over four million inhabitants (3.8% of the national total), it is the 14th most densely populated. Particularities include the large share of rural residents at 32% of the state's population (23.5% national average). After the capital Morelia, other important cities include Uruapan, Pátzcuaro, Zamora and Lazaro Cárdenas. It has a major port in Lazaro Cardenas of great importance on the Pacific Coast. The state population actually declined between 2000-2005 (-0.1%) due to migration to the US and other Mexican states, with 6.7% of its population 15-64 having migrated to the US in the last year recorded (second largest annual flows in absolute terms). The state consequently receives considerable amounts of remittances. In terms of educational attainment, it is far behind the national averages in both schooling years and the proportion of its population over 15 years that completed secondary schooling.

The state's GDP of USD 19.1 billion is 2.2% of the national economy (13th largest), though its annual income per head of USD 4 743 is only 58% the national average of USD 8 241 (6th lowest state). Michoacan is the third producer of iron ore in the country and the fifth copper producer. It is the largest producer of avocado, blackberry, strawberry and guava. It has very few *maquiladora* plants. The state is below most others in Mexico on the Human Development Index, ranking 28th (fifth lowest) out of 32 states, having one of the highest (tenth place) marginalised populations in the country but a similar income distribution index to that of Mexico as a whole.

Table 12.1. Socio-economic snapshot: Michoacan

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	4.0	3.8	9	GDP (USD million)	19 109	2.2	13
Area (sq. km)	58 667	3.0	16	GDP per capita (USD)	4 743	8 241	27
Population density[1]	68.2	97.9	14	GDP yearly growth 1996-2006 (%)[4]	2.6	3.6	26
Population 0-14 (%)	32.3	31.1	11	Primary sector (%)	12.5	5.5	3
Population 15-64 (%)	61.4	63.7	26	Industrial sector (%)	21.4	27.5	26
Population 65+ (%)	6.3	5.3	4	Services sector (%)	66.1	67.1	17
Rural population (%)[2]	32	24	11	Employment rate (%)	63.5	62.9	14
Population annual growth (2000-2005) (%)	-0.1	1.0	32	Unemployment rate (%)	1.4	3.0	2
Yearly migration to the US[3]	165 502	6.7	2	Participation rate (%)	65.3	64.9	13
Population with at most lower secondary education (%)	73.1	66.9	5	Average yearly FDI 1999-2007 (USD million)	250	1.2	10
Population with upper secondary education (%)	13.5	16.7	28	Exporting *maquiladora* industry production (2004 USD million)	0	0.0	26
Population with tertiary education (%)	13.3	16.4	27	Marginalisation index	0.46	0	9
Households with a PC (%)	13	19	25	Gini coefficient	0.651	0.616	27
Municipalities (number)	113	4.6	7	Human Development Index	0.758	0.803	28

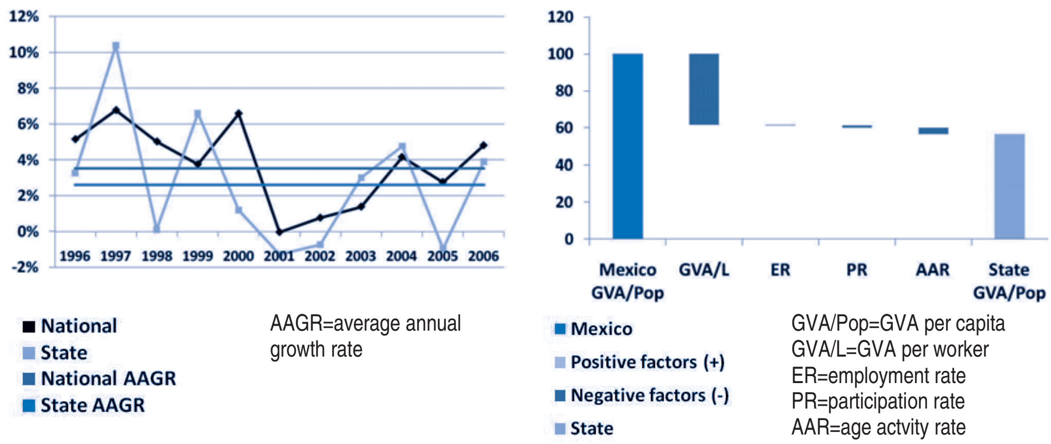
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 12.1. GDP growth and GVA per capita: Michoacan

% growth GVA per capita of state *versus* national average



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Michoacan's GDP had an average growth rate of 2.6% from 1996 to 2006, less than the national average of 3.6%. However, since the state's population has increased at a much slower rate than the national average (due mainly to migration), its real GDP per head increased relatively more. Even at this rate of growth, it would take the state over five decades to reach the GDP per capita level of Mexico City. To ensure a more rapid convergence of the region towards OECD standards, even higher economic growth rates will be needed.

Michoacan's GVA per head is only 57% of the national average. Given the significant labour productivity disparities within the country, GVA per worker (at – 39%) is the most important factor explaining per head GVA differences from the national average. The second most significant contributing factor to the state's underperformance is the age activity rate which drives down the GVA per capita an additional 3.6% below the national average. This lower rate is mainly due to a relatively small working age population as a percentage of the total population (probably due to notable migration of this subset of the regional population).

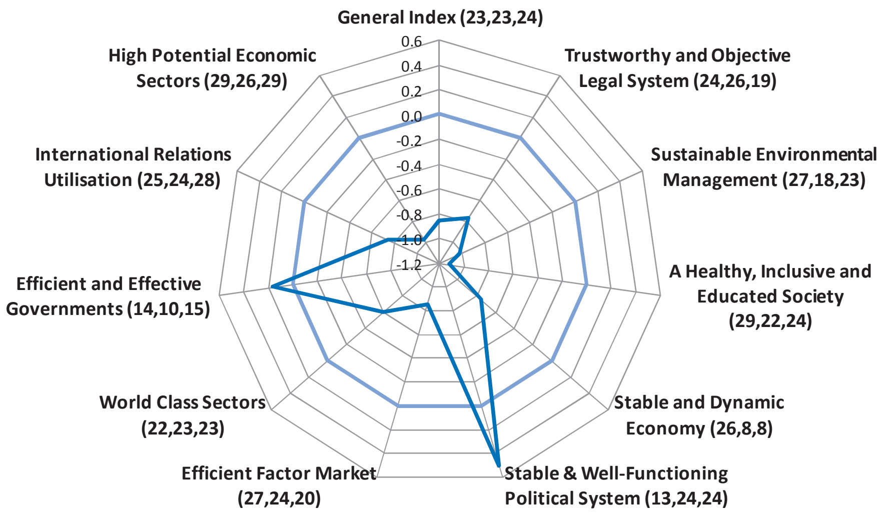
Michoacan ranks relatively low on traditional competitiveness indicators. According to IMCO in 2008, it was ranked 23rd, the same as in 2006 and up one position from 2003. The state is 0.77 standard deviations below the Mexico average. Of the ten component indices, Michoacan ranks below the national average on eight. The state tends to perform best in areas related to governance, including Efficient and effective government (position 14) and Stable and well functioning political system (up to position 13 from 24 in prior years). The state has made progress in reducing corruption, cutting red tape and improving regulations. The state's cities ranked by IMCO include Morelia (34) and Zamora (59). It is ranked lower on the Knowledge Economy Index at 28th place.

Competitiveness indices

Figure 12.2. Example competitiveness rankings: Michoacan

Standard deviations from the mean (0)

IMCO (23, 23, 24)

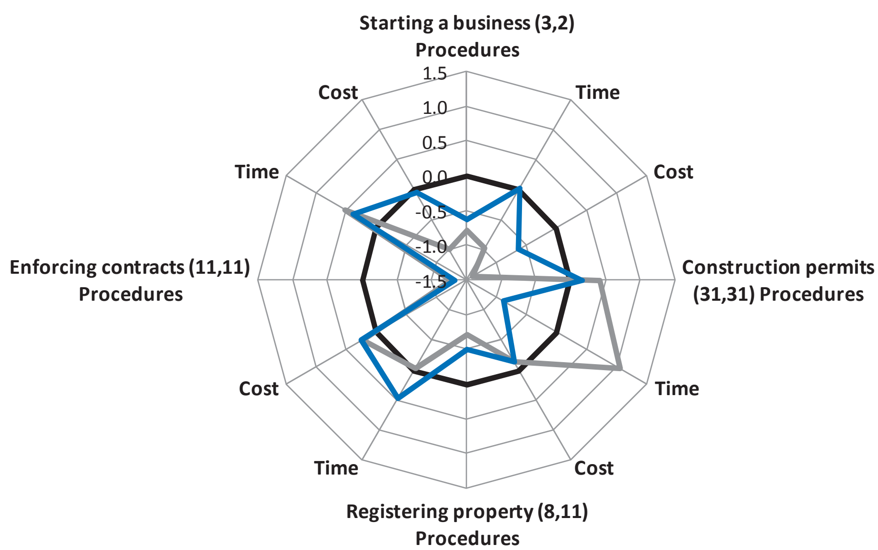


State

Mexico Average

Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.

Doing Business (14, 15)



OECD average   Mexico state average   State

Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

Michoacan is an interesting example of a state whose performance on overall competitiveness indices is low but shows better results in terms of its regulatory framework as measured by Doing Business. Michoacan performs above the Mexico average, ranking 14th in 2009, up one place from 2007. The state's performance is better than OECD averages in five out of 12 factors. Michoacan also performs better than the national average on eight of the 12 factors. Especially strong is the state's performance in starting a business (ranked third nationally). For the construction permits category, the state placed very low at 31st nationally in the last two rankings.

Of the state's 113 municipalities, six are covered by the federal system SARE (to support firm start-ups and development), containing 36.6% of the state's population. However, despite the fact that coverage in terms of population seems relatively low, it does reflect an above average dispersion of the population, including a high rural share, as SARE offices are present in the key cities in the state.

Competitiveness committees and policies

- Michoacan has created "The regional programme for systemic competitiveness" which identifies the most important and strategic economic sectors. This programme diagnoses status and trends of these sectors and seeks to introduce clusters in those that are viable along with specific actions and policies.
- The Associations of Michoacan Businessmen serves as an intermediary between the private sector and government and presents its views on diverse topics directly affecting industry.
- The State's Consulting Council for Economic Development is a mixed body with an equal number of representatives from the local government and the private sectors. It is closely involved in the decision making process for strategies and lines of action aimed at fostering (as it name suggests) economic development.

Industrial structure and clusters

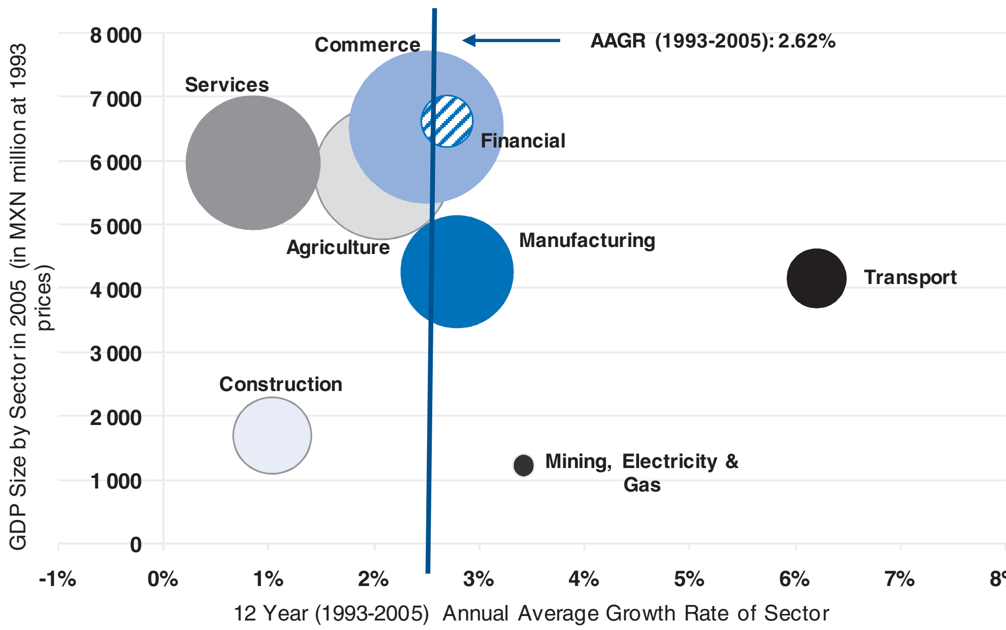
Table 12.2. Sectoral breakout: Michoacan

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	11.0	0.8	12.4	5.8	2.1	17.7	9.2	15.5	25.6
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	16.8	1.0	11.4	5.5	2.1	18.0	7.5	17.9	20.0
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

Figure 12.3. GDP by sector size and growth: Michoacan

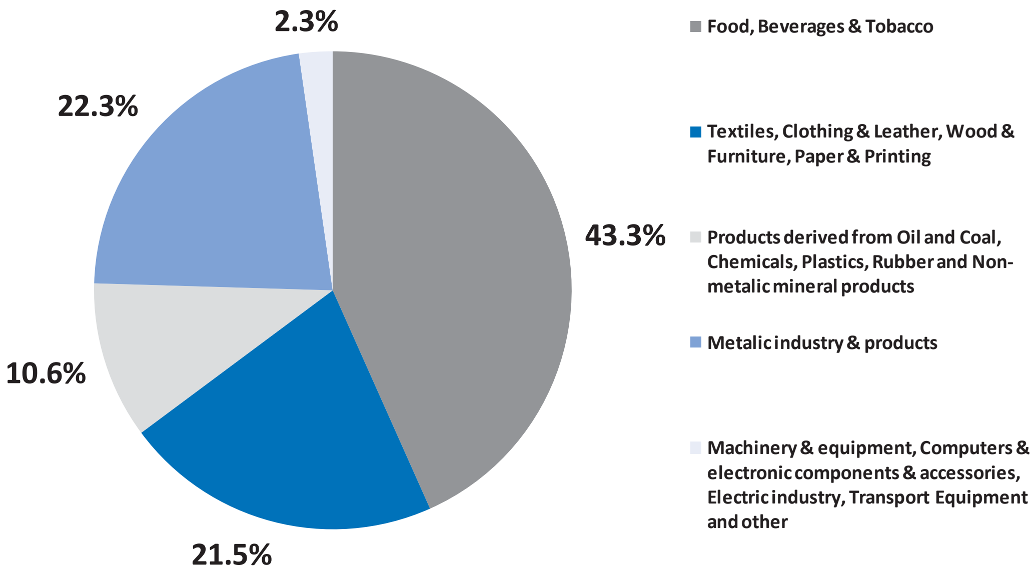


Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The structure of the state's economy (primary, industrial and services) changed substantially between 1993 and 2005. Agriculture, forestry and fishing reduced its share by almost 35% (a decrease from 16.8% of Michoacan's GDP in 1993 down to 11% in 2005). However, the share of GDP in the primary sector is more than threefold that of the national average, explained mainly by its relatively larger rural population. The state is the largest national producer of avocado (96.3%), blackberry (97.6%), strawberry (62.4%) and guava (57.4%). Some of its agriculture, especially that for export (avocado and most of its fruits) has developed intensively through available irrigation systems; however, there is still room for vast improvements in this field. As can be seen, manufacturing in the state is rather low at 12.3% of GDP as opposed to almost 18% nationally. As is the case in the vast majority of other states, the tertiary sector is the dominant one with 67.9% of the state's GDP where communal, social and personal services, (including government) is the mayor contributor with over 25% of GDP.

Figure 12.4. Breakout of manufacturing sectors: Michoacan



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 12.3. GVA by technology level: Michoacan

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	60.0	32.1	35.0	24.7	4.3	31.6	0.7	11.6	958
Number of firms	55.3	61.8	43.9	35.3	0.5	2.1	0.3	0.8	21 000
Employment	61.4	44.1	35.1	25.0	2.7	21.5	0.9	9.4	83 906
Total assets	37.0	29.4	59.4	36.8	3.1	29.6	0.6	4.2	1 976
Investment	69.5	30.2	22.3	22.0	7.6	41.1	0.7	6.8	43
FDI (2007)	-0.9	9.8	100.2	40.5	0.0	32.5	0.7	17.2	1,402

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 12.4. Firm demographics: Michoacan

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	1 123 665	100.0	100.0
Micro	789 473	70.3	54.8
Small	132 724	11.8	20.3
Medium	76 116	6.8	13.5
Large	125 352	11.2	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

The sector that had the largest annual average growth was transport, communications and storage with over 6%. Mining, electricity, gas and water (a relatively small sector in the state) grew at an annual average rate of 3.4% during the same period. Manufacturing grew at 2.8% (slightly over the economy's average). The largest sector in terms of employment is commerce, restaurants and hotels with a total of 438 043 workers, followed by agriculture that employs a total of 343 347 and represents 21.5% of the state's total employment. Manufacturing employs 236 929, representing only 69% of what agriculture does (and 14.84% of the state's total employment).

As stated before, manufacturing is moderately important, but not the main activity in the state. Its level of industrialisation is low, with the share of the industrial sector being the 26th largest out of the 32 states. In manufacturing, foods, beverages and tobacco represents 43.3% of the sector, while metallic minerals and products (iron ore) and textiles, clothing and leather jointly with wood, furniture, paper and printing represent 22.6% and 20.9% of total manufacturing respectively. The level of industrialisation of the state is low except for the industrialisation of iron (mainly around the port of Lazaro Cárdenas).

Michoacan's manufacturing GVA is almost entirely in low and mid-low tech industries. For example, 60% of GVA is in low tech industries (*versus* 32.1% nationally) and 35% is in mid-low tech industries (*versus* 24.7% nationally). The state has a very small mid-high tech industry (4.3% of GVA *versus* 31.6% nationally) and less than 1% in high technology industries. However, while most of Michoacan's industry is in industries characterised by having low technology, there are still numerous opportunities to apply technology for productivity improvements or intellectual property for greater value added, like what is being done with branding of agricultural products.

Michoacan has a much higher share of employment in micro enterprises than the national average. They account for 70.3% of total employment (compared to 54.8% nationally). Consequently, there is less employment in small firms (11.8% *versus* 20.3% nationally) and in medium-sized firms (6.8% *versus* 13.5% nationally). These results show that Michoacan's economic activities tend to occur in smaller firms than the national average, implying lower economies of scale and potentially greater barriers for technology upgrading.

Strategies and policies to support sectors and clusters

Sectors targeted: Auto, IT, Textiles, Agro-industrial, Metals and Logistics

According to different sources, Michoacan's industry and mining had the following specific characteristics:

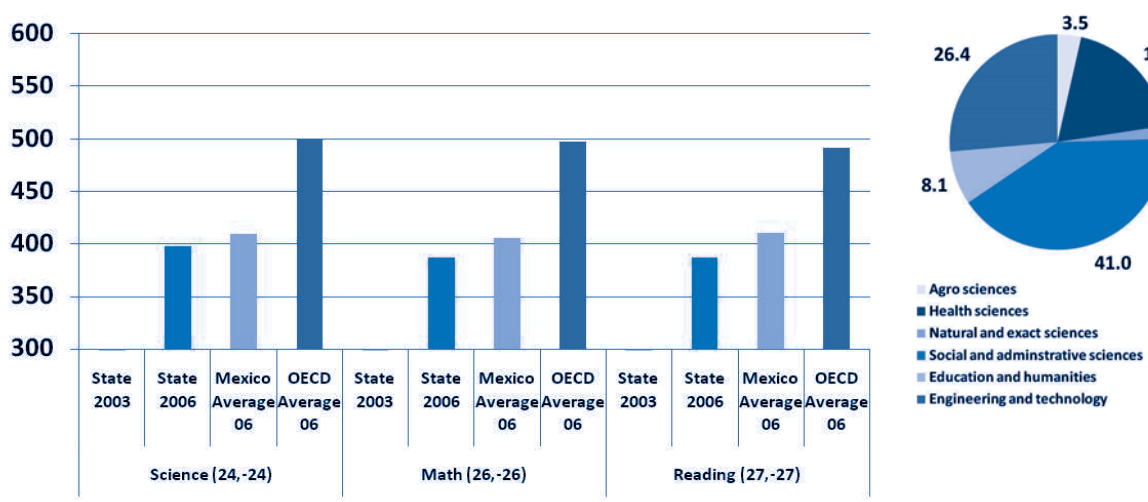
- Third and fifth nationally in terms of iron and copper production (Source: CONACYT 2006).
- Five industrial parks, cities and corridors (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 1.728 billion for 0.8% of the national total, mainly received in 2007 (Source: Ministry of Economy 2008).

Innovation system

Figure 12.5. Education: Michoacan

PISA performance

Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

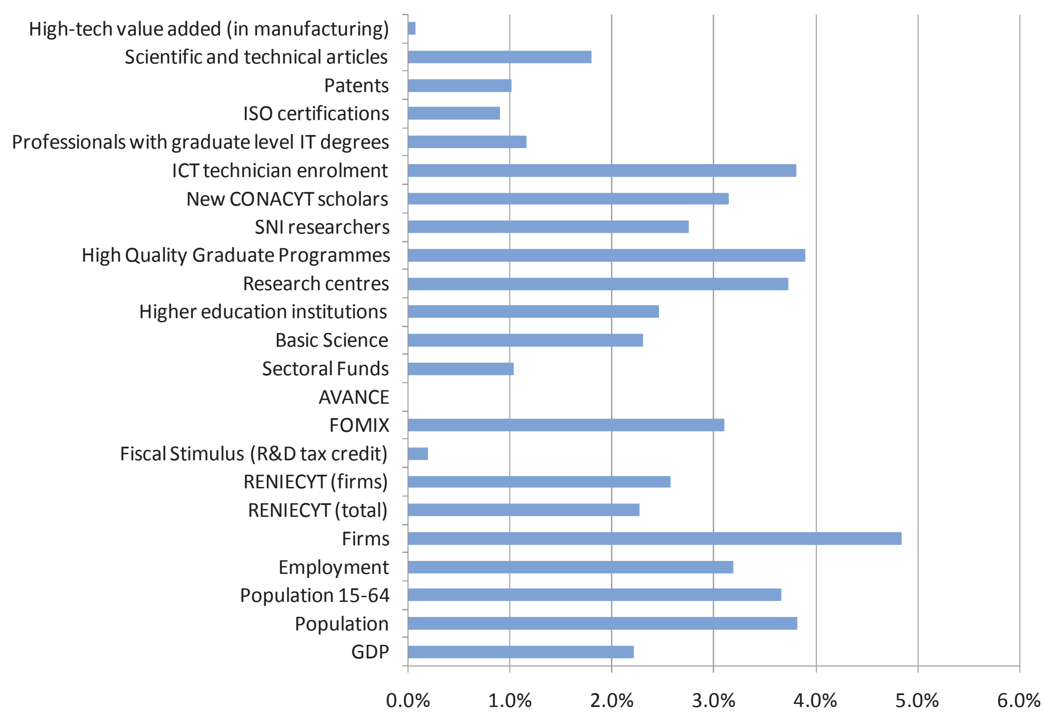
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

In the 2006 PISA results, Michoacan fell in the bottom third of states with respect to performance in education quality. The state ranked 24th in science, 27th in reading and 26th in math, out of 32 states in Mexico. These results are three standard deviations or more below the OECD averages. Low levels of human capital formation of students in earlier stages (*i.e.,* prior to higher education) will negatively impact the region's future economic potential and in particular its innovative capacity mainly through a less qualified workforce and a reduced number of future researchers.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies somewhat with what is observed nationally. As is the case in most of the country, Michoacan shows a relatively high concentration of students in social and administrative sciences programmes (41% *versus* 46.9% nationally). Engineering and technology related programmes account for the second highest enrolment in the state at 26.4%, as compared to a much higher 33.4% enrolment nationally. Health sciences enrolment is particularly high at 19.1%, *versus* only 9.4% nationally. Although the primary sector is prominent in the state, only 3.5% of enrolled students study agro sciences, just above the 2.3% observed nationally.

Figure 12.6. Innovation snapshot: Michoacan

Percent of national total



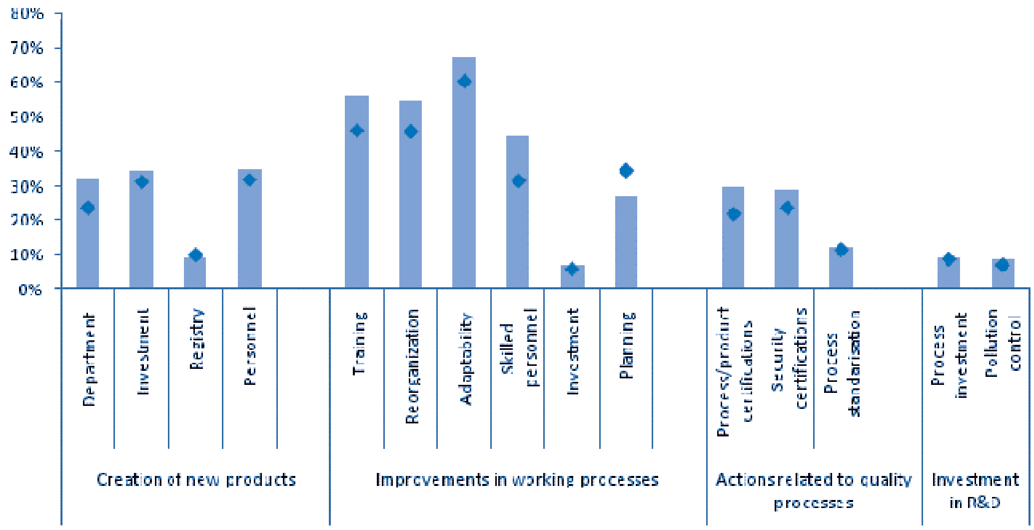
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Michoacan's GDP accounts for 2.2% of the national total, and while in many areas related to innovation the state may under-perform, there are some scientific assets upon which to build. Particularly high is the state's use of FOMIX funds (3.1%) and the number of high quality graduate programmes (3.9%), with the share of SNI researchers and Basic Science allocations above the state's GDP share at 2.74% and 2.3% respectively. Nevertheless, indicators of technological development are low, as expected, due to the state's underdeveloped manufacturing sector. These indicators include the low number of patents (1% of the national total), no AVANCE funds and low levels of ISO certifications (0.9%). Also very low are the use of the R&D tax credits (Fiscal Stimulus) and Sectoral Funds. Here lies an opportunity for the state and federal governments to mobilise and use the existing assets, and to strengthen areas that are currently under-developed.

Figure 12.7. Innovation by manufacturing firms: Michoacan

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, Michoacan's firms generally show weaker results than the nation as a whole. In terms of the creation of new products, the state ranks lower than the national average, especially in terms of the number of firms that have a department for this purpose (24% *versus* 32% nationally). Investments in improvements of the working process are also lower than the national average by a percentage point. Process certifications are lower than the nation as a whole, and investment in R&D shows a similar level to the national average.

State Science and Technology Council and other major innovation initiatives

The state shows a very interesting approach with respect to government co-ordination in S&T. Although the State Council is relatively new, it works with all local Ministries. They present and fund S&T and R&D related projects to a council presided by the Governor which then are approved and implemented in close co-ordination with the S&T Council.

Branding of products and trademark culture is particularly developed in the state (even in lower tech sectors), thanks in part due to active policies coming from different bodies of the state government.

Chapter 13

Nuevo Leon

Strengths
-High GDP per capita and GDP growth rates with a strong local market
-High levels of industrialisation and FDI flows
-Low levels of poverty, inequality and marginalisation along with high levels of human development
-High levels of human capital, quality of education, high tertiary attainment rates and good quality of HEIs
-High levels of productivity and overall competitiveness
-Strong and well developed industrial and technological capacity and culture (high propensity of manufacturing firms to innovate and good usage of national S&T programmes)
-Strong student inward migration

Weaknesses
-Above average unemployment rate
-Average scientific capacity (in terms of scientific publications and SNI researchers)
- Lesser degree of development outside the metropolitan area of Monterrey City

The state of Nuevo Leon is a Northern border state in the North-East meso-region. It is the 13th largest in surface area (just smaller than Ireland). However, with a population of around 4.2 million inhabitants (4.1% of the country, eighth nationally), it is the 15th most densely populated. Some particularities of its population are its highly urban proportion of 94.3% (76.5% national average) and that most of its economic activity and population is encompassed in the metropolitan area of the capital city of Monterrey. The state population is growing at a higher rate than the national level (1.6% *versus* 1.0%). The state is strongly linked to the US in trade, business environment and culture. However, the economic success does not result in significant levels of out-migration to the US. In terms of educational attainment, it is ahead of national averages in both schooling years and in the proportion of its population over 15 years that completed secondary schooling. The state is a particularly advanced economy with good living standards and overall levels of welfare.

The state's GDP of USD 64.2 billion is 7.4% of the national economy (third largest). Its living standards are also second highest in the country, with a GDP per capita of USD 15 437 as compared to USD 8 241 nationally. The state of Nuevo Leon is one of the most industrialised in the country. In mining, it is the major producer of barite. It also has *maquiladora* plants with exports of USD 6.1 billion (7% of the national total) representing 42.9% of the state's total exports. The state is the second highest ranking in the country on the Human Development Index, having one of the least marginalised populations in the country, and a better income distribution than most of Mexico as measured by the Gini coefficient.

Table 13.1. Socio-economic snapshot: Nuevo Leon

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	4.3	4.08	8	GDP (USD million)	64 221	7.4	3
Area (sq. km)	64 203	3.28	13	GDP per capita (USD)	15 437	8 241	2
Population density[1]	66.7	97.9	15	GDP yearly growth 1996-2006 (%)[4]	5.0	3.6	4
Population 0-14 (%)	28.3	31.1	31	Primary sector (%)	1.2	5.5	30
Population 15-64 (%)	66.5	63.7	4	Industrial sector (%)	29.5	27.5	12
Population 65+ (%)	5.1	5.3	22	Services sector (%)	69.3	67.1	12
Rural population (%)[2]	5.7	23.5	31	Employment rate (%)	65.6	62.9	5
Population annual growth (2000-2005) (%)	1.6	1.0	8	Unemployment rate (%)	3.8	3.0	24
Yearly migration to the US[3]	33 066	1.2	17	Participation rate (%)	69.0	64.9	3
Population with at most lower secondary education (%)	57.7	66.9	31	Average yearly FDI 1999-2007 (USD million)	2 059	10.2	2
Population with upper secondary education (%)	20.9	16.7	3	Exporting *maquiladora* industry production (2004 USD million)	6 077	7.0	5
Population with tertiary education (%)	21.4	16.4	2	Marginalisation index	-1.3	0	31
Households with a PC (%)	26%	19	2	Gini coefficient	0.551	0.616	6
Municipalities (number)	51	2.1	16	Human Development Index	0.851	0.803	2

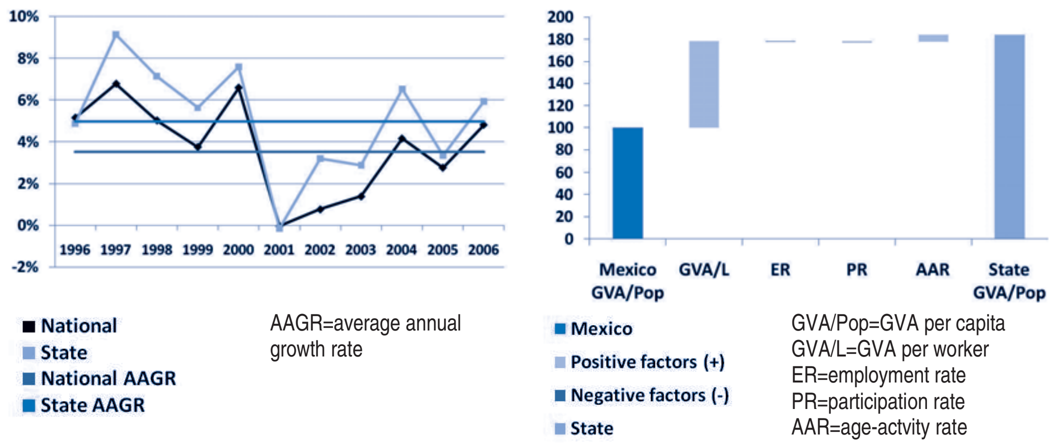
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 13.1. GDP growth and GVA per capita: Nuevo Leon

growth (1996-2006) GVA per capita of state *versus* national average, 2004



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Nuevo Leon's GDP had a strong average annual growth rate of 5% from 1996 to 2006, significantly above the national average of 3.6%. As a result, Nuevo Leon's real GDP per head increased by a much larger share than the growth nationally. With annual growth rates consistently at or above the national average, the state is converging to income levels in other OECD regions.

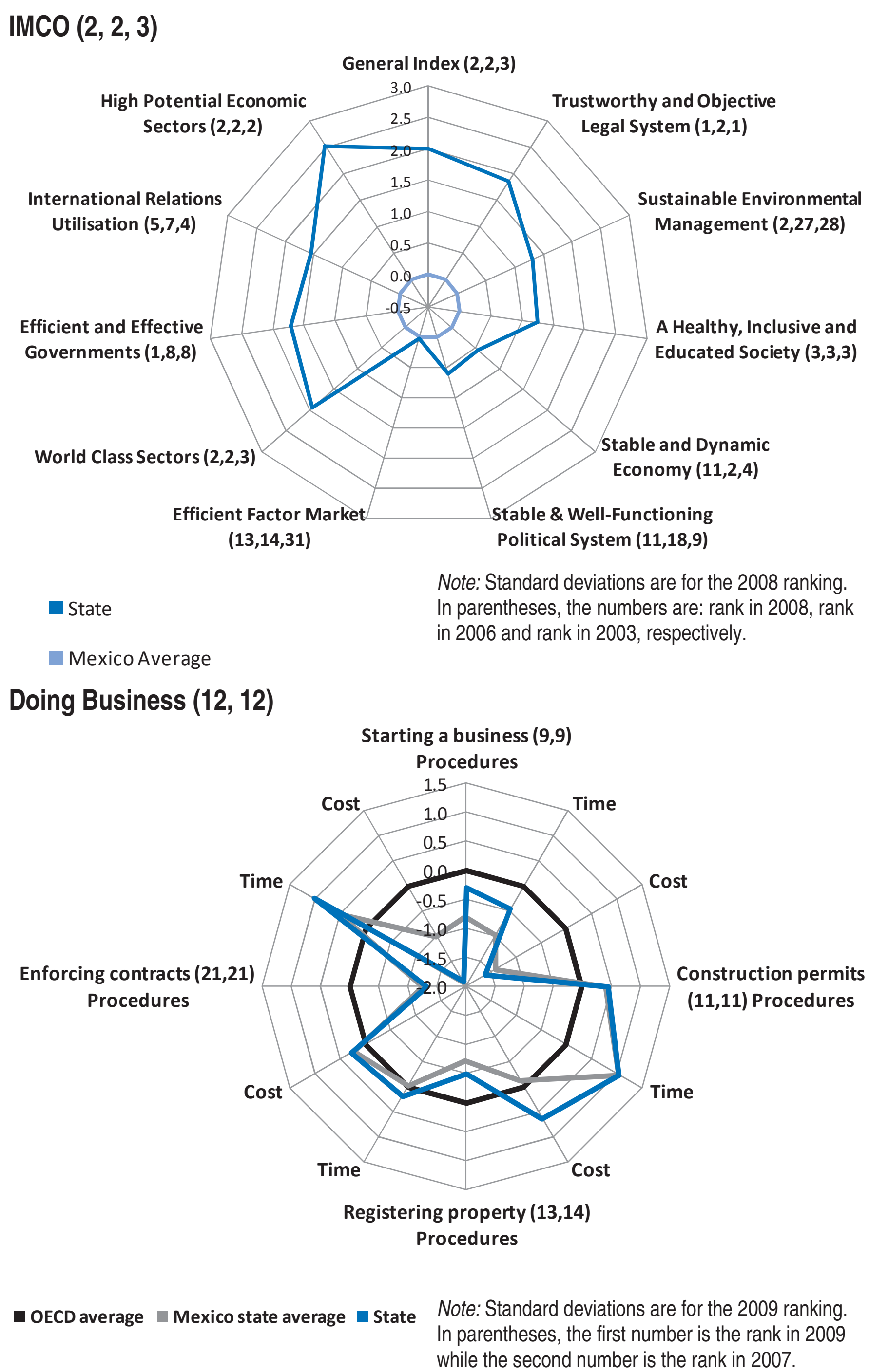
Nuevo Leon has a GVA per head that is 84% higher than the national average. A significantly higher GVA per worker (78.1%), which is used as a proxy for labour productivity, is driving this strong performance. Nuevo Leon's industrial structure and more highly educated workforce contribute to this strong labour productivity. The state also has a higher age activity rate that is 6.5% above the national average, explained by a slightly larger proportion of the population in the working age range of 15-64 years.

Nuevo Leon performs very well on traditional competitiveness indicators. Regarding IMCO, the state improved from third in 2003 to second in 2006 and 2008. The state's overall score is two standard deviations above the Mexico average. Of the ten component indices, Nuevo Leon ranks significantly above the national average on all but one (Efficient factor markets) where it is at the national average, albeit this factor has seen significant progress (up to position 13 from 31 in 2003). Outstanding improvement is noted in the category Sustainable environment management (up to position two from 28 in 2003). High potential economic sectors, World class sectors and Trustworthy and objective legal system all have shown excellent performance over time. IMCO ranks two cities in the state, Monterrey (seven) and Cadereyta Jimenez (27). Nuevo Leon is ranked second on the Knowledge Economy Index, illustrating important innovation potential.

Competitiveness indices

Figure 13.2. Example competitiveness rankings: Nuevo Leon

Standard deviations from the mean (0)



Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

In terms of Doing Business, the state has less outstanding performance, being ranked only 12th nationally in 2007 and 2009. The state performs better than the OECD average in six factors out of 12. Improvement is vital in starting a business, as while it performs better than the national averages, it is still lower than the OECD averages on all three factors in this category. The state performs better than the Mexico average in eight factors contributing to the business environment. The least successful area nationally is in the category of enforcing contracts, where it is 21st the last two rankings.

In terms of the federal SARE system to facilitate firm registration and development, nine of 51 municipalities have a SARE office. Given that most of the population and economic activity is concentrated in the Monterrey metropolitan area, these nine municipalities cover almost 86% of the state's population.

Competitiveness committees and policies

- The state has formed Civil Councils in eight strategic sectors to promote an increased capacity to compete.
- Nuevo Leon's government has issued a state law aimed at improving regulatory framework conditions.
- Its recent law for attracting investments seeks to address specific needs hindering the economic potential of the state.
- Nuevo Leon has developed a well designed supplier development programme (Supply Hub) aimed at integrating value chains and increasing local content of production.

Industrial structure and clusters

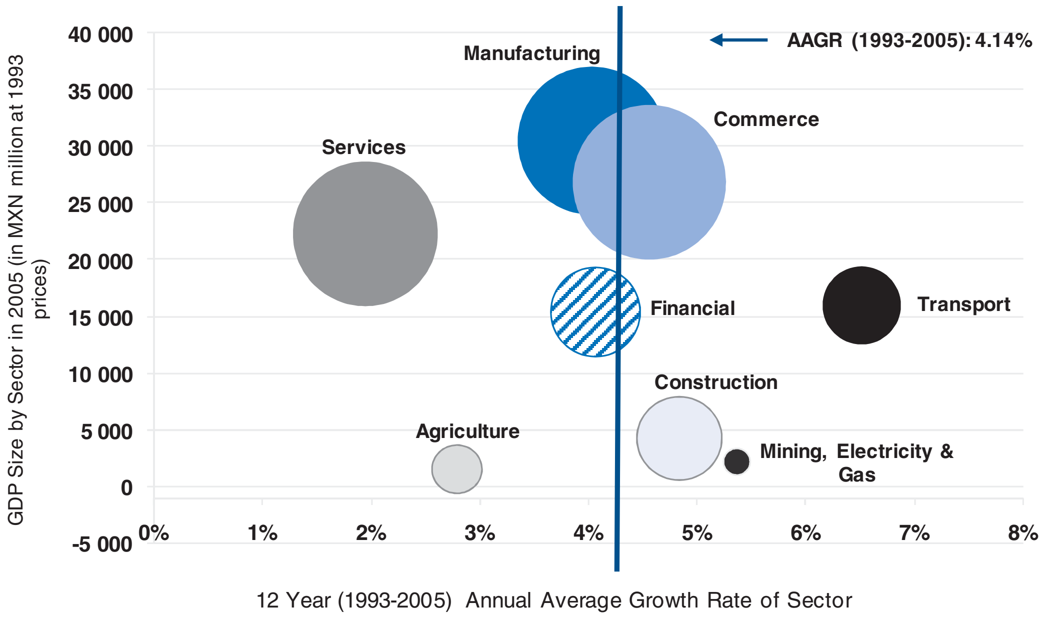
Table 13.2. Sectoral breakout: Nuevo Leon

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	1.3	0.4	22.5	4.3	1.1	21.0	11.2	11.5	26.8
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	1.4	0.3	25.7	3.2	1.2	21.2	10.1	12.9	23.8
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

Figure 12.3. GDP by sector size and growth: Nuevo Leon



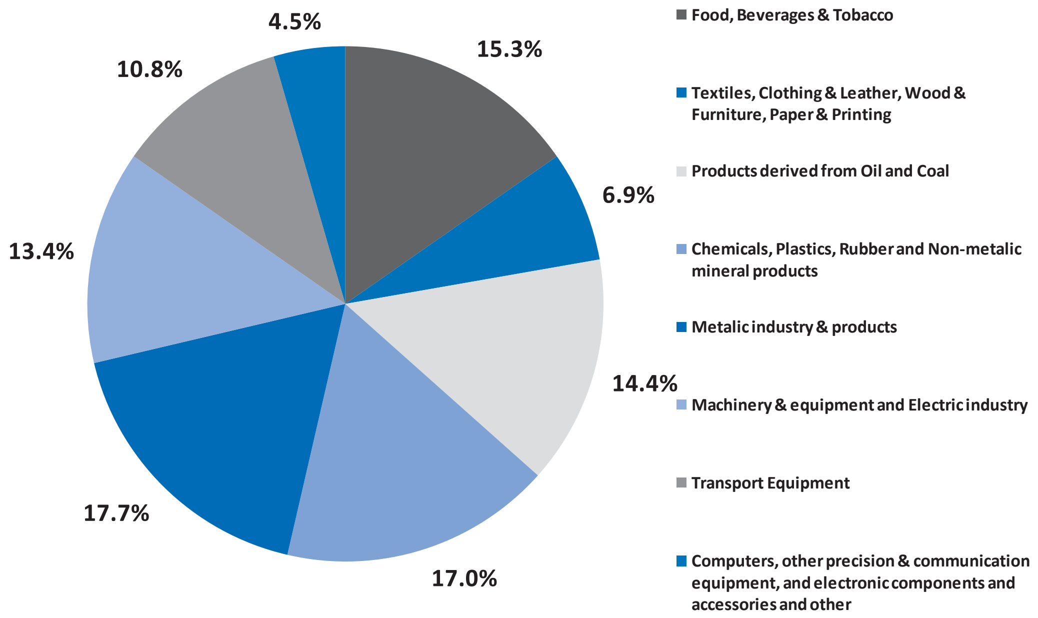
Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

Contrary to what happened in most states, the structure of the economy of Nuevo Leon did not change substantially by sector between 1993 and 2005. Agriculture, forestry and fishing reduced its share somewhat, representing 1.4% of Nuevo Leon's GDP in 1993 and 1.3% in 2005. The state has a lower proportion of its GDP coming from the primary sector as compared to the national average of 5.5%. In spite of having scarce hydrologic systems, Nuevo Leon has developed some agriculture and has become a leading national producer of sorghum for cattle (over 86% of national total production), second national producer of potatoes (13.9%), oranges (14.6%), tangerines (23.5%) and third national producer of grapefruit (7% of national total). It is also an important producer of egg, goat's milk, chicken and beef, the latter especially for export.

The sector that had the largest annual average growth was transport, communications and storage with 6.5%, while manufacturing grew at an annual average rate of 4.0% during this period. Similarly, commerce, restaurants and hotels grew at 4.6%; agriculture, forestry and fishing at an average annual rate of 2.8% and construction at 4.8%. The largest employer is commerce, restaurants and hotels with 475 136 workers, followed closely by manufacturing that employs a total of 442 534 and represents 24.2% of the state's total employment. Agriculture employs 49 225, representing only 2.7% of the state's total employment.

Figure 13.4. Breakout of manufacturing sectors: Nuevo Leon



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 13.3. GVA by technology level: Nuevo Leon

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	20.8	32.1	43.2	24.7	33.5	31.6	2.5	11.6	8 403
Number of firms	46.0	61.8	44.9	35.3	8.2	2.1	0.9	0.8	10 725
Employment	27.6	44.1	37.4	25.0	31.0	21.5	4.0	9.4	324 856
Total assets	17.5	29.4	50.9	36.8	30.5	29.6	1.0	4.2	13 791
Investment	24.0	30.2	27.0	22.0	48.7	41.1	0.3	6.8	841
FDI (2007)	3.5	9.8	75.8	40.5	20.1	32.5	0.5	17.2	2 685

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census using OECD industry classification by technology level.

Table 13.4. Firm demographics: Nuevo Leon

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	1 626 209	100.0	100.0
Micro	638 223	39.3	54.8
Small	377 049	23.2	20.3
Medium	290 538	17.9	13.5
Large	320 399	19.7	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing represented a significant percentage of the state economy already by 1993 at 25.7% of the state's GDP, which declined somewhat to 22.5% in 2005. This is compared with a national average of 17.9%. The state has a diversified manufacturing sector with many significant and well developed industries, a characteristic not very common in Mexico and illustrates that the state began its industrialisation more than 100 years ago, where the first beer and cement factories were installed. The industrial groups of Monterrey include several very large Mexico-based multinational firms. They include one of the largest cement conglomerates worldwide CEMEX; FEMSA (Coca Cola) the largest bottling company in Latin America; Cervecería Cuauhtémoc-Moctezuma, one of the largest beer manufacturers; Grupo ALFA, a multi-conglomerate that includes Alpek, the largest private petrochemical manufacturer in Mexico; and ALESTRA, a telecommunications company. Even though *maquiladora* plants exports totalled more than USD 6 billion in 2004, this sector represents only 6.1% of the state's industrial value added.

The state's industrial strength is focused in the mid-low and mid-high technology categories. While its GVA in low technology industries is significantly below the national average (20.8% *versus* 32.1%), its share in mid-low technology sectors is much higher at 43.2% *versus* 24.7% nationally. The share in mid-high tech is similar to national averages, however the share of GVA, employment and FDI flows in high technology sectors is below the national share.

Nuevo Leon's employment tends to be in the larger firm sizes relative to the national figures. For example, employment in medium and large economic units, with 37.6% of total employment, is significantly more than the 24.9% national average. Furthermore, the state has a much smaller share of employment in micro enterprises at 39.3% of employment *versus* 54.8% nationwide. These results indicate that the state's firms are larger in scale, serving larger markets either domestically or internationally, and this supports the state's overall competitiveness.

Strategies and policies to support sectors and clusters

Sectors targeted: Aerospace, Agro-industrial, Auto, Biotech, Electronic home appliances, Nanotech, ICT, Medical services (Source: State Development Plan and the State Law for Investment Attraction and Employment Creation)

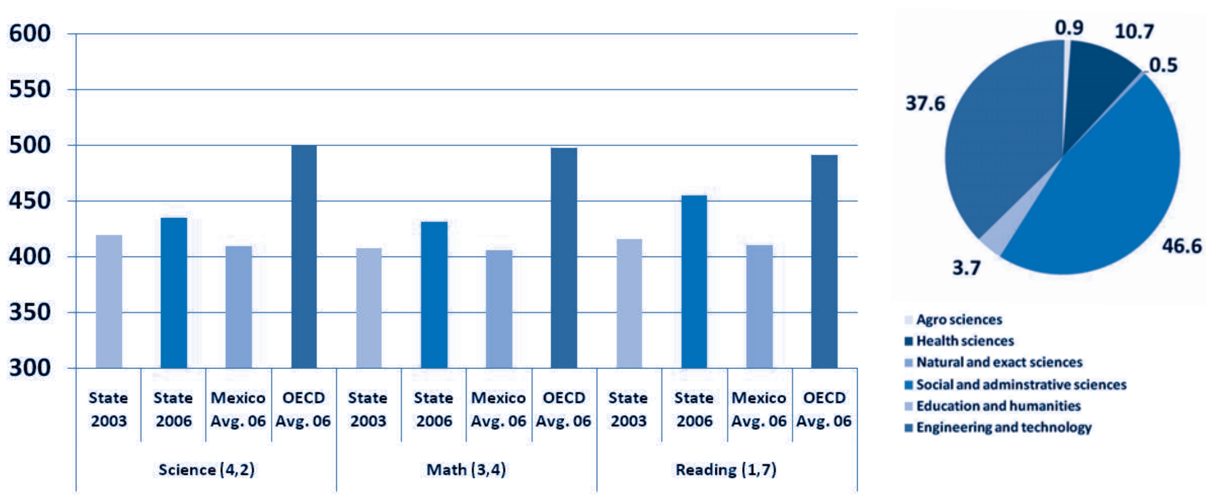
According to different sources, Nuevo Leon's industry and mining had the following specific characteristics:

- Largest barite producer (77.7% of national total) (Source: CONACYT 2006).
- It has 63 industrial parks, cities and corridors (mainly encompassed around Monterrey's metropolitan area) (Source: Economic Development Secretary 2008).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 21.096 billion for 10.0% of the national total (Source: Ministry of Economy 2008).

Innovation system

Figure 13.5. Education: Nuevo Leon

PISA performance | Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Nuevo Leon scores among the top four states in the different areas of the PISA (Programme for International Student Assessment) evaluations. Nevertheless it is still behind the OECD average by over two standard deviations in science and math and one standard deviation in reading. Compared to the Mexico average, it is outstanding how significantly Nuevo Leon improved its scores in the 2006 PISA evaluation from those observed in the 2003 evaluation, advancing two places in science, four in math and seven in reading. This trend should continue for the state to reach educational standards of a higher income OECD country.

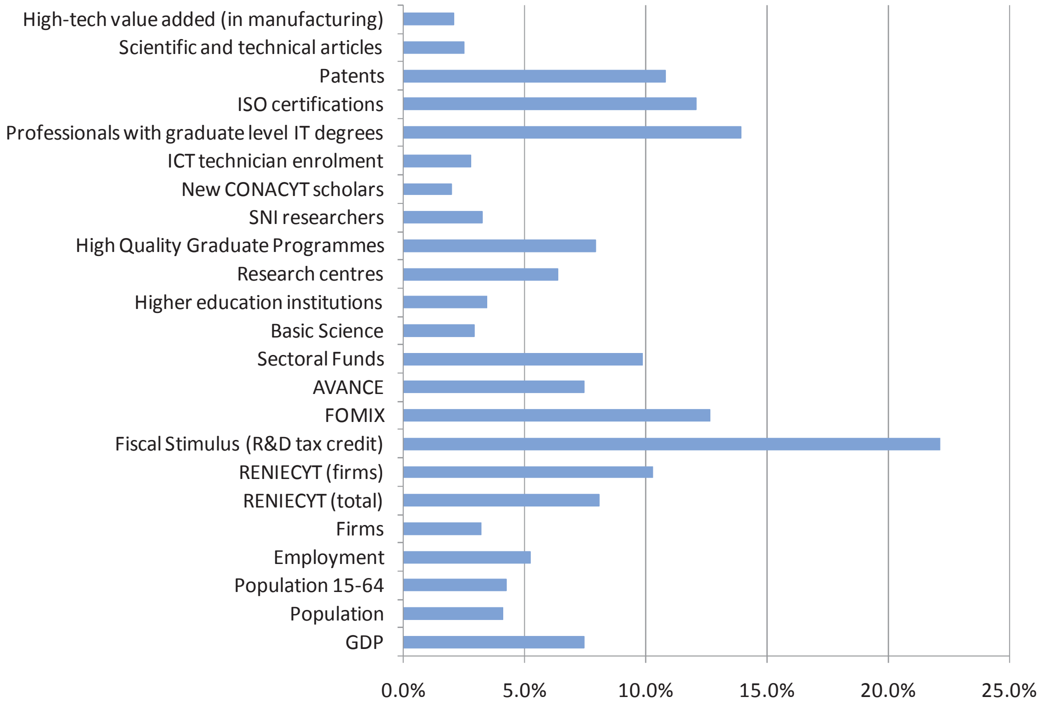
Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies little with respect to national trends. As is the case in most of the country, Nuevo Leon shows a relatively high concentration of students in social and administrative sciences programmes (46.6%). It does have a higher share of enrolment in engineering and technology related programmes at 37.6% of enrolment, a few percentage points above the Mexico average of 33.4%. This trend reflects in part the more engineering related industrial vocation of the state. Enrolment in the different sciences is low generally in Mexico, but even lower in Nuevo Leon as a percentage of total enrolment.

Nuevo Leon's GDP represents 7.4% of the national total; however the state has an even greater share on a number of innovation related indicators. Particularly high is the state's use of the R&D tax credit (Fiscal Stimulus) with 22.1% of the national total, albeit this programme results in credits to a very few number of firms in select industries. Also high is the state's use of FOMIX funds (12.6%), ISO certifications (12.1%), Sectoral Funds (9.9%), and the number of firms and other entities registered in the national S&T registry (RENIECYT). Furthermore, AVANCE (7.5%), the number of patents registered (10.82%) and high quality graduate programmes (7.9%) are all strong. The state does not have a CONACYT public research centre, but does have other innovation assets, such as ITESM (*Tecnológico de Monterrey*) that is actively engaged in several state (regional) innovation systems, including at the headquarters campus in Nuevo Leon. Additionally the state has 12 research centres according to ADIAT's directory. Areas for potential improvement include resources from the Basic Science Programme, the number of SNI researchers and new CONACYT scholars, as well as total scientific and technical publications.

Regarding innovations among manufacturing firms, Nuevo Leon's firms generally show better results than the nation as a whole. In terms of the creation of new products, the state ranks relatively higher than the national average, especially in terms of the number of firms that have a department for this purpose (38% *versus* 32% nationally). Investments on improvements of the working process are also higher than the national average by at least one percentage point. Process certifications are better ranked than the nation as a whole, and so is investment in R&D.

Figure 13.6. Innovation snapshot: Nuevo Leon

Percent of national total

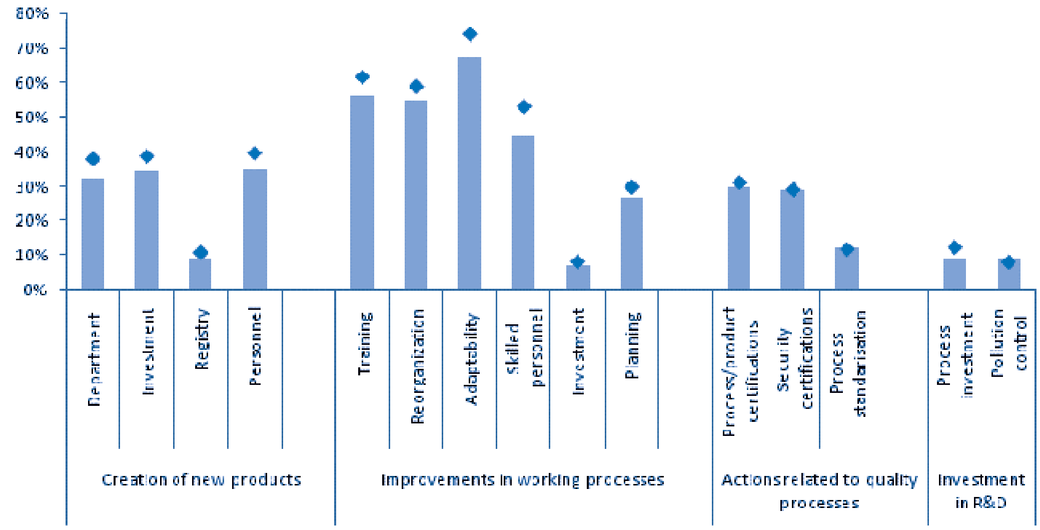


Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Figure 13.7. Innovation by manufacturing firms: Nuevo Leon

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

State Science and Technology Council and other major innovation initiatives

- The state constituted the I^2T^2 Institute for Innovation and Technological Transfer which is aimed at promoting innovative activities linking HEIs and other knowledge generators with industry.
- Since 2004, the state government set as one of its main pillars for economic development a strategic project named Monterrey International City of Knowledge which is based on an alliance between government, HEIs and industry to promote growth through innovation.
- To further enhance the RIS (predominantly centred around its main city Monterrey), the state invested in the Research and Innovation Technology Park (PIIT). The objective of the park is to concentrate on strengthening innovation endeavours and technological developments while facilitating technology transfers to the private sector. The park hosts HEIs, specialised business incubators as well as public and private research centres. For this purpose, the state government invested USD 90 million, providing land and other needed infrastructure, reserving the majority of the space for firms and knowledge generators.

Chapter 14

Puebla

Strengths
-Above average GDP growth rates
-Relatively good scientific capacity (SNI researchers and scientific publications, good usage of national S&T programmes)
-Proximity to Mexico City and good interconnection
-Manufacturing specialisation specially in mid-high tech sectors
-Government commitment to regional development
-Solid higher education institutions

Weaknesses
-Important regional disparities, high marginalisation, poverty and inequalities
-Low levels in terms of education and below average tertiary attainment rates
-Important challenges in terms of regulatory framework and overall competitiveness

The state of Puebla is geographically located in the Southern central part of Mexico (in the Centre meso-region but also part of the South-Southeast meso-region). The state is close to the Metropolitan Area of Mexico City (with more than 18 million inhabitants). Its territory is relatively small (20th out of 32 in surface area) and is the seventh most densely populated with slightly over 5.3 million inhabitants. It nevertheless has a somewhat higher share of rural residents than the national average (29.4% *versus* 23.5%). Its annual population growth is about the same as the national level at 1%. In terms of educational attainment, it is behind the national averages in both schooling years and in the proportion of its population over 15 years that completed secondary schooling.

The state's GDP of USD 0.7 billion is around 3.6% of the national economy (eighth largest). The GDP per capita is nevertheless noticeably below the national average (USD 5 730 *versus* USD 8 241). More than 80% of the state's economic activity is encompassed around the metropolitan area of Puebla City. The state is in close proximity to the largest national market, the Metropolitan Area of Mexico City, and has one of the largest car plants in Mexico (Volkswagen). During the last 20 years Puebla has developed *maquiladora* production, including for textiles. The state is behind most others in Mexico on the Human Development Index (ranking 26th) and has the seventh most marginalised population in the country, while the income distribution index (Gini Coefficient) shows that the state is relatively more unequal than most of Mexico.

Table 14.1. Socio-economic snapshot: Puebla

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	5.5	5.23	5	GDP (USD million)	30 716	3.6	8
Area (sq. km)	34 251	1.75	21	GDP per capita (USD)	5 730	8 241	22
Population density[1]	160.0	97.9	7	GDP yearly growth 1996-2006 (%)[4]	4.3	3.6	9
Population 0-14 (%)	33.1	31.1	6	Primary sector (%)	3.9	5.5	21
Population 15-64 (%)	61.4	63.7	25	Industrial sector (%)	30.4	27.5	11
Population 65+ (%)	5.5	5.3	15	Services sector (%)	65.6	67.1	18
Rural population (%)[2]	29.4	23.5	14	Employment rate (%)	65.0	62.9	9
Population annual growth (2000-2005) (%)	1.0	1.0	17	Unemployment rate (%)	3.1	3.0	20
Yearly migration to the US[3]	69 775	2.1	7	Participation rate (%)	67.2	64.9	7
Population with at most lower secondary education (%)	70.7	66.9	8	Average yearly FDI 1999-2007 (USD million)	480	2.4	7
Population with upper secondary education (%)	13.7	16.7	26	Exporting *maquiladora* industry production (2004 USD million)	632	0.7	13
Population with tertiary education (%)	15.5	16.4	19	Marginalisation index	0.63	0	7
Households with a PC (%)	14	19	24	Gini coefficient	0.627	0.616	24
Municipalities (number)	217	8.8	2	Human Development Index	0.767	0.803	26

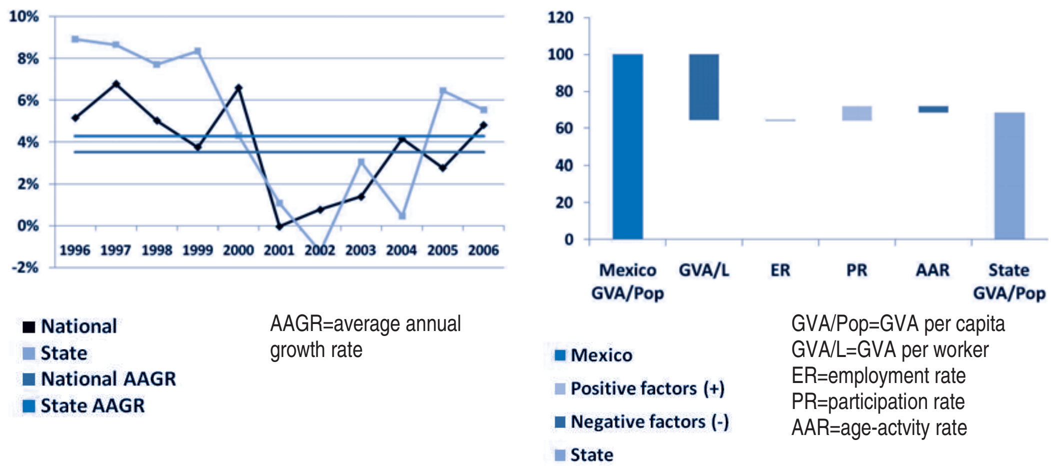
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 14.1. GDP growth and GVA per capita: Puebla

Growth (1996-2006) GVA per capita of state *versus* national average, 2004



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Puebla's GDP had an average growth rate of 4.3% from 1996 to 2006, above the national average of 3.6%. Growth rates were particularly high during the second half of the nineties, but decreased substantially after 1999 and have again started to accelerate since 2005. While the growth pattern generally tracks national trends, there exist significant year-to-year fluctuations. This growth has not, however, been enough to reduce the gap with most advanced states in the Central and Northern regions of Mexico. In general terms, Puebla's real GDP per head did increase slightly above that of the national average.

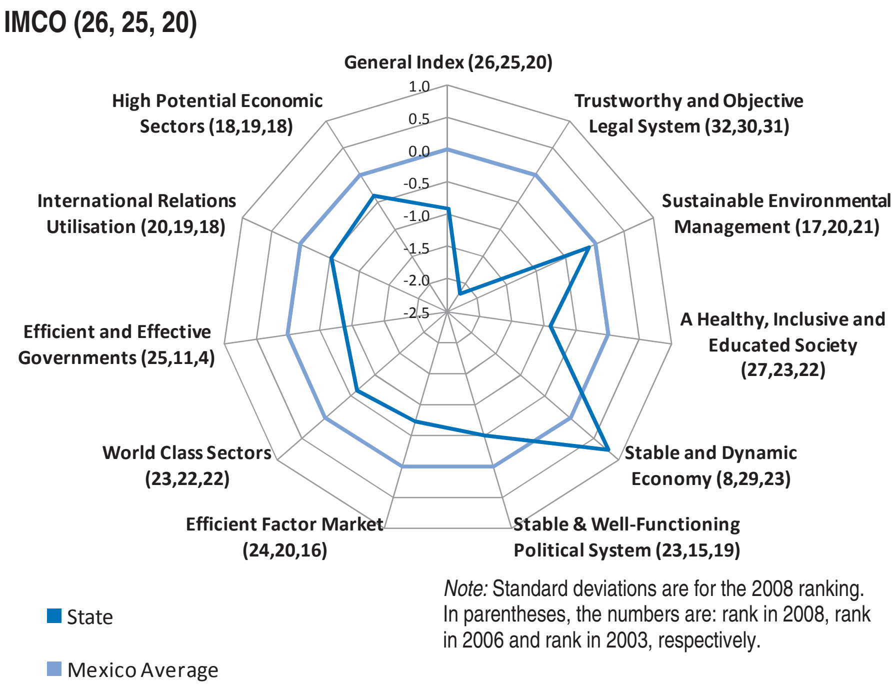
Puebla has a GVA per head that is only 68.3% of the national average. The lower than average GVA per worker (-35.5%) is the main driver of this gap. The age activity rate also contributes negatively by 3.6% to GVA per head, which is due to a higher dependency rate. One of the two factors contributing positively, by 7.7%, is the participation rate, whereby a higher share of the working age population is economically active.

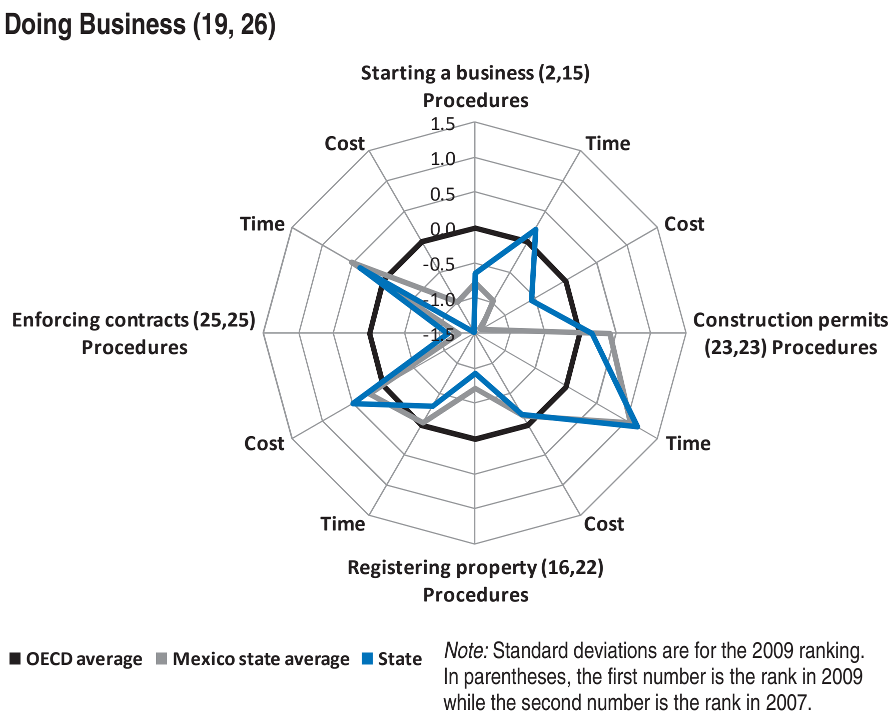
Puebla's performance on traditional competitiveness indicators like IMCO is below average. The 2008 ranking places the state in 26th position, down from 25th in 2006 and 20th in 2003. The state is more than 0.9 standard deviations below the Mexico average on this overall index. Among the ten component indices, Puebla scores below the national average on all but one factor that has shown significant improvement, Stable and dynamic economy (up to position eight from 23 in 2003). Puebla compares particularly unfavourably in the category Trustworthy and objective legal system, which is currently in last place. IMCO ranked the city of Puebla as the 20th most competitive among Mexico's main metropolitan areas. The state ranked 25th on the Knowledge Economy Index.

Competitiveness indices

Figure 14.2. Example competitiveness rankings: Puebla

Standard deviations from the mean (0)





Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

Puebla has average performance on the Doing Business measures, ranking 19th in 2009, but having improved by seven positions nationally from the 2007 ranking. The state is above OECD averages in five out of 12 factors. Nationally, Puebla scores above average on six out of 12 factors. The state performs particularly high in terms of starting a business, having jumped to second position nationally from 15th. Performance on enforcing contracts (25th) and construction permits (23rd) has remained in the lower end of all Mexican states with no change in the last evaluation, while that of registering property has improved by six places.

In terms of the federal SARE system to facilitate firm registration and development, 16 of 217 municipalities have a SARE office. These municipalities cover 51% of the state's population.

Competitiveness committees and policies

- The state actively tracks its performance in terms of competitiveness. It tracks several indices of competitiveness, the most important of them being that of IMCO. Other indices tracked include: aregional.com, those produced by the United Nations, the World Bank's Doing Business and Transparencia Mexicana. The state monitors a total of 304 variables across these indices.
- A state council has been formed that includes government and the private sector (through industry chambers and associations) for industrial, commercial and services development.
- The state has recently created a new ministry within the government structure which deals directly topics related to labour and competitiveness. Within this new secretary, the agency Puebla Institute for Competitive Productivity seeks to further enhance economic performance through different strategies targeting SMEs.

Industrial structure and clusters

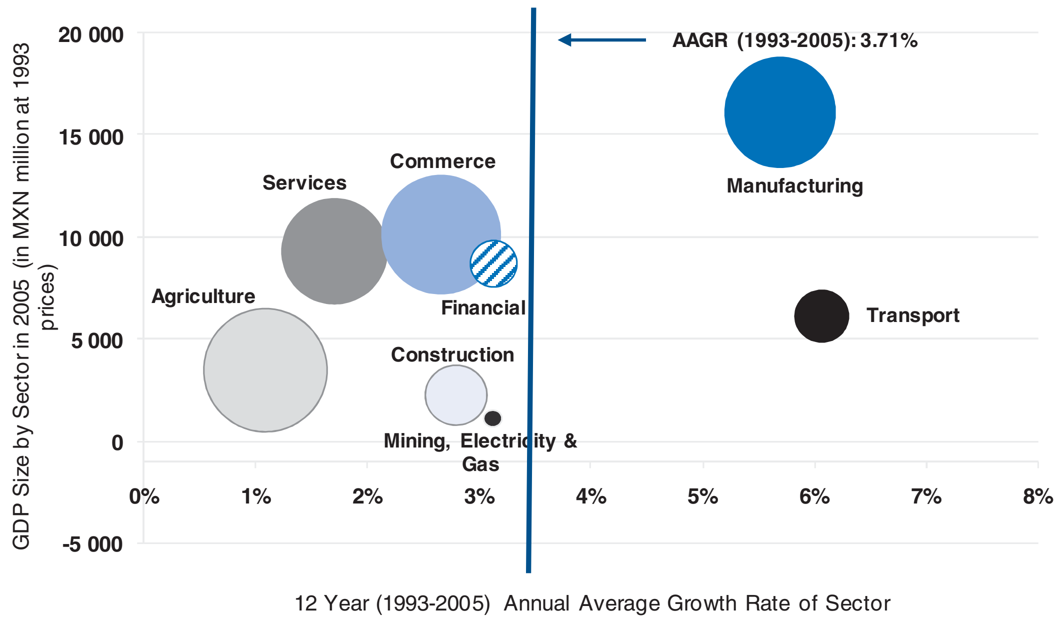
Table 14.2. Sectoral breakout: Puebla

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	3.8	0.4	23.5	5.0	1.4	21.7	9.2	12.9	22.2
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	8.1	0.6	22.0	4.3	1.5	19.6	8.0	15.9	20.1
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

Figure 14.3. GDP by sector size and growth: Puebla



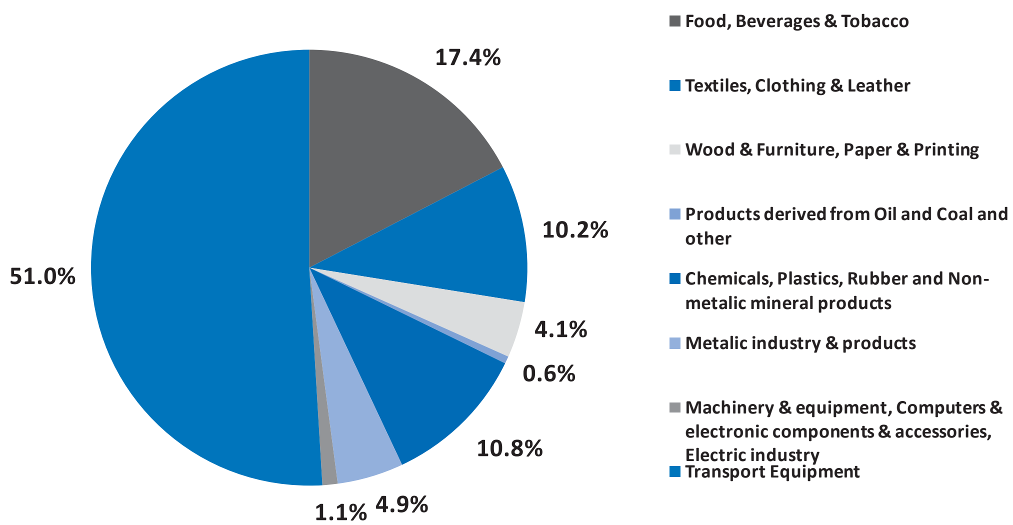
Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The structure of the economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share by more than half, representing 8.1% of Puebla's GDP in 1993 compared to 3.8% in 2005. While manufacturing grew at an annual average rate of 5.7% during this period, agriculture, forestry and fishing grew at an average annual rate of 1.1%. Nevertheless in 2005, agriculture is still the largest employer with 539 277, while manufacturing employed 423 0174 and commerce, restaurants and hotels (in second place) provided employment to 496 632.

Manufacturing is one of the most important activities, mainly due to the importance of the automobile industry. In 1993 it already represented the second largest share of the state's GDP with over 19% of the total economy, while in 2005 its relative size grew to over 23.5%. Within the manufacturing sector, four main activities can be identified: transport equipment; food, beverages and tobacco; chemicals; and textiles. Almost 51% of Puebla's manufacturing sector is highly dependent on the manufacturing of auto parts and car assembly or transport equipment. Another 17.4% comes from foods, beverages and tobacco, while another 10.8% from chemicals, plastic, rubber, etc., which also supplies the transport equipment branch. During the last 20 years Puebla has developed some *maquiladora* production, mainly in the clothing sector (including denim jeans), that represented exports of USD 632 million in 2004.

Figure 14.4. Breakout of manufacturing sectors: Puebla



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 14.3. GVA by technology level: Puebla

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	29.0	32.1	11.9	24.7	56.6	31.6	2.4	11.6	4 875
Number of firms	61.1	61.8	37.4	35.3	1.1	2.1	0.4	0.8	26 455
Employment	63.7	44.1	19.1	25.0	15.6	21.5	1.6	9.4	211 262
Total assets	16.8	29.4	12.2	36.8	70.0	29.6	1.0	4.2	8 945
Investment	15.3	30.2	3.4	22.0	80.9	41.1	0.4	6.8	680
FDI (2007)	0.9	9.8	4.5	40.5	84.0	32.5	10.6	17.2	176

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census using OECD industry classification by technology level.

Table 14.4. Firm demographics: Puebla

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	1 469 872	100.0	100.0
Micro	894 518	60.9	54.8
Small	276 756	18.8	20.3
Medium	177 038	12.0	13.5
Large	121 560	8.3	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Puebla's economy has more than half of its GVA in mid-high technology sectors. Its share in low technology industries is slightly less than the national average (29% *versus* 32.1%), albeit this category accounts for almost 63.7% of firms. It has a much lower share of GVA in mid-low technology industries (11.9% *versus* 24.7%), which is compensated by a very high share of GVA in mid-high technology sectors, 56.6%, as well as a very large share of FDI in that category. There is only a small share of the state's manufacturing in high technology of 2.4%.

Puebla's employment is disproportionately in smaller firm sizes relative to national averages. For example, 60.9% of the state's employment is in micro enterprises, higher than the national share of 54.8%. The state also has a lower share of employment in large firms (8.3% *versus* 11.5%).

Strategies and policies to support sectors and clusters

Sectors targeted

Auto, Dairy products, Tourism, Food and beverage, Textile, Pharmaceutical, ICT, Agro-industrial (Source: Based on information provided by different Ministries of the State Government, 2008)

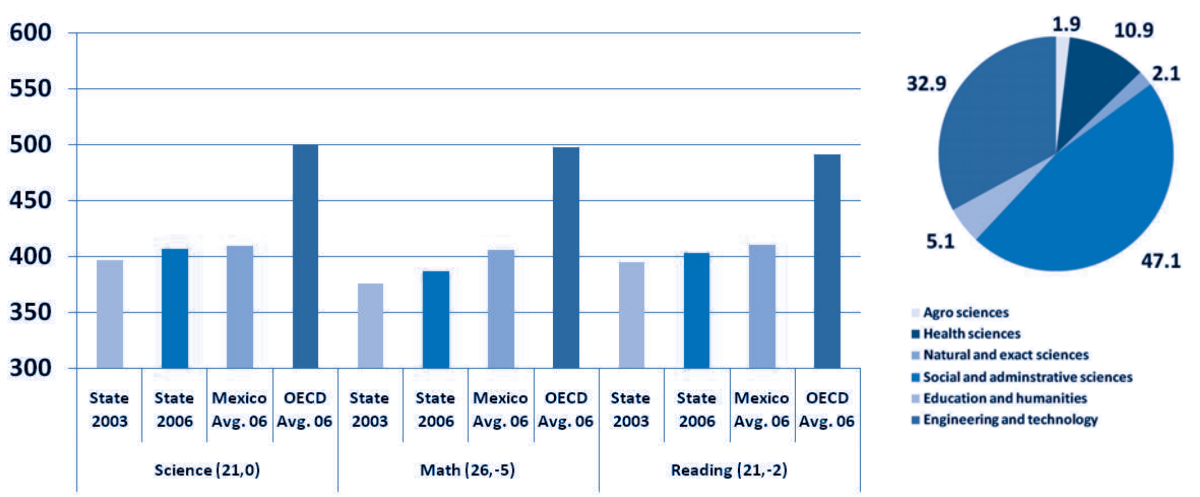
According to different sources, Puebla's industry had the following specific characteristics:

- The auto and auto-parts industry assembled 345 000 vehicles, employed more than 12 000 workers, represented 13% of the state's GDP and included 33 major international companies (Source: CONACYT 2006).
- Puebla possesses 13 industrial parks, cities and corridors (mainly encompassed within the City of Puebla) (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 4.589 billion for 2.2% of the national total (Source: Ministry of the Economy, 2008).

Innovation system

Figure 14.5. Education: Puebla

PISA performance | Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

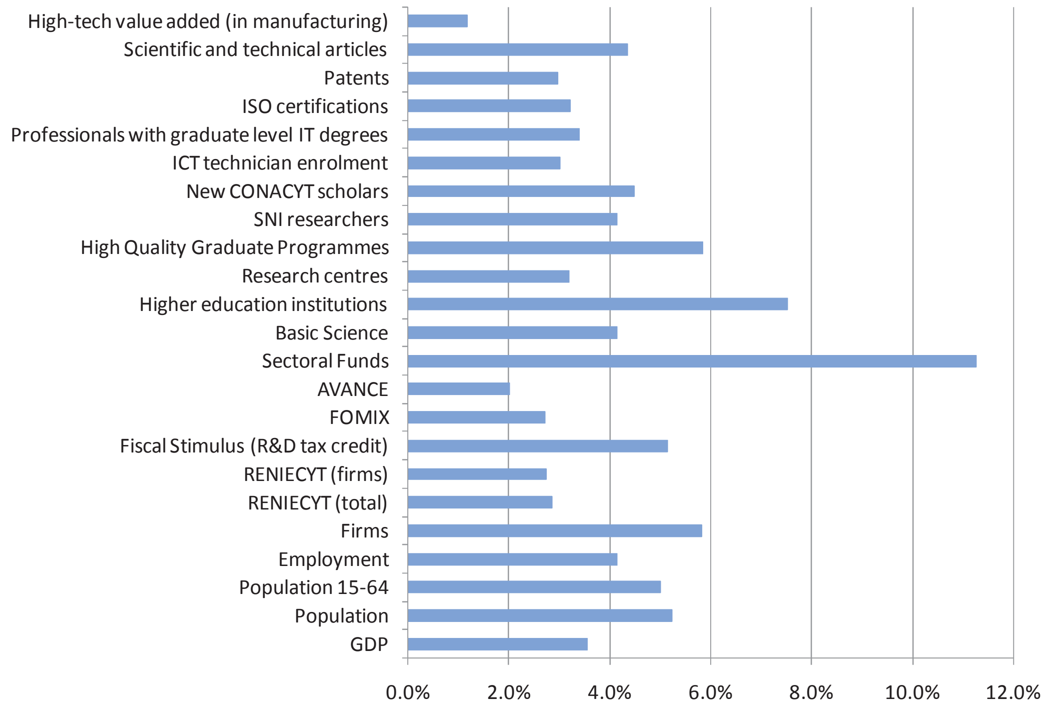
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Puebla performs below average with respect to the PISA (Programme for International Student Assessment) evaluations. It is ranked 21st in science, 26th in math and 21st in reading. In 2006, these scores were between 2.5 and three standard deviations from the OECD average in all three areas. While PISA scores have increased over time, the state dropped its position relatively, two places in reading and five places in math.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies little with respect to what is observed nationally. As is the case in much of the country, Puebla shows a relatively high concentration of students in social and administrative sciences programmes (47.1% *versus* 46.9% nationally). Engineering and technology related programmes account for the second highest enrolment in the state with 32.9% of enrolment, which is slightly below the Mexico average of 33.4%. Similarly to what is observed around the country, Puebla has a relatively small student population in natural and exact sciences (2.1%).

Figure 14.6. Innovation snapshot: Puebla

Percent of national total



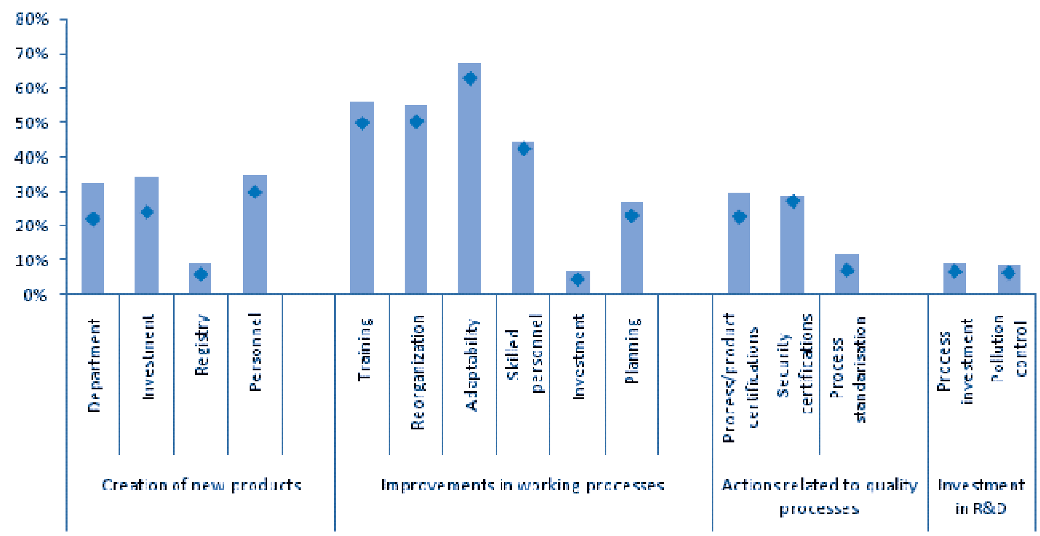
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Puebla's GDP accounted for 3.6% of the national total in 2005 and compared to this benchmark the state performs relatively well on several innovation indicators. Relatively low is the state's usage of the FOMIX programme, with 2.7% of total resources. It is worth mentioning that the capital city of Puebla is one of only two cities in Mexico which has directly committed resources to the FOMIX. Also somewhat low is the state's participation in AVANCE (2.03% of national total). Puebla is the state benefiting the most from the Sectoral Funds (11.24% of the national total), where a large part is financed by the Naval Ministry. Similarly the state receives a considerable amount from the R&D tax credit (Fiscal Stimulus) programme at 5.1% of the national total, but these are received predominantly by large firms, and most of them related in the car assembly and auto-parts industries. Puebla has a relatively low registration in the national Science and Technology Registry (RENIECYT) for firms and other entities. Slightly better performance is observed regarding ISO certifications in the state, which could promote integration into more advanced production processes and value chains. Other scientific capacity indicators are present, with over 4% of SNI researchers and 4.5% of the total of new CONACYT scholars, as well as 4.1% in the Basic Science programme and 5.84% of all national high quality graduate programmes. The state has one CONACYT public research centre and six overall according to ADIAT's directory.

Figure 14.7. Innovation by manufacturing firms: Puebla

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, Puebla's firms generally show lower results than the nation as a whole. In terms of the creation of new products, the state ranks relatively lower than the national average, especially in terms of investment (24% *versus* 34% nationally). Investments on improvements of the working process are also lower than the national average by two percentage points. Process certifications are much lower than the nation as a whole, while investment in R&D shows a similar, but lower, level relative to the national average.

State Science and Technology Council and other major innovation initiatives

- Increasing attention is being paid to S&T and R&D in the state of Puebla as means to increase economic performance.
- A state council specifically dedicated to S&T was formed early in the 1980's, rather early for Mexican state standards. More recently (2004) the council was put under the administrative structure of the state Secretary of Education, while maintaining its status as a decentralised public body with its own legal statutes and budget. During the same year and at the beginning of the current administration, the State Congress approved the Law to Promote Scientific, Technological and Humanistic Research and Innovation.
- The state has established an inter-institutional network of researchers which may help better link knowledge generators and promote knowledge diffusion.

Chapter 15

Queretaro

Strengths
-Very high GDP growth rates
-Very high propensity of manufacturing firms to innovate
-High patenting activity, SNI researchers and number of scientific publications
-Good usage of national S&T programmes
-High rates of tertiary attainment and very good quality of education (PISA)
-Good regulatory framework and quality of life

Weaknesses
-High unemployment rates
-Very high intra-state disparities in terms of income distribution
-Low State Council expenditures in local S&T programmes

The state of Queretaro is located in the Centre-West meso-region, but is also part of the Centre region. Its capital city, Queretaro City, has been growing and developing rapidly over the last 20 years. Part of Mexico City's population and industrial decentralisation has relocated in this state. It is only the 27th largest state in surface area (about half the size of Slovenia), and with a population of 1.6 million inhabitants it is the 23rd largest state and the eighth most densely populated. Nevertheless, it does have 30% of its population living in rural areas, higher than the 23.5% average nationally, as most of its economic activity and population is encompassed in the metropolitan area of the capital city of Queretaro. The state population is growing at a markedly faster rate than the national average (2.3% *versus* 1% nationally), even if there is a slightly higher propensity for out migration to the US than nationally. It is at national averages in both schooling years and in the proportion of its population over 15 years that completed secondary schooling, however in terms of tertiary attainment rates it is well above average.

The state's GDP of USD 14.9 billion is 1.7% of the national economy (16th largest). Its GDP per capita is somewhat above national averages at USD 9 474 *versus* USD 8 241 (12th highest). The state of Queretaro has developed an industrial base, while in mining it produces gold. It also has *maquiladora* plants with exports of USD 250 million representing almost 10% of the state's total exports, however this is only a tiny fraction of the nation's overall *maquila* exports (0.29%). Queretaro has a higher than average Human Development Index for Mexico, this being an important indicator of general welfare, but has a much more unequal income distribution than most of Mexico (ranked 31st out of 32 states), especially in the difference in standards of living of the countryside and its cities.

Table 15.1. Socio-economic snapshot: Queretaro

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	1.6	1.6	23	GDP (USD million)	14 850	1.7	16
Area (sq. km)	11 658	0.6	27	GDP per capita (USD)	9 474	8 241	12
Population density[1]	139.7	97.9	8	GDP yearly growth 1996-2006 (%)[4]	5.1	3.6	2
Population 0-14 (%)	31.7	31.1	12	Primary sector (%)	2.7	5.5	26
Population 15-64 (%)	64.0	63.7	17	Industrial sector (%)	34.2	27.5	6
Population 65+ (%)	4.3	5.3	26	Services sector (%)	63.1	67.1	24
Rural population (%)[2]	30.1	23.5	13	Employment rate (%)	60.5	62.9	27
Population annual growth (2000-2005) (%)	2.3	1.0	4	Unemployment rate (%)	4.0	3.0	26
Yearly migration to the US[3]	24 682	2.4	21	Participation rate (%)	63.0	64.9	25
Population with at most lower secondary education (%)	64.4	66.9	20	Average yearly FDI 1999-2007 (USD million)	138	0.7	15
Population with upper secondary education (%)	16.5	16.7	16	Exporting *maquiladora* industry production (2004 USD million)	250	0.3	16
Population with tertiary education (%)	19.0	16.4	4	Marginalisation index	-0.14	0	17
Households with a PC (%)	24	19	5	Gini coefficient	0.685	0.616	31
Municipalities (number)	18	0.7	23	Human Development Index	0.809	0.803	13

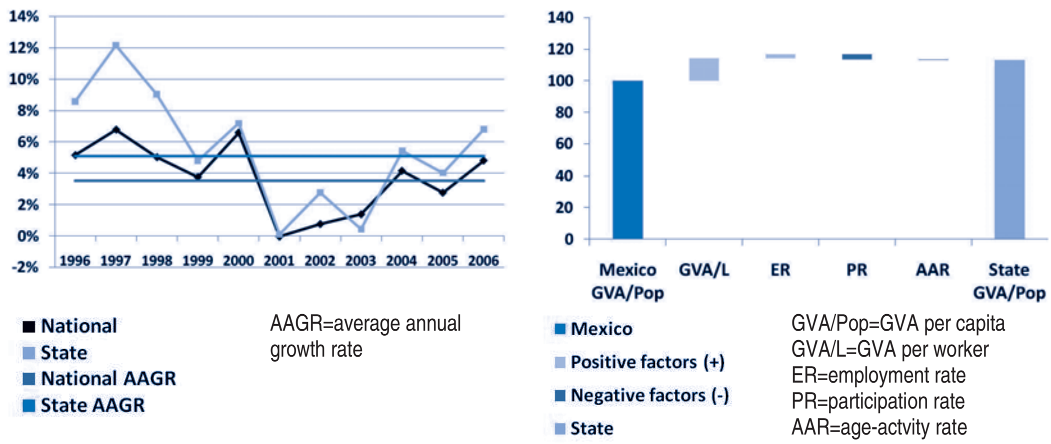
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 15.1. GDP growth and GVA per capita: Queretaro

growth (1996-2006) GVA per capita of state *versus* national average, 2004



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Queretaro's GDP had an average growth rate of 5.1% from 1996 to 2006, well above the national average of 3.6%. The trend in most years is a higher rate than nationally, although this differential was greater pre-2000. Despite strong population growth, the state has nevertheless managed to increase its GDP per head above the national level increase over the period.

Queretaro has a GVA per head that is 12.9% higher than the national average. The state's higher GVA per worker, 14% higher than the national average, illustrates the benefit of having higher labour productivity. Queretaro has higher average scores in the quality of education, contributing to its human capital and the value added of the workforce.

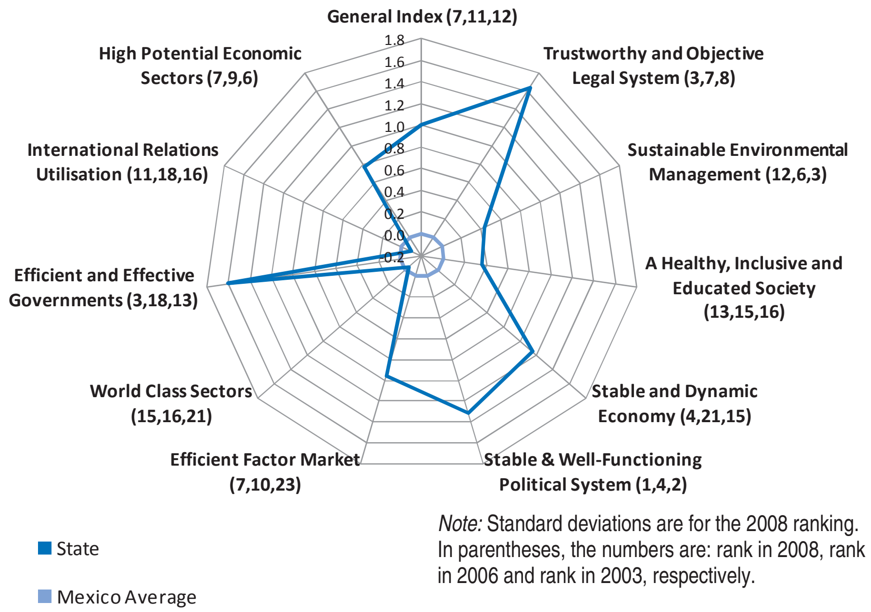
Queretaro has continued to improve its position on traditional competitiveness indicators. It is currently ranked seventh by IMCO, up from 11th in 2006 and 12th place in 2003. The state's score is one standard deviation above the Mexico average. Of the ten component indices, the state scores above the Mexico averages in eight, the other two being just below average. Areas of notable success and improvement concern governance, such as Stable and well functioning political system (top ranked), Trustworthy and objective legal system (third) and Efficient and effective governments (third). Categories with relatively lower values include International relations utilisation and World class sectors. Significant improvements are also noted in Stable and dynamic economy (up to position four from 15 in 2003). Among the state's cities ranked by IMCO are Queretaro (21) and San Juan del Rio (42). The state is ranked eighth on the Knowledge Economy Index.

Competitiveness indices

Figure 15.2. Example competitiveness rankings: Queretaro

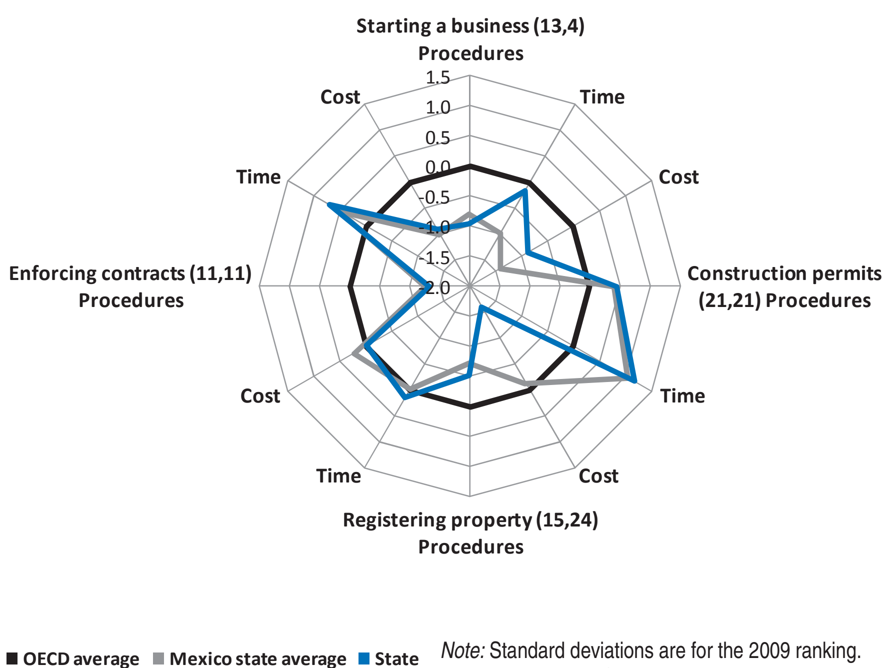
Standard deviations from the mean (0)

IMCO (7, 11, 12)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.

Doing Business (17, 17)



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

Queretaro performs only average with respect to Doing Business indicators, at 17th place in 2007 and 2009. It performs above the OECD average on four factors out of 12. Nationally, the state scores above average on eight of the 12 factors. While the state has ranked the same in the enforcing contracts (11th) and construction permits (21st) categories, it has gained with respect to registering property (up nine places to 15th) and slipped with respect to starting a business (down nine places to 13th). Improvements are needed for starting a business, especially with respect to time and cost. Given the relatively few number of municipalities in the state, greater success in these indicators should be achieved.

In terms of the federal SARE system to facilitate firm registration and development, three of 18 municipalities have a SARE office, Queretaro, Corregidora and San Juan del Rio. The latter two are encompassed in the metropolitan area of the capital city (where most of the population and economic activity is concentrated). Almost 65% of the population lives within a SARE municipality, however, increasing the coverage could help improve the performance on indicators related to starting a business.

Competitiveness committees and policies

- In order to improve the state's competitiveness, the local government has determined that resources levied with the 2% payroll tax are used to constitute a fund intended for infrastructure projects.
- The state has created the Programme for Strengthening Competitiveness which is aimed at SMEs and provides firm diagnosis, consulting, services for quality certifications, innovation and technological transfers, as well as services for linking firms, integrating value chains, and export and commercial promotion.

Industrial structure and clusters

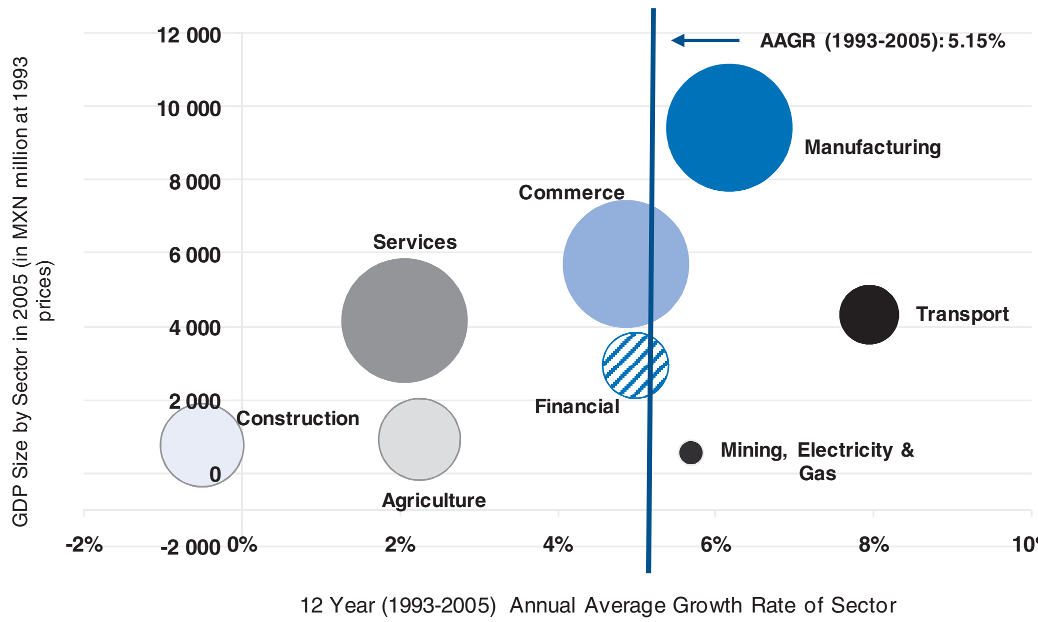
Table 15.2. Sectoral breakout: Queretaro

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	2.9	0.3	30.0	3.3	1.1	21.1	12.3	8.5	20.5
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	4.3	0.2	28.4	4.9	1.6	19.9	10.6	10.0	20.1
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

Figure 15.3. GDP by sector size and growth: Queretaro



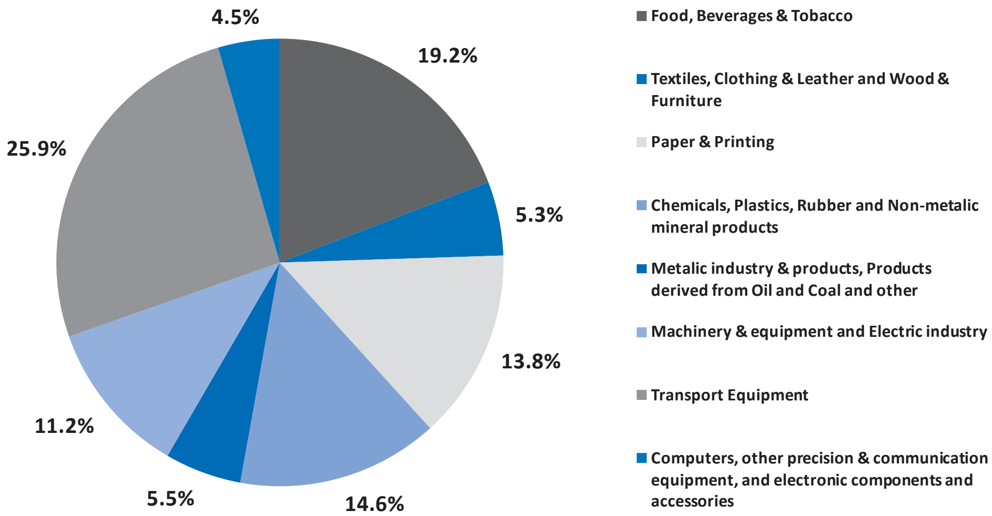
Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

As observed in most states, the structure of the economy of Queretaro varied by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share by a third, representing 4.3% of Queretaro's GDP in 1993 and 2.8% in 2005. Queretaro has a larger proportion of its population living in rural areas than the national average and even though it has developed some extensive agriculture, it is not a significant agricultural producer, except for red tomato for export and grapes.

The sector that had the largest annual average growth was transport, communications and storage with 7.9%, while manufacturing grew at an annual average rate of 6.2% during this period and became the largest employer with 23.2 of total employment. Also, commerce, restaurants and hotels (the second largest employer with 22.9% of the total) grew at an average 4.9%, agriculture, forestry and fishing at 2.3% and construction declined somewhat (-0.51%). The largest employer is manufacturing with 151 074 workers, followed closely by commerce, restaurants and hotels (where tourism plays an important role) with 149 150 and by communal, social and personal services (including government) employing 144 279. Queretaro's agriculture, forestry and fishing activity plays a minor role, employing less than 10% of the workforce with 62 579.

Figure 15.4. Breakout of manufacturing sectors: Queretaro



Source: INEGI Economic Census 2004 (Censos Económicos 2004)

Table 15.3. GVA by technology level: Queretaro

Percent of row total, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	35.2	32.1	14.2	24.7	45.5	31.6	5.1	11.6	2 219
Number of firms	51.1	61.8	43.1	35.3	4.8	2.1	1.0	0.8	3 459
Employment	42.3	44.1	21.3	25.0	31.7	21.5	4.7	9.4	94 364
Total assets	45.8	29.4	20.0	36.8	31.5	29.6	2.8	4.2	3 175
Investment	26.1	30.2	31.6	22.0	41.2	41.1	1.2	6.8	202
FDI (2007)	2.8	9.8	23.9	40.5	70.7	32.5	2.6	17.2	113

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census using OECD industry classification by technology level.

Table 15.4. Firm demographics: Queretaro

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	513315	100.0	100.0
Micro	259 619	50.6	54.8
Small	107 811	21.0	20.3
Medium	76 469	14.9	13.5
Large	69 416	13.5	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing, that had a significant percentage of the state economy already by 1993 with 28.4% of the state's GDP, increased its share to 30% in 2005. This is notably higher than the 17.9% national average share. The state has a diversified manufacturing structure with some well developed industries. The tradition started in the late 1940's when the textile, food processing and chemical industries began their development in the state. The major manufacturing sector is the transport equipment industry, where the car assembly sector is dominant. Queretaro has developed other industrial sectors such as: the domestic oriented food, beverages and tobacco industries and the chemicals, plastics, rubber and non-metallic minerals industries as well. Paper and printing are also important to the state's manufacturing base. Lately, Queretaro has also been developing high technology sectors, notably its aerospace industry with important FDI commitments for the next years. In 2003, *maquiladoras* represented almost 3.8% of the state manufacturing value added.

Queretaro's GVA has a strong representation in mid-high technology industries. While the state does have a slightly higher share of GVA in low technology industries (35.2% *versus* 32.1% nationally), it has a much lower share of mid-low technology industries (14.2% *versus* 24.7% nationally). Where the state stands out is in mid-high technology sectors, which represent 45.5% of the state's economy (*versus* 31.6% nationally). Queretaro's share in high technology industries is less than half the national share (5.1% *versus* 11.6%).

Queretaro has a roughly similar structure of employment by firm size relative to the national average. It does exhibit a slightly higher share of employment in large firms (13.5% *versus* 11.5% nationally). It also has a lower share of micro enterprises, albeit nevertheless large at 50.6% of employment (54.8% nationally).

Strategies and policies to support sectors and clusters

Sectors targeted:

- *Strategic:* IT, Aerospace, Telecom, Logistics (Source: *Proposal of Public Policies for the Economic Development of Queretaro*)
- *Other:* Electronics, Auto (Source: Ministry of Sustainable Development)

According to different sources, Queretaro's industrial and mining sectors had the following specific characteristics:

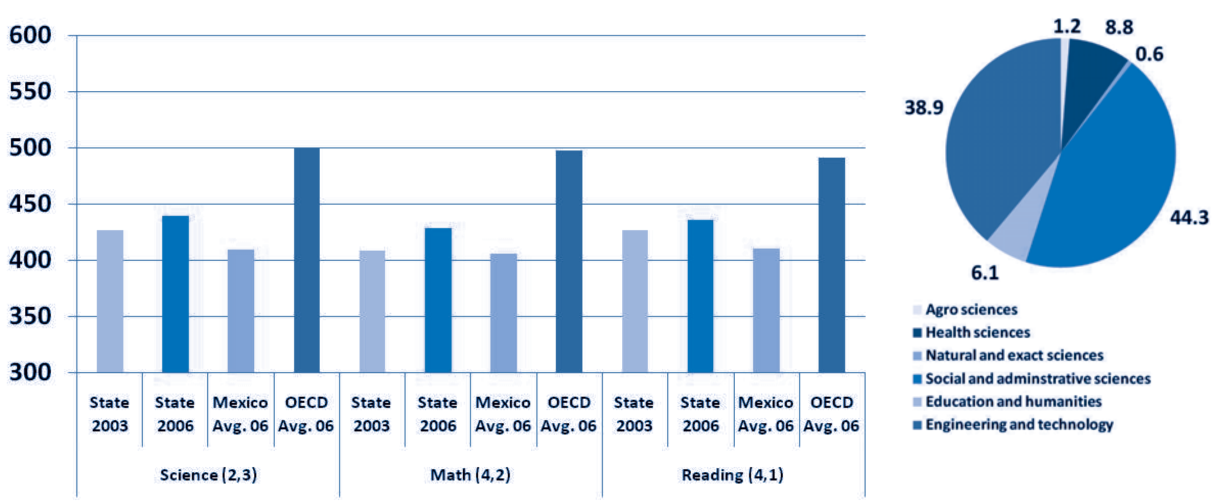
- Eighth largest auto part manufacturer with 4.1% of national total (Source: CONACYT 2006).
- Fourth national producer of gold (Source: CONACYT 2006).
- 17 industrial parks, cities and industrial corridors (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 1.468 billion for 0.7% of the national total (Source: Ministry of Economy 2008).

Innovation system

Figure 15.5. Education: Queretaro

PISA performance

Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Queretaro has outstanding performance in the PISA (Programme for International Student Assessment) evaluations. It is second place in science, fourth in math and fourth in reading. Compared to the Mexico average, Queretaro improved its scores in the 2006 PISA evaluation from those observed in the 2003 evaluation, gaining three places in science, two in math and one in reading. If this trend continues, the state will be on a path to reaching the educational standards of higher income countries, as it is still behind the OECD average by two standard deviations in all three areas: science, reading and math.

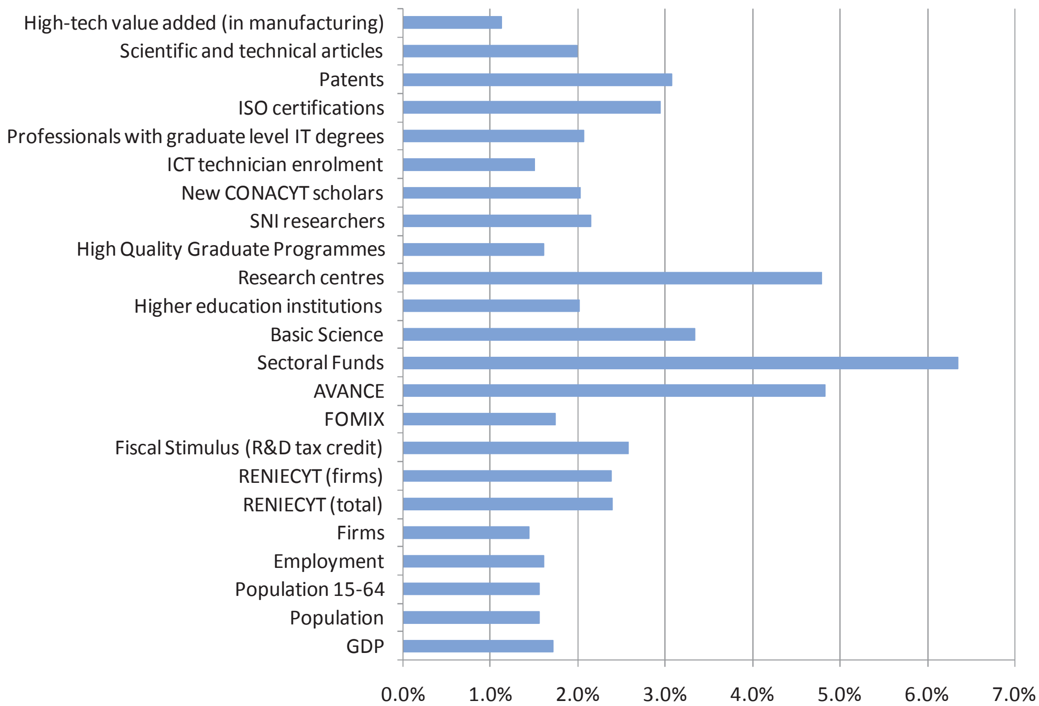
Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies somewhat with respect to what is observed nationally. As is the case in most of the country (46.9%), Queretaro (44.3%) has a relatively high concentration of students in social and administrative sciences programmes. The state does have a noticeably higher share of students in engineering and technology related programmes with 38.9% of enrolment *versus* 33.4% nationally. It most also be noted that, similarly to what is observed around the country, Queretaro has a relatively small student population in natural and exact sciences.

Queretaro's GDP accounts for 1.7% of the national total, however it generally performs higher than its share in terms of scientific capacity. Particularly high is the state's Sectoral and AVANCE funds with 6.34% and 4.83% of national totals. Higher than expected is the number of patents with 3.1% of the national total. Also relatively high are ISO certifications (2.9%). This performance is no doubt supported by the existence of three CONACY public research centres in the state and nine total research centres according to ADIAT's directory. Close to what would be expected from the size of the state's GDP are the indicators related to FOMIX (1.75%), the number of high quality graduate programmes (1.6%), SNI researchers (2.1%), scientific and technical publications (1.98%) and new CONACYT scholars (2%). There are no innovation-related indicators which are significantly lower than would be expected in the case of Queretaro.

Regarding innovations among manufacturing firms, Queretaro's firms show far greater results than the nation as a whole. In terms of the creation of new products, the state ranks well above the national average, especially in terms of investment (47% *versus* 34% nationally). Investments for improvements of the working process are also higher than the national average by two percentage points. Process certifications are much better ranked than the nation as a whole, and investment in R&D also shows a higher level than the national average. In general terms, manufacturing firms in the state tend to perform well above the rest of the country in terms of innovation.

Figure 15.6. Innovation snapshot: Queretaro

Percent of national total

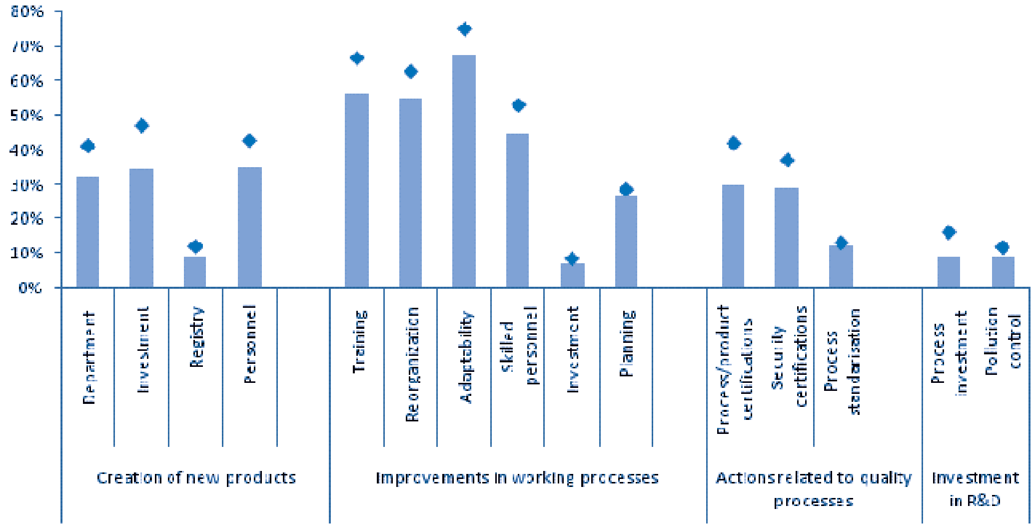


Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Figure 15.7. Innovation by manufacturing firms: Queretaro

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

State Science and Technology Council and other major innovation initiatives

- The state has put increasing attention to transitioning to higher technology sectors and is currently developing an aerospace cluster around the state's airport based on the presence of two large multinational firms.
- The state shows low levels of S&T spending via the S&T Council resulting in reduced opportunities for place-based polices.
- The state has constituted an independent local fund aimed at promoting innovation which is very similar to FOMIX but does not depend upon CONACYT's calls for proposals.

Chapter 16

San Luis Potosi

Strengths
- -Above average GDP growth rate
- -Below average unemployment rate
- -Strong industrial sector
- -Established special free trade zone
- -Important manufacturing capabilities

Weaknesses
- -High marginalisation
- -Below average in terms of human development and inequalities
- -Below average in terms of schooling years and tertiary attainment rates

The state of San Luis Potosi is in the Centre-West meso-region of Mexico. The state has a diversity of climates within its borders. It is the 15th largest in size, and with a population of just over 2.4 million inhabitants (2.3% of nation), has a lower than average population density (ranked 21st). A few of the state's larger cities include San Luis Potosí, its capital city, Soledad de Graciano Sanchez, Ciudad Valles, Tamazunchale and Matehuala. The state has a highly rural proportion of 37.4%, higher than the national average of 23.5%. The state population is growing slower than the national average (0.8% *versus* 1.0%) in part due to migration to the US and other neighbouring states. As a result of this out migration, it is the fifth state in terms of remittances. In terms of educational attainment, it is behind the national averages in both schooling years and in the proportion of its population over 15 years that completed secondary schooling.

The state's GDP of USD 15.7 billion is 1.8% of the national economy (15th largest). However, its GDP per capita is notably lower than the national average (USD 6 469 *versus* USD 8 241). In mining, the state ranks fifth with respect to the value of mineral-metallurgical production nationwide, but first in the production of fluorite, phosphorite, and arsenic, second in tin, third in zinc, fourth in cooper, fifth in gold and lead, and sixth in silver. It is an important producer of sugar cane, oranges, dry chillies, Serrano chilli, red tomatoes and soy beans. It has 24 *maquiladora* plants. The state is below most others in the Human Development Index, ranking 20th out of 32 states. It has one of the highest (6th highest) marginalised populations in the country (including a relatively high share of its population being indigenous ethnic population), albeit a slightly more equal income distribution index to that of Mexico as a whole.

Table 16.1. Socio-economic snapshot: San Luis Potosi

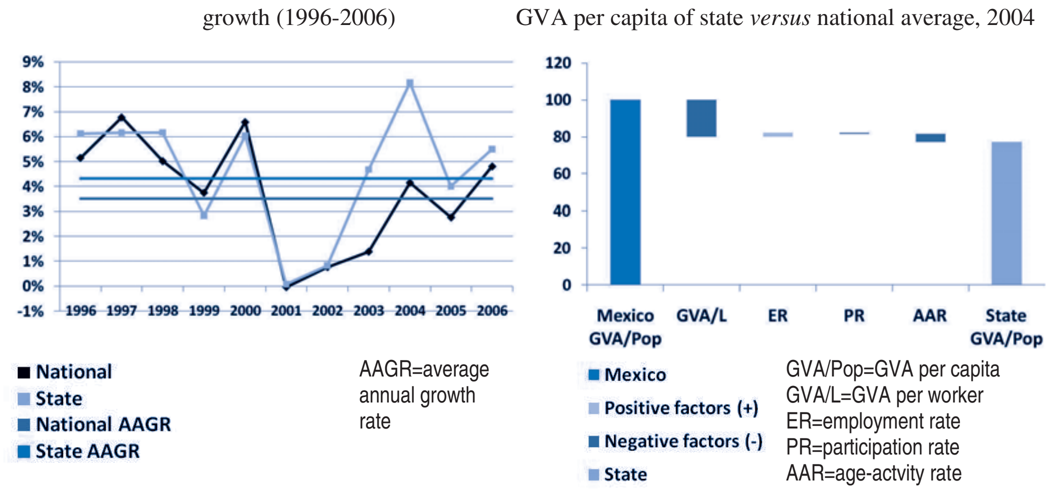
Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	2.4	2.3	17	GDP (USD million)	15 672	1.8	15
Area (sq. km)	61 165	3.1	15	GDP per capita (USD)	6 469	8,241	19
Population density[1]	40.0	97.9	21	GDP yearly growth 1996-2006 (%)[4]	4.3	3.6	8
Population 0-14 (%)	33.1	31.1	7	Primary sector (%)	5.3	5.5	14
Population 15-64 (%)	60.9	63.7	29	Industrial sector (%)	36.7	27.5	3
Population 65+ (%)	6.1	5.3	8	Services sector (%)	58.0	67.1	30
Rural population (%)[2]	37.4	23.5	8	Employment rate (%)	63.1	62.9	16
Population annual growth (2000-2005) (%)	0.8	1.0	21	Unemployment rate (%)	2.7	3.0	15
Yearly migration to the US[3]	61 757	4.1	9	Participation rate (%)	64.8	64.9	15
Population with at most lower secondary education (%)	69.9	66.9	11	Average yearly FDI 1999-2007 (USD million)	119	0.6	16
Population with upper secondary education (%)	14.4	16.7	25	Exporting *maquiladora* industry production (2004 USD million)	776	0.9	11
Population with tertiary education (%)	15.7	16.4	17	Marginalisation index	0.66	0	6
Households with a PC (%)	16	19	19	Gini coefficient	0.605	0.616	22
Municipalities (number)	58	2.4	14	Human Development Index	0.785	0.803	19

Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 16.1. GDP growth and GVA per capita: San Luis Potosi



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

San Luis Potosi's GDP had an average growth rate of 4.3% from 1996 to 2006, above the national average of 3.6%. The state was close to the national growth rates in almost every year through 2002, but since then has shown a continued positive trend of higher average growth rates. As the state's population has increased slower than the national average due to migration, its real GDP per head increased more than the national GDP per capita increase.

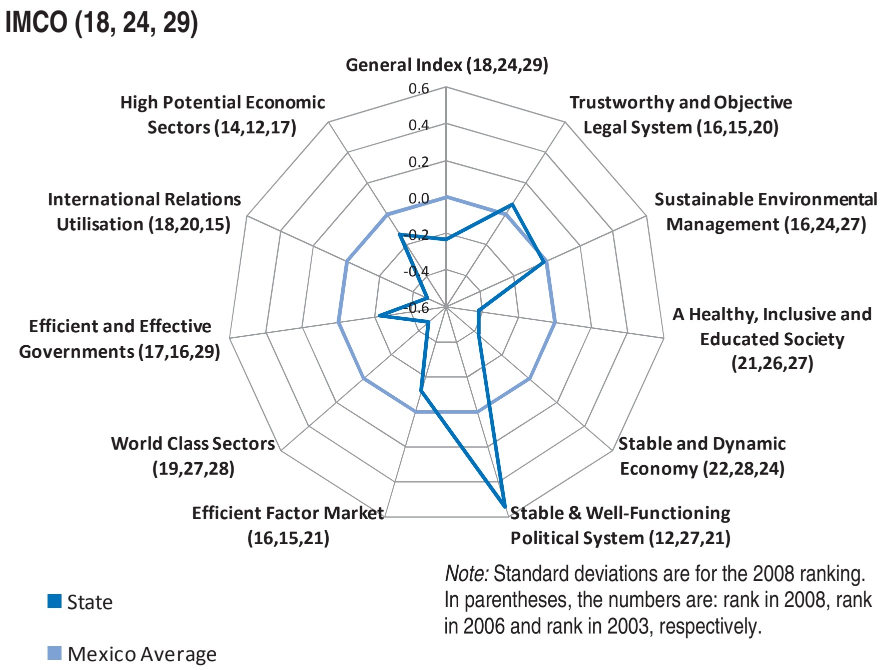
San Luis Potosi has a GVA per capita that is only 77% of the national average. A lower than average GVA per worker drives this differential, as it is 20% below the national average. Other sources of a lower GVA per head include an age activity rate that is 4.60% less than the national average, which could be due in part to the out-migration of people aged 14-65.

San Luis Potosi ranks relatively low on traditional competitiveness indicators. Regarding IMCO, San Luis Potosi has nevertheless been improving considerably from 29th place in 2003, to 24th place in 2006, and up an additional six notches to 18th place in 2008. The state is lower than the Mexico average by 0.23 standard deviations overall. Of the ten component indices, San Luis Potosi scores below the average on eight. The factor that shows relative strength (0.5 standard deviations above the national average) is Stable and well functioning political system (in position 12 up from 21 in 2003). Cites in the state ranked by IMCO include San Luis Potosi (43) and Rioverde (69). The state is ranked 18th on the Knowledge Economy Index.

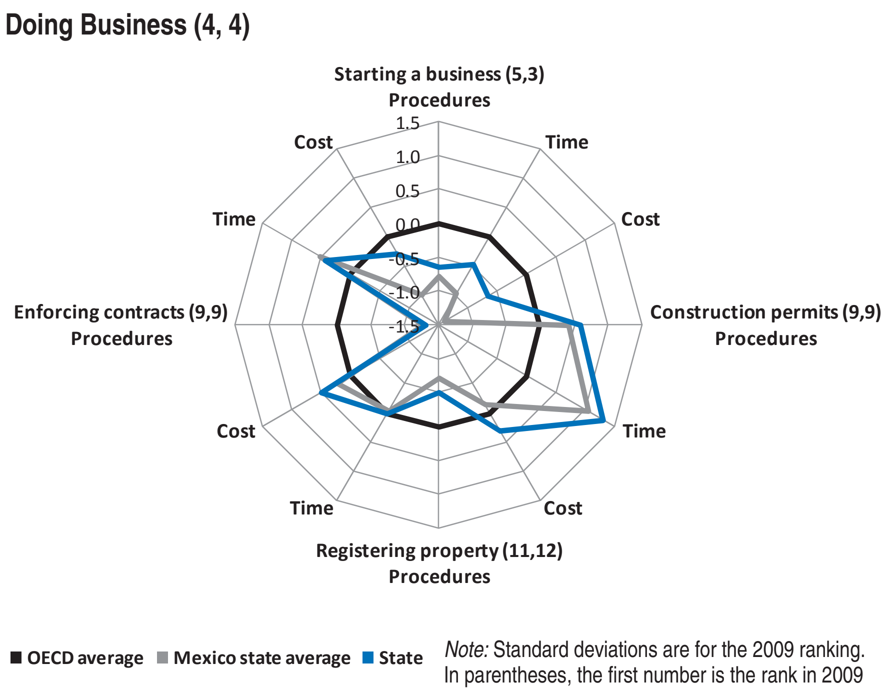
Competitiveness indices

Figure 16.2. Example competitiveness rankings: San Luis Potosi

Standard deviations from the mean (0)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

San Luis Potosi ranks much higher with respect to Doing Business indicators at fourth place in 2007 and 2009 nationally. Relative to OECD averages, the state performs better on six of the 12 factors. With respect to the Mexico average, the state is higher on ten of the 12 factors. Performance has been consistent in the four categories nationally, with construction permits and enforcing contracts at ninth place, up one place to 11th for registering property, and down two places to fifth for starting a business.

In terms of the federal SARE system to facilitate firm registration and development, only three of 58 municipalities have a SARE office (San Luis Potosi, Ciudad Valles and Tamuín). Only 38% of the population lives within a SARE municipality, and increasing the coverage could help improve the performance on indicators related to starting a business, although the state already performs well above average for the country on such indicators.

Competitiveness committees and policies

- San Luis Potosi was the first state (and only fully functioning) with a special foreign free trade zone (*Recinto Fiscalizado Estrategico*) which allows firms established in the state to avoid paying taxes exclusively for production aimed at the export market, hence reducing transaction costs.
- The state has an ambitious supplier development programme to raise the competitiveness of local firms and integrate them into global value chains which is closely linked to industries already developed or developing in San Luis Potosi.

Industrial structure and clusters

Table 16.2. Sectoral breakout: San Luis Potosi

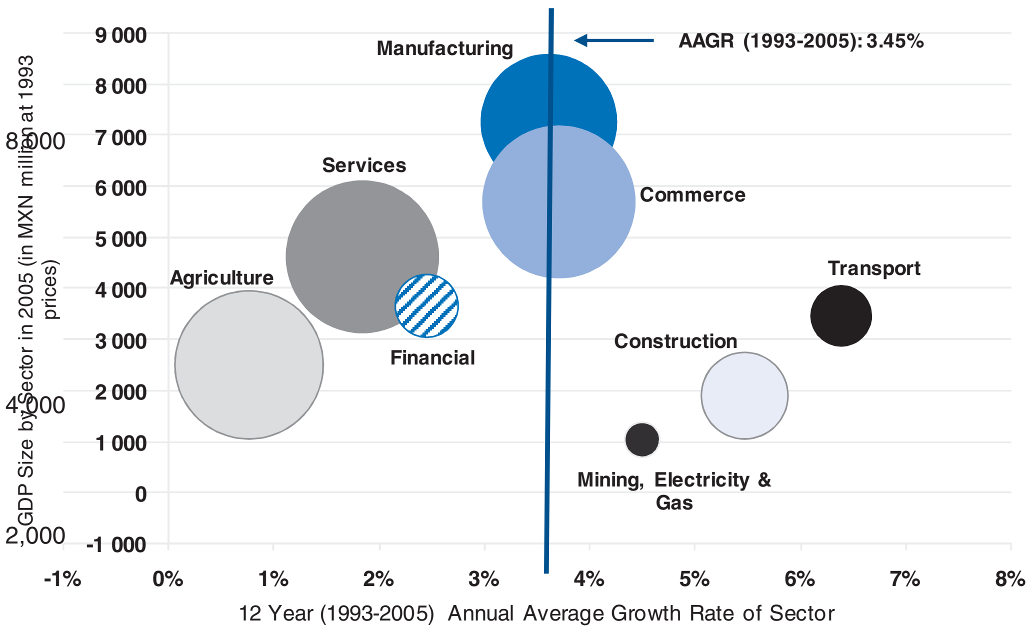
in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	5.2	1.9	23.0	8.6	1.6	18.7	9.4	10.2	21.5
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	11.2	1.2	23.2	4.9	1.8	18.0	8.1	13.4	18.2
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

The structure of the economy varied substantially by sector between 1993 and 2005. Agriculture, forestry and fishing reduced its participation by half, representing 11.2% of San Luis Potosi's GDP in 1993 and only 5.2% in 2005. San Luis Potosi has a 50% higher share of its GDP coming from this sector as compared to the national average. The state is an important national producer of the following agricultural products: whole corn (24.9% of national production), dried chillies (27.9%), Serrano green chilli (14.0%), red tomato (13.7%) and beans (5.4%). It is also a large producer of lamb, goat meat and goat's milk.

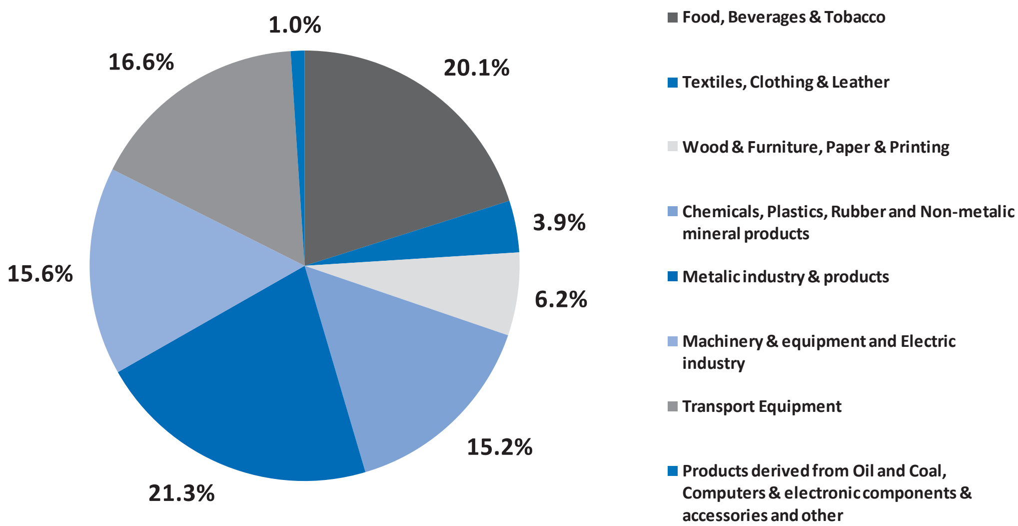
Figure 16.3. GDP by sector size and growth: San Luis Potosi



Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

Figure 16.4. Breakout of manufacturing sectors: San Luis Potosi



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 16.3. GVA by technology level: San Luis Potosi

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	31.7	32.1	33.7	24.7	34.2	31.6	0.4	11.6	1 868
Number of firms	58.5	61.8	39.4	35.3	1.5	2.1	0.5	0.8	6 117
Employment	42.5	44.1	29.9	25.0	26.5	21.5	1.1	9.4	87 060
Total assets	32.4	29.4	50.2	36.8	17.3	29.6	0.1	4.2	3 879
Investment	47.1	30.2	33.2	22.0	19.4	41.1	0.3	6.8	203
FDI (2007)	-3.0	9.8	47.0	40.5	52.9	32.5	3.1	17.2	133

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census using OECD industry classification by technology level.

Table 16.4. Firm demographics: San Luis Potosi

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	647 493	100.0	100.0
Micro	341 348	52.7	54.8
Small	127 718	19.7	20.3
Medium	84 098	13.0	13.5
Large	94 329	14.6	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

The sector with the largest annual average growth was transport, communications and storage with 6.4%, while construction grew notably at an annual average rate of 5.5% during this period. Manufacturing grew at 3.6%, while commerce, restaurants and hotels grew at 3.7%. Agriculture, forestry and fishing experienced much lower growth at 0.8% and communal, social and personal services (including government) at 1.9%. The tertiary sector is the dominant one with 58% of the state GDP. Within this category, communal, social and personal services (including government) are the major contributors followed by commerce, restaurants and hotels. The largest employer is commerce, restaurants and hotels with 210 878 workers followed by communal, social and personal services that employs a total of 206 178. Agriculture, forestry and fishing employs 202 375 (22.2%), representing slightly more employment than the manufacturing sector (21.6%).

Manufacturing constitutes 23% of the state's GDP, with the secondary sector being the third highest share out of 32 states. Nevertheless, except for the transport equipment sector that is linked to global trends and markets, most of San Luis Potosi's manufacturing is centred on the domestic market, sometimes with a lower value added, such as the foods, beverages and tobacco sector that accounts for 20% of all manufacturing. Metallic minerals and products represents 21.3% and chemicals, plastics, rubber and non-metallic minerals account for 15.2% of all manufacturing. The state has 24 *maquiladora* plants that make up 43.6% of the state's exports. A recent and increasing contributor to exports is the car assembly industry that represents 2.2% of the national industry.

The state's economy is split almost evenly between low, mid-low and mid-high technology industries. The share of GVA in low technology is similar to the national average (31.7% *versus* 32.1%). The state has a disproportionately large share of mid-low technology industries (33.7% *versus* 24.7% nationally). The share of the economy in mid-high technology industries is a bit above the national share (34.2% *versus* 31.6%). However, the state has virtually no high technology industries in terms of GVA, employment and FDI.

San Luis Potosi has a similar profile to the national average in terms of employment by firm size, but exhibits a slightly higher percentage of employment in large firms (14.6% *versus* 11.5% nationally). It also has a slightly lower share in micro enterprises (52.7% *versus* 54.8% nationally).

Strategies and policies to support sectors and clusters

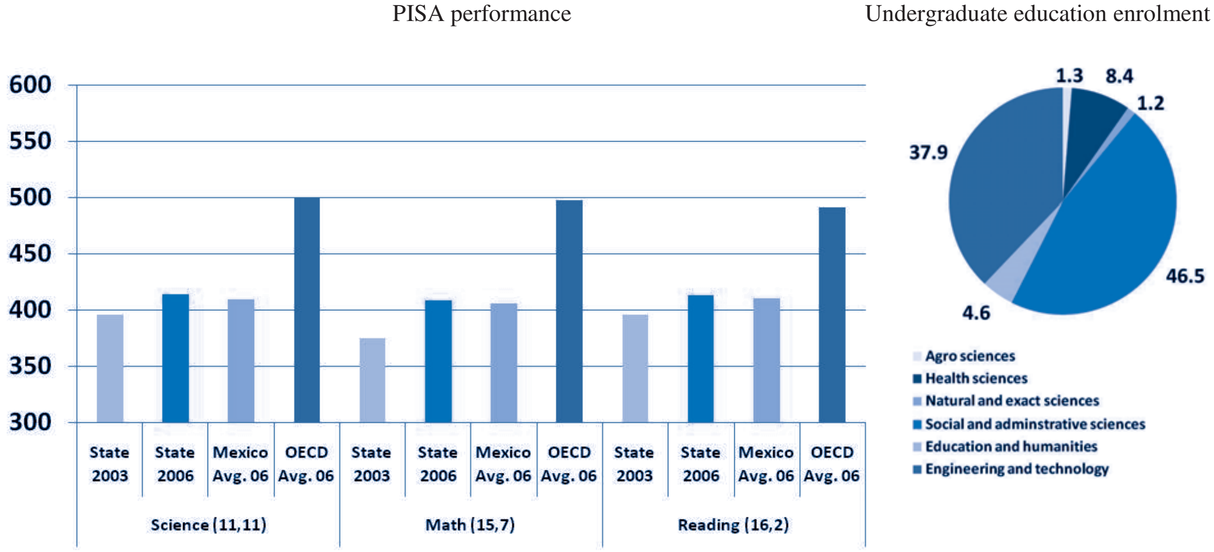
Sectors targeted: Auto and auto parts, Electronic home appliances, Aerospace, Metal-mechanic, Stainless Steel, Plastics, Logistics, ICT, Electric-electronic, Agro, Eco-tourism, Alternative energies (Source: State Development Plan, Economic Development Programme and Economic Development Department).

According to different sources, San Luis Potosi's industry and mining had the following specific characteristics:

- First nationwide in the production of fluorite, phosphorus and arsenic, second in tin, third in zinc, fourth in copper, fifth in gold and lead, and sixth in silver (Source: Economic Development Department 2008).
- It has 18 industrial parks and corridors (CONACYT, 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 1.178 billion for 0.6% of the national total (Source: Ministry of Economy, 2008).

Innovation system

Figure 16.5. Education: San Luis Potosi



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

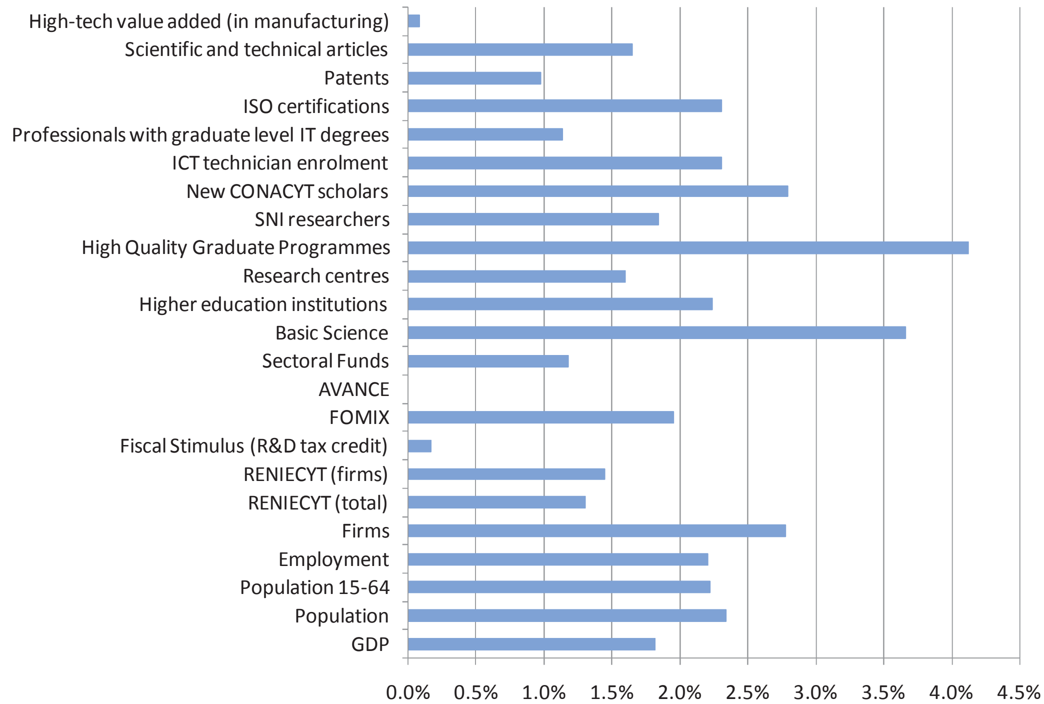
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

San Luis Potosi has average performance for Mexico with respect to PISA (Programme for International Student Assessment) evaluations. Nevertheless, the state made tremendous progress between the 2003 and 2006 evaluations, gaining 11 places in science, seven in math and two in reading. This trend should continue to reach educational standards of higher income OECD countries, as currently the scores are still more than 2.5 standard deviations behind the OECD average in all three areas.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state is very similar to what is observed nationally. As is the case in most of the country (46.9%), San Luis Potosi (46.5%) shows a relatively high concentration of students in social and administrative sciences programmes. The state does have a slightly higher share of enrolment in engineering and technology related programmes (37.9% *versus* 33.5% nationally). Similar to what is observed around the country, San Luis Potosi has a relatively small student population in natural and exact sciences with 1.2% of the total.

Figure 16.6. Innovation snapshot: San Luis Potosi

Percent of national total



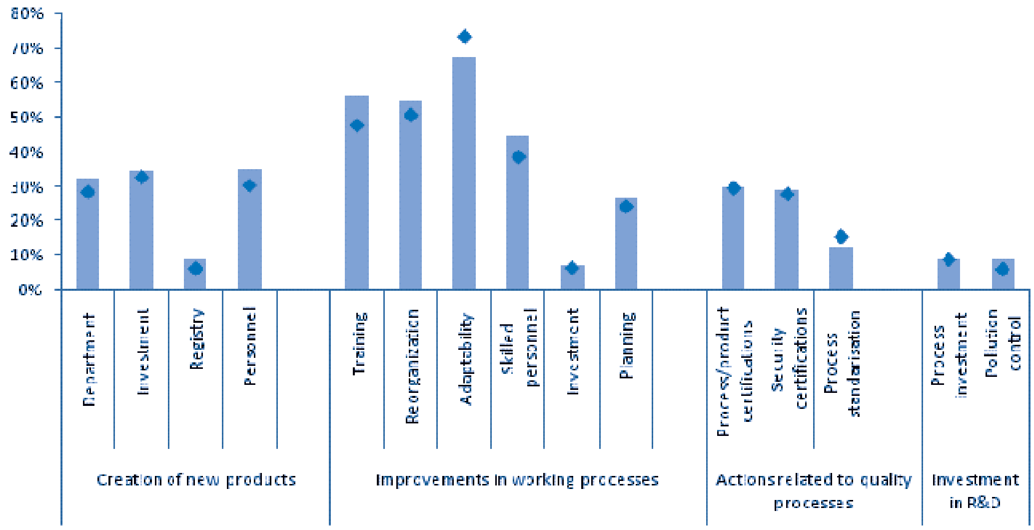
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-2005. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-2006. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

The GDP of San Luis Potosi accounts for 1.8% of the national total, however in a number of innovation related measures the state performs better than what would be expected by this benchmark. Particularly high is the state's share of high quality graduate programmes (4.1%), its level of Basic Science (3.7%), the percentage of FOMIX funds (2% of national total) and the number of ISO Certifications (2.3%). Nevertheless, the R&D tax credit Fiscal Stimulus has a low take up in the state (0.17% of the national total) and the AVANCE programme use is nil. The state does have two CONACYT public research centres and three overall (according to ADIAT's directory) that may support its performance in these indicators.

Figure 16.7. Innovation by manufacturing firms: San Luis Potosi

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, San Luis Potosi's firms generally show lower results than the nation as a whole. In terms of the creation of new products, the state ranks relatively lower than the national average, especially in terms of personnel dedicated to it (30% *versus* 35% nationally). Investments on improvements of the working process are also lower than the national average by a percentage point. Process certifications and investment in R&D show similar levels to the national average.

State Science and Technology Council and other major innovation initiatives

- The state has developed a programme for innovation, technological development and linkages with the private sector with the main objective of identifying technological needs that could be addressed by HEIs and research centres in the state. This programme seeks to identify available resources and obtain funds for such projects.
- San Luis Potosi has performed a formal study to analyse linkages between knowledge generators and industry.

Chapter 17

Tamaulipas

Strengths
-Strong exporting *maquiladora* activity and intense trade activity
- Important FDI flows
-Above average GDP growth rate
-Below average marginalisation and poverty levels
-High enrolment rates in tertiary education and above average tertiary attainment rates
-Strong secondary sector
-Economic activity distributed across state regions

Weaknesses
-High unemployment rate
-Low scientific publications and SNI researchers
-Below average in terms of regulatory framework

The state of Tamaulipas is a border state in the North-East meso-region. It has coast to the Gulf of Mexico and is also an oil and gas rich state. It is the 6th largest in surface area (about half the size of Austria). With a population of just over 3 million inhabitants (2.9% of Mexico's total) it is ranked 23rd in terms of population density. The state has a more urbanised population than the national average at 87.2% *versus* 76.5% nationally. Several important cities in the state include: Tampico (port), Ciudad Victoria, Ciudad Madero, Nuevo Laredo (border to US city), Reynosa (border to US city) and Matamoros (border to US city). The state population is growing at a higher rate than the national average (1.7% *versus* 1.0% nationally). In terms of education, it is ahead of the national averages in both schooling years and in the proportion of its population over 15 years that completed secondary schooling.

The state's GDP of USD 28.8 billion represents 3.3% of the national economy (11th largest). Its annual income per head of USD 9 632 is above the national average of 8 241 (11th highest). The state is the third natural gas producer, the fifth oil producer and the seventh sulphur producer. It also has 363 *maquiladora* plants (12.9% of the national total) with exports of USD 14.6 billion (16.7% of the national total) that represent 90% of the state's total exports. Tamaulipas is somewhat above average in the Human Development Index, ranking 11th out of 32 states, has a relatively lower level of marginalisation and a similar income distribution as Mexico overall.

Table 17.1. Socio-economic snapshot: Tamaulipas

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	3.1	2.93	13	GDP (USD million)	28 846	3.3	11
Area (sq. km)	80 148	4.09	6	GDP per capita (USD)	9 632	8,241	11
Population density[1]	38.4	97.9	22	GDP yearly growth 1996-2006 (%)[4]	4.4	3.6	7
Population 0-14 (%)	29.2	31.1	27	Primary sector (%)	3.3	5.5	24
Population 15-64 (%)	65.5	63.7	8	Industrial sector (%)	31.5	27.5	9
Population 65+ (%)	5.3	5.3	17	Services sector (%)	65.2	67.1	19
Rural population (%)[2]	12.8	23.5	27	Employment rate (%)	63.6	62.9	13
Population annual growth (2000-2005) (%)	1.7	1.0	7	Unemployment rate (%)	4.2	3.0	28
Yearly migration to the US[3]	32 665	1.6	18	Participation rate (%)	66.0	64.9	11
Population with at most lower secondary education (%)	63.3	66.9	24	Average yearly FDI 1999-2007 (USD million)	381	1.9	8
Population with upper secondary education (%)	18.1	16.7	12	Exporting *maquiladora* industry production (2004 USD million)	14544	16.8	3
Population with tertiary education (%)	18.6	16.4	6	Marginalisation index	-0.68	0	22
Households with a PC (%)	17	19	14	Gini coefficient	0.57	0.616	10
Municipalities (number)	43	1.8	18	Human Development Index	0.825	0.803	11

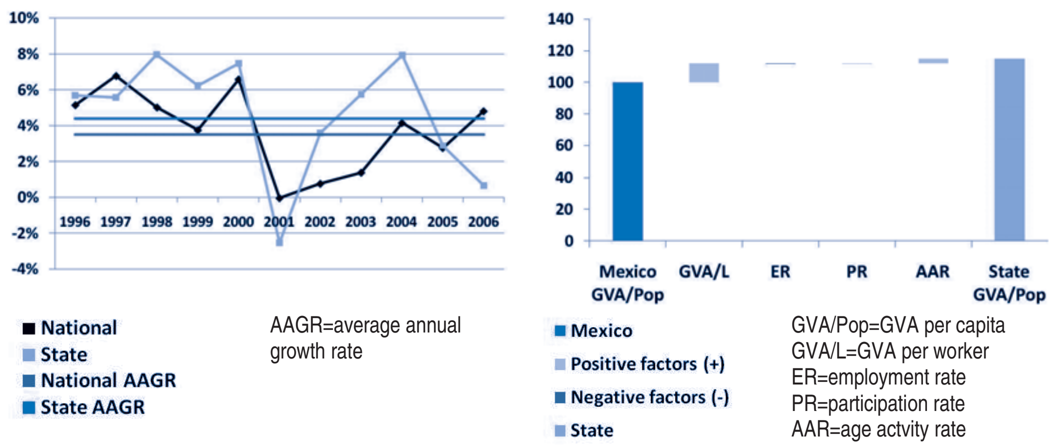
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 17.1. GDP growth and GVA per capita: Tamaulipas

growth (1996-2006) GVA per capita of state *versus* national average, 2004



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

The state's GDP had an average annual growth rate of 4.4% from 1996 to 2006, more than the national average of 3.6%. In most years over that decade, the state's growth was clearly above national averages with the exception of the 2001 recession given the state's reliance on the US economy. Moreover, Tamaulipas's real GDP per head increased more than that of the national average.

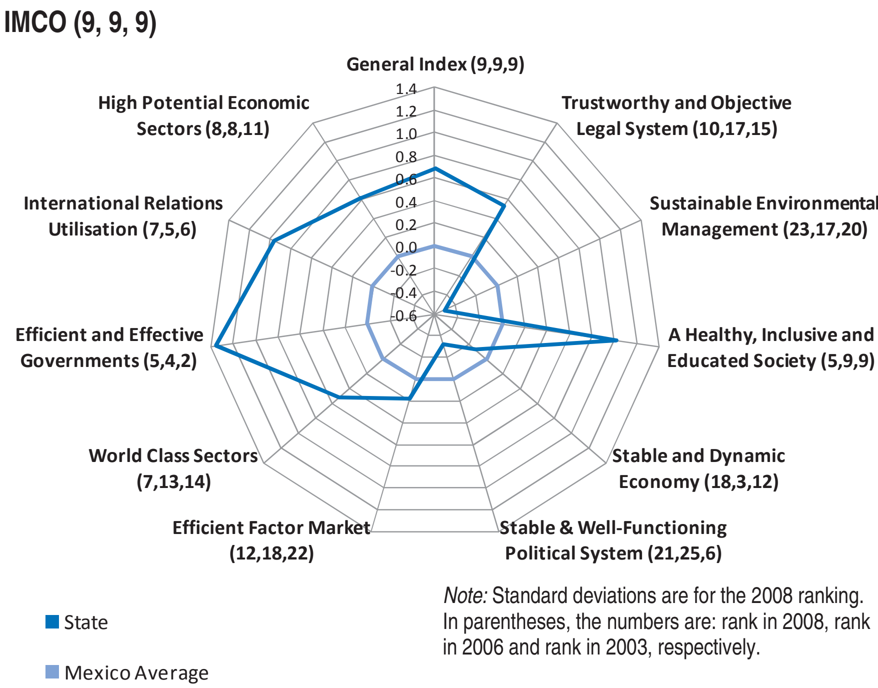
Tamaulipas has a GVA per head that is 12% higher than the national average. This difference is almost entirely due to a higher GVA per worker by 12% above the national average. Tamaulipas has slightly better scores in the quality of education, schooling years and secondary completion standards that, combined with its industrial structure, contribute to this higher productivity.

Tamaulipas has varied performance on the different traditional competitiveness indicators. It performs the highest on IMCO indicators, being ranked ninth all three years (2008, 2006 and 2003). The state is almost 0.7 standard deviations above the Mexico average. Of the ten component indices, Tamaulipas ranks above the national average in seven. One area of below average performance is in Sustainable environment management (23rd). Areas of notable improvement include World class sectors (up to position seven from 14 in 2003) and efficient factor market (up to position 12 from 22 in 2003). The state also has several well ranked cities according to IMCO, including Reynosa (8), Matamoros (17), and Tampico (22). On the Knowledge Economy Index, the state ranks more average at 16th.

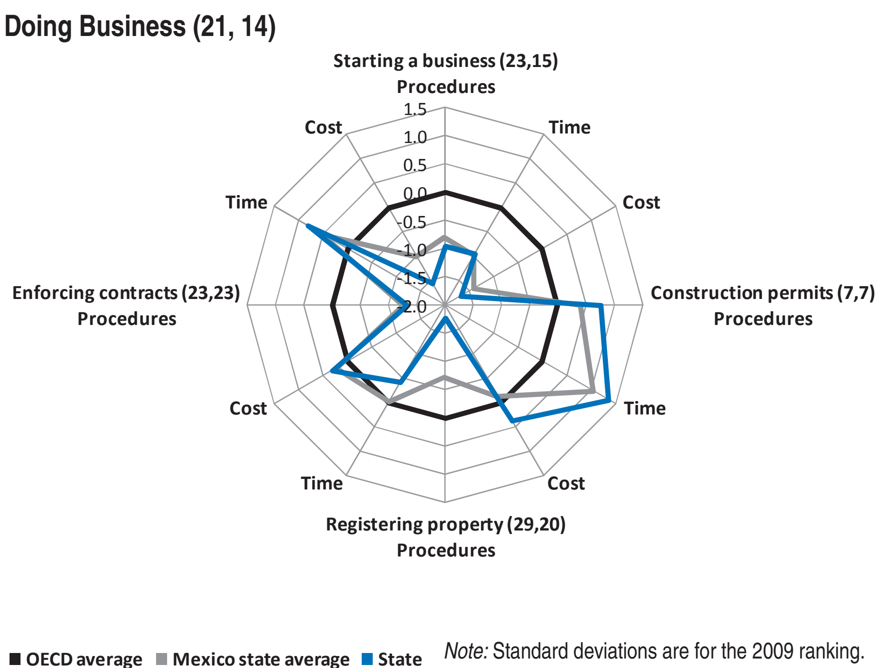
Competitiveness indices

Figure 17.2. Example competitiveness rankings: Tamaulipas

Standard deviations from the mean (0)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

Tamaulipas is somewhat less strong in its performance with respect to Doing Business. The state is currently ranked 21st overall, down seven places from 2007. The state performs above OECD averages on five out of 12 factors, three of which are related to construction permits. It is above the Mexico average in six out of the 12 factors contributing to business environment. Performance for the category of starting a business has slipped (eight places since the last rating), as has registering property (nine places).

In terms of the federal SARE system to facilitate firm registration and development, only three of 43 municipalities have a SARE office (Reynosa, Tampico and El Mante). These municipalities contain only 31.8% of the state's population. This could explain in part the below average performance on starting a business indicators.

Competitiveness committees and policies

- The state has set forth a competitiveness strategy to increase economic performance, which includes an innovation component and is based on the triple helix model.
- The competitiveness strategy of the state is based on identifying the competitive advantages of each region, where several are important and specialised in different sectors.

Industrial structure and clusters

Table 17.2. Sectoral breakout: Tamaulipas

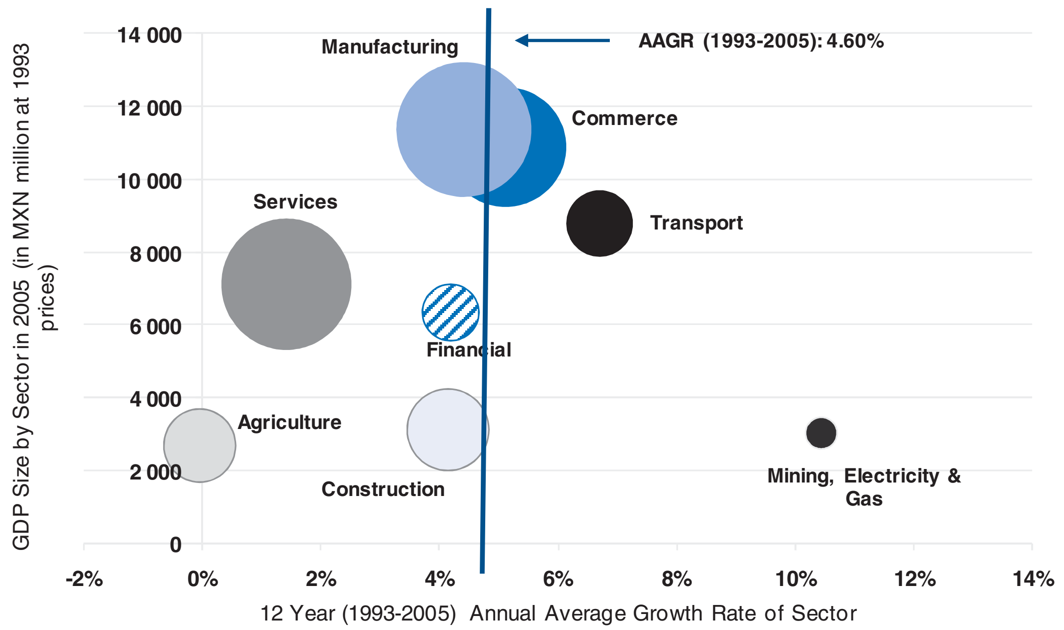
in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	3.1	1.6	19.7	7.2	3.0	24.3	12.5	9.8	18.7
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	8.4	0.9	18.6	5.9	1.9	21.0	12.5	12.0	18.7
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

The structure of the state's economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share by almost two-thirds, representing 8.4% of the state's GDP in 1993 but only 3.1% in 2005. Tamaulipas has a lower proportion of its GDP coming from the primary sector as compared to the national average. Tamaulipas has nevertheless developed some agriculture and has become an important producer of various products: sisal plant (100% of national total), soy (67.1%), aloe (75.3%), green Serrano chilli (44.7%), sorghum grain (40.1%), Valence orange (21.8%), cherry tomato (21.3%), onion (13.7%) and industrial sugar cane (6%). Having an important coastal front, the state is also a significant producer of the following sea fish products: lisa (36.7%), dogfish (22.6%), sea trout (21.1%), shrimp (12.7%) and crab (10.3%).

Figure 17.3. GDP by sector size and growth: Tamaulipas



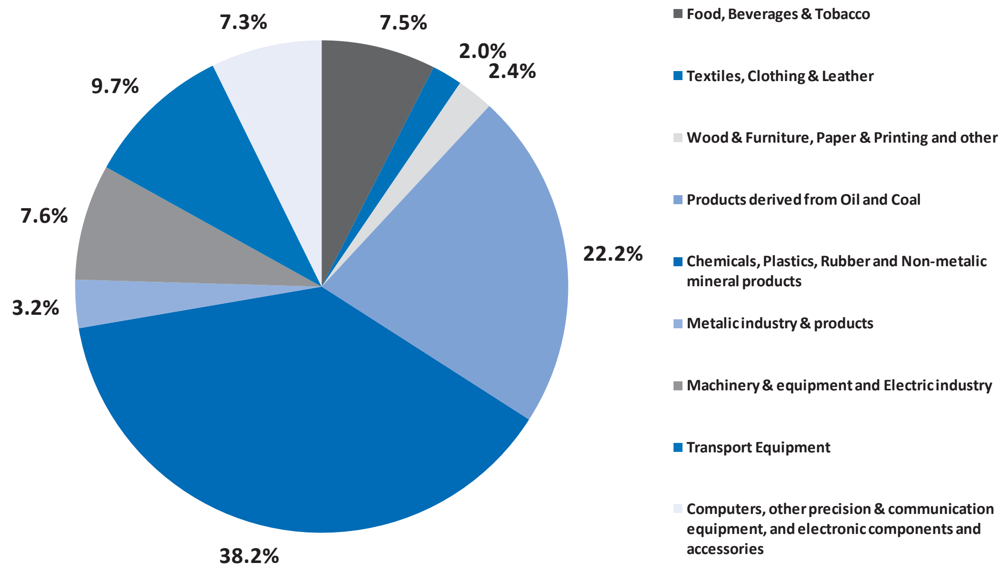
Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The sector that had the largest annual average growth was mining, electricity, gas and water with 10.4%, followed by transport, communications and storage with 6.7% and manufacturing grew at an annual average rate of 5.1% during this period. Commerce, restaurants and hotels as well as construction both grew over 4%. The largest employer is commerce, restaurants and hotels with 330 364, followed by communal, social and personal services (including government) employing 308 135 and manufacturing that employs a total of 260 340 and represents 20.5% of the state's total employment. Agriculture represents 7.7% of the state's employment, more than twice its share of GDP.

Manufacturing increased its share of the state's GDP, from 18.6% in 1993 to over 19.7% in 2005. The chemicals, plastics, rubber and non-metallic minerals alongside the petroleum, coal and derivatives industries accounted for over 60% of the state's manufacturing. This is due to the oil industry and the petrochemicals that is often associated with it. The other important contributor to the state's industry is *maquiladoras*. In 2003, *maquila* already represented 35.4% of the industrial value added of the state, with transport equipment (including auto parts and car assembly) accounting for almost 10% of all manufacturing.

Figure 17.4. Breakout of manufacturing sectors: Tamaulipas



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 17.3. GVA by technology level: Tamaulipas

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	12.3	32.1	26.2	24.7	46.5	31.6	15.0	11.6	3 399
Number of firms	59.5	61.8	36.5	35.3	2.7	2.1	1.3	0.8	6 584
Employment	21.7	44.1	21.4	25.0	37.8	21.5	19.1	9.4	211 921
Total assets	9.6	29.4	40.5	36.8	44.0	29.6	5.9	4.2	3 499
Investment	7.0	30.2	26.9	22.0	63.6	41.1	2.4	6.8	375
FDI (2007)	1.4	9.8	23.3	40.5	30.7	32.5	44.6	17.2	390

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census using OECD industry classification by technology level.

Tamaulipas stands out for its large share of industry in mid-high technology sectors. It has only 12.3% of its GVA in low technology industries (*versus* 32.1% nationally) and a somewhat higher share in mid-low technology (26.2% *versus* 24.7%). The share in mid-high tech of 46.5% is significantly higher than the national average of 31.6%. The state also has a higher share of GVA in high technology industries (15% *versus* 11.6% nationally) with an even larger share of FDI in such industries.

Table 17.4. Firm demographics: Tamaulipas

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	1 027 867	100.0	100.0
Micro	486 965	47.4	54.8
Small	199 171	19.4	20.3
Medium	112 052	10.9	13.5
Large	229 679	22.4	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Tamaulipas has a much higher share of employment in larger firms which can support competitiveness and technology upgrading with appropriate policies. Large firms account for 22.4% of total employment, as compared to a national average of almost half that at 11.5%. Micro enterprises still account for a very large share of employment, but several percentage points less than the national average (47.4% *versus* 54.8% nationwide).

Strategies and policies to support sectors and clusters

Sectors targeted: Auto, IT, Electronics, Aeronautic, Agro, *Maquila* (Source: Secretary of Economic Development).

According to different sources, industry and mining in Tamaulipas had the following specific characteristics:

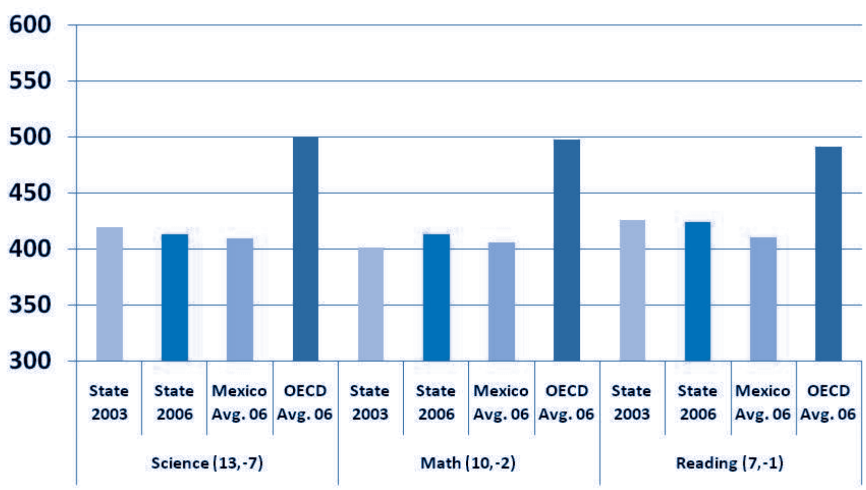
- Third largest natural gas producer in Mexico (Source: CONACYT 2006).
- Fifth largest oil producer (Source: CONACYT 2006).
- 363 *maquiladoras* (12.9% of national total) (Source: CONACYT 2006).
- It has 21 industrial parks, cities and corridors (Source: CONACYT 2006)/
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 3.785 billion for 1.8% of the national total (Source: Ministry of Economy, 2008)

Tamaulipas had slightly above average scores in the last two PISA (Programme for International Student Assessment) evaluations. Nevertheless, like most Mexican states, it is still behind OECD averages by at least 2.5 standard deviations. Furthermore, the state lost seven places in science, two in math and one in reading between 2003 and 2006.

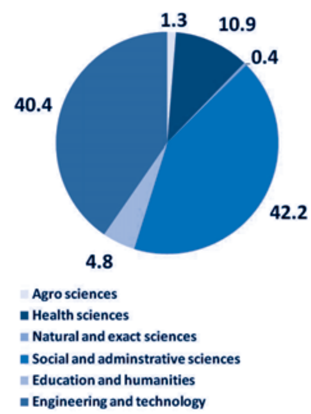
Innovation system

Figure 17.5. Education: Tamaulipas

PISA performance



Undergraduate education enrolment



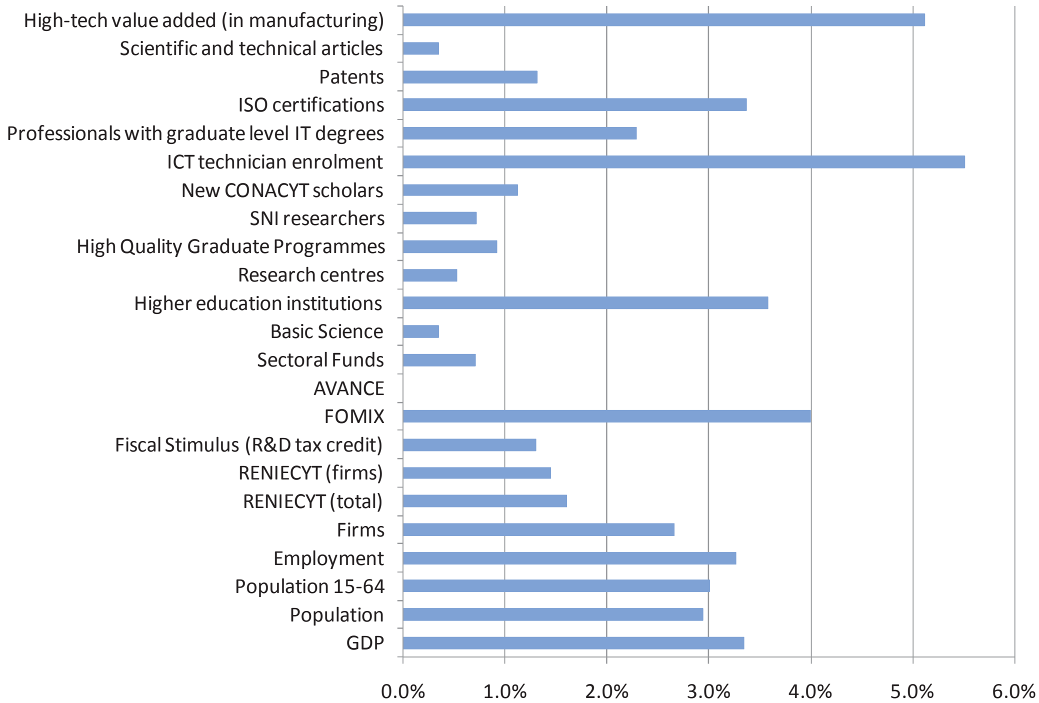
Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state is somewhat different from national averages. Like in all states, enrolment is most concentrated in social and administrative sciences programmes at 42.2%, notably lower than the national average of 46.9%. The state also shows much higher rates of enrolment in technology and engineering related programmes at 40.4% as compared to the national share of 33.4%. This strong enrolment is likely due to the state's strong industrial base. Similarly to what is observed around the country, Tamaulipas has a particularly small student population in natural and exact sciences with 0.4% as compared to a higher 1.9% nationally.

Figure 17.6. Innovation snapshot: Tamaulipas

Percent of national total



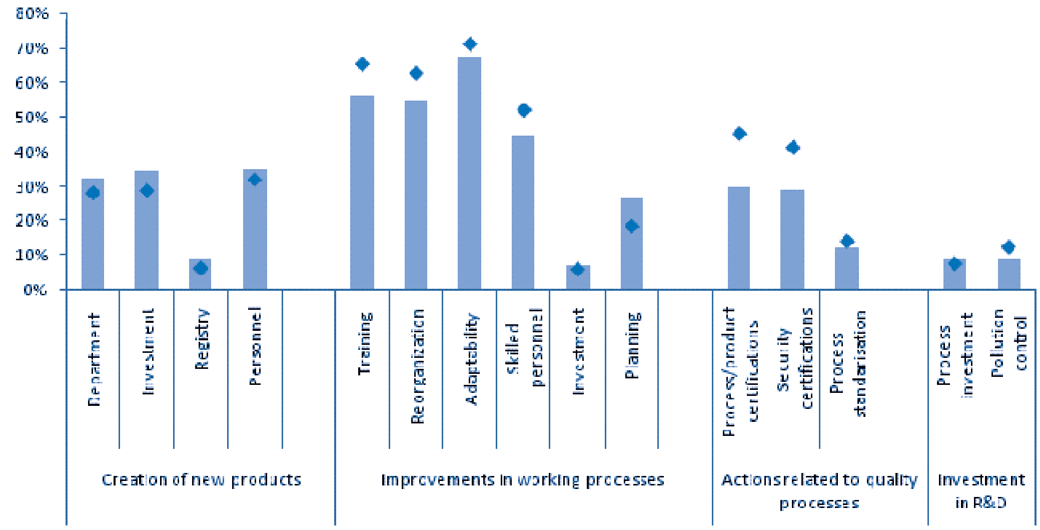
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-2006. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

The GDP of Tamaulipas accounts for 3.3% of the national total, however, on most indicators of scientific capacity the state under-performs relative to this benchmark. Among these indicators are Basic Science funds (0.35%), new CONACYT scholars (1.12%), SNI researchers (0.71%) and high quality graduate programmes (0.92%) as well as AVANCE (0%) and patents (1.31%). The absence of a CONACYT public research centre (and only one overall according to ADIAT's directory) contributes to this lower scientific capacity. Also low is the take-up by the state's firms of R&D tax credits (Fiscal Stimulus) with 1.30% of the national total and Sectoral Funds (0.7%). Given the state's strong industrial base, it is nevertheless high in its use of FOMIX funding with 4.0% of the national total. Also high are the ISO certifications, with 3.4% of the national total, an instrument to improve the quality of production processes also related to the scale of the average production unit. Finally, the state also ranks high in terms of value added in high-tech manufacturing at over 5.1% of national total, potentially indicating more sophisticated production processes.

Figure 17.7. Innovation by manufacturing firms: Tamaulipas

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, the state's firms show greatly varying results. In terms of the creation of new products, the state ranks relatively lower than the national average, especially in terms of investment (29% *versus* 34% nationally). Investments on improvements of the working process are also lower than the national average by a percentage point. Process certifications are much better ranked than the nation as a whole, and investment in R&D shows a similar, but lower, level to the national average.

State Science and Technology Council and other major innovation initiatives

- The state S&T Council finances productive projects, each of which is assigned to a particular director.
- The state S&T Council identifies and selects firms with technological needs and issues a call for proposals for HEI and research centres to address such needs, these knowledge generators present alternative solutions, and the firm selects the most appropriate provider.
- The state has shown particular interest in intellectual property, having constituted a special centre that provides consulting services for firms interested in such topic. This policy is aimed at increasing the total numbers of patents in the state.
- The state government also helps firms financially in matters related to intellectual property.

Chapter 18

Yucatan

Strengths
-Above average GDP growth rate
-High employment and participation rates
-Low migration rate
-Very important tourist and logistics sectors
-Scientific capacity (scientific publications and SNI researchers)
-Competitiveness and quality of life of the state's main city (Merida)
-Below average unemployment rate

Weaknesses
-Above average marginalisation
-Low average schooling years and tertiary attainment rate
-High informality rates

The state of Yucatan is one of three states in the Southeast Mexican Peninsula (South-Southeast meso-region). It is the 15th largest in surface area and with a population of 1.9 million (1.8% of Mexico), it is the 18th most densely populated. Nevertheless, the state has a high share of its population in urban areas at 83% compared to a national average of 76.5%. Some of the state's larger cities include Mérida, Valladolid, Puerto Progreso, Motul and Tizimín. The state population is growing notably faster than the national average (1.6% *versus* 1%). As the state is far from the US, it has a very low share of its adult population that has migrated there, a factor contributing to the relatively higher rates of population growth in the state. In terms of educational attainment, it is behind the national averages in both schooling years and in the proportion of its population over 15 years that has completed secondary schooling.

The state's GDP of USD 12.2 billion is 1.4% of the national economy (21st). However, the state GDP per capita of 6 778 is notably below the national average of USD 8 241 (17th highest). The state is an important producer of sisal, Habanero chilli, avocado and Persian lemon. Yucatan has important tourist attractions: the Mayan ruins of Chichen-Itzá and Uxmal are well-known archaeological sites, in addition to the spillovers from tourism flows to neighbouring states, alongside significant Biosphere reserves and a variety of climates in its territory. Yucatan has 88 *maquiladora* plants, mainly focused on textiles. The state is below the national average in the Human Development Index, ranking 20th out of 32 states, and has a relative high level of marginalisation (11th place) and an average income distribution index.

Table 18.1. Socio-economic snapshot: Yucatan

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	1.9	1.8	21	GDP (USD million)	12 224	1.4	21
Area (sq. km)	39 671	2.0	20	GDP per capita (USD)	6 778	8 241	17
Population density[1]	46.6	97.9	18	GDP yearly growth 1996-2006 (%)[4]	4.2	3.6	10
Population 0-14 (%)	29.2	31.1	26	Primary sector (%)	3.6	5.5	23
Population 15-64 (%)	64.9	63.7	9	Industrial sector (%)	23.7	27.5	23
Population 65+ (%)	5.9	5.3	9	Services sector (%)	72.8	67.1	7
Rural population (%)[2]	17.0	23.5	19	Employment rate (%)	67.5	62.9	3
Population annual growth (2000-2005) (%)	1.6	1.0	8	Unemployment rate (%)	2.5	3.0	13
Yearly migration to the US[3]	5 839	0.5%	28	Participation rate (%)	68.2	64.9	5
Population with at most lower secondary education (%)	68.4	66.9	15	Average yearly FDI 1999-2007 (USD million)	39	0.2	23
Population with upper secondary education (%)	17.0	16.7	15	Exporting maquiladora industry production (2004 USD million)	968	1.1	9
Population with tertiary education (%)	14.6	16.4	25	Marginalisation index	0.43	0	11
Households with a PC (%)	16	19	18	Gini coefficient	0.586	0.616	14
Municipalities (number)	106	4.3	8	Human Development Index	0.783	0.803	20

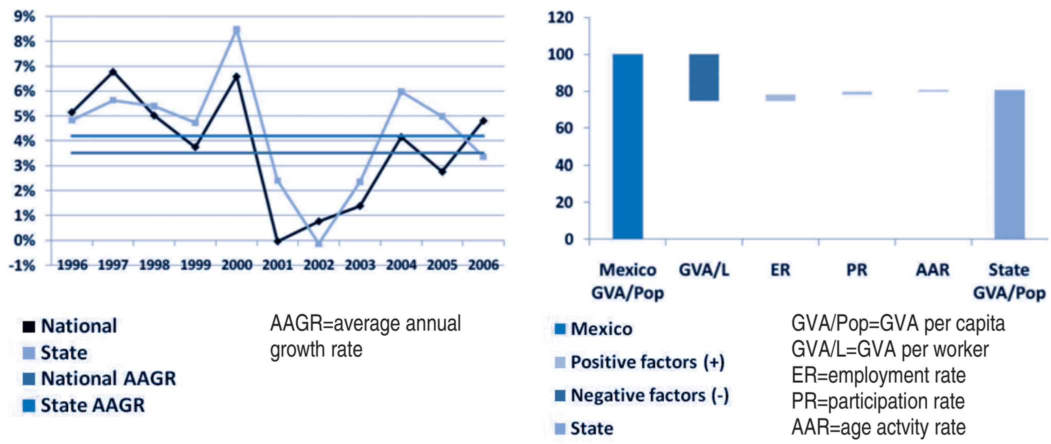
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

Economic growth

Figure 18.1. GDP growth and GVA per capita: Yucatan

growth (1996-2006) GVA per capita of state *versus* national average, 2004



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

Yucatan's GDP had an average annual growth rate of 4.2% from 1996 to 2006, above the national average of 3.6%. This growth rate above national levels is observed in most of the years in that decade. This faster growth rate has made convergence to Mexico standards in the medium term a real possibility, however, even faster growth rates will be needed to converge to more advanced OECD regions.

Yucatan has a GVA per head that is 80.8% of the national average. A lower GVA per worker (-25.4%) is the main factor driving this difference. Factors having a positive effect include a higher than average employment rate by 3.5%.

Yucatan has below average scores on traditional competitiveness indicators. The state is ranked 20th by IMCO, down two places from 18th place in 2006 and 2003. The state is 0.84 standard deviations lower than the Mexico average. Of the ten component indices, Yucatan is below average on six and above average on four. One factor with significant improvement is Stable and well functioning political system (up to position four from 23 in 2003). However, the factor Trustworthy and objective legal system experienced a significant relative decline (down to position 26 from nine in 2003). Yucatan does contain a city ranked as highly competitive in Mexico, Merida at sixth place. The state ranks 23rd on the Knowledge Economy Index.

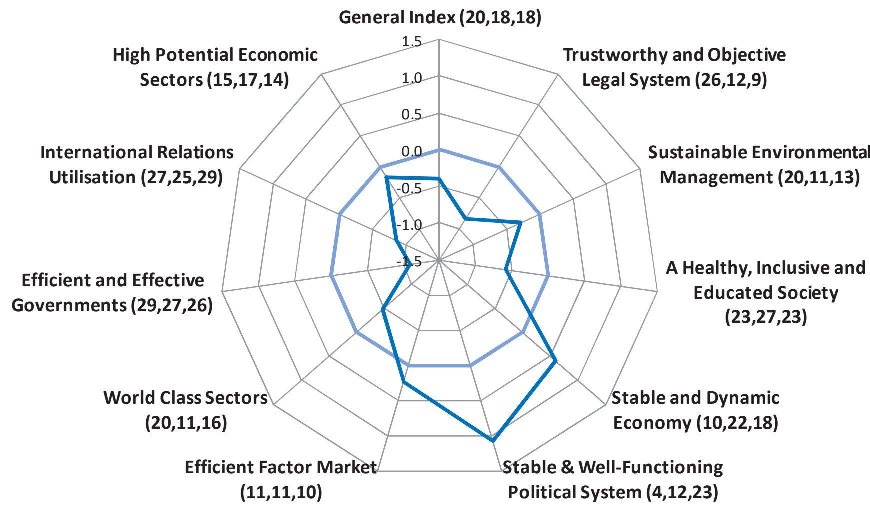
Yucatan is below Mexico averages with respect to Doing Business indicators. In the 2009 rankings, it is in 26th place, down three places from 2007. The state performs better than OECD averages in six out of 12 factors, mainly with respect to the categories of construction permits and registering property. The state performs below the OECD average in all three factors related to starting a business: number of procedures, time and cost. Yucatan ranks above national averages in five out of 12 factors. Among the four categories, it performs best nationally for starting a business, fourth place.

Competitiveness indices

Figure 18.2. Example competitiveness rankings: Yucatan

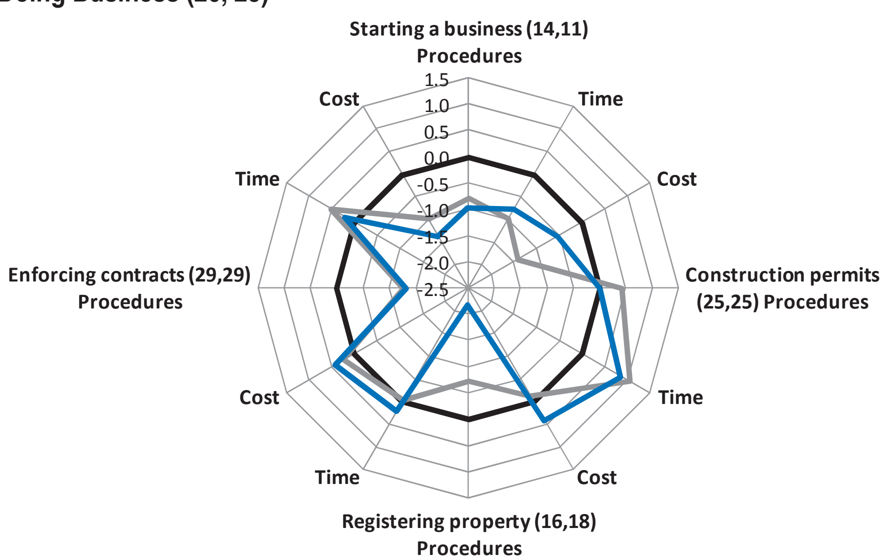
Standard deviations from the mean (0)

IMCO (20, 18, 18)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.

Doing Business (26, 23)



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

In terms of the federal SARE system to facilitate firm registration and development, six of 106 municipalities have a SARE office. These six municipalities (Mérida, Tizimín, Valladolid, Puerto Progreso, Tekax and Ticul) cover 57% of the state's population, potentially a barrier for improving performance on indicators related to starting a business.

Competitiveness committees and policies

- The state has an interesting approach to increasing competitiveness through improving its productivity levels, which could potentially have a strong impact on investment levels.
- The state constituted the Institute for Innovation, Quality and Competitiveness which works on three main themes that include: training for SME and government agencies; developing a culture of high quality standards; and improvements to the regulatory framework.
- The state possesses a civil forum for regulatory framework improvement and government innovation to speed up services and procedures that are the direct responsibility of the state government.

Industrial structure and clusters

Table 18.2. Sectoral breakout: Yucatan

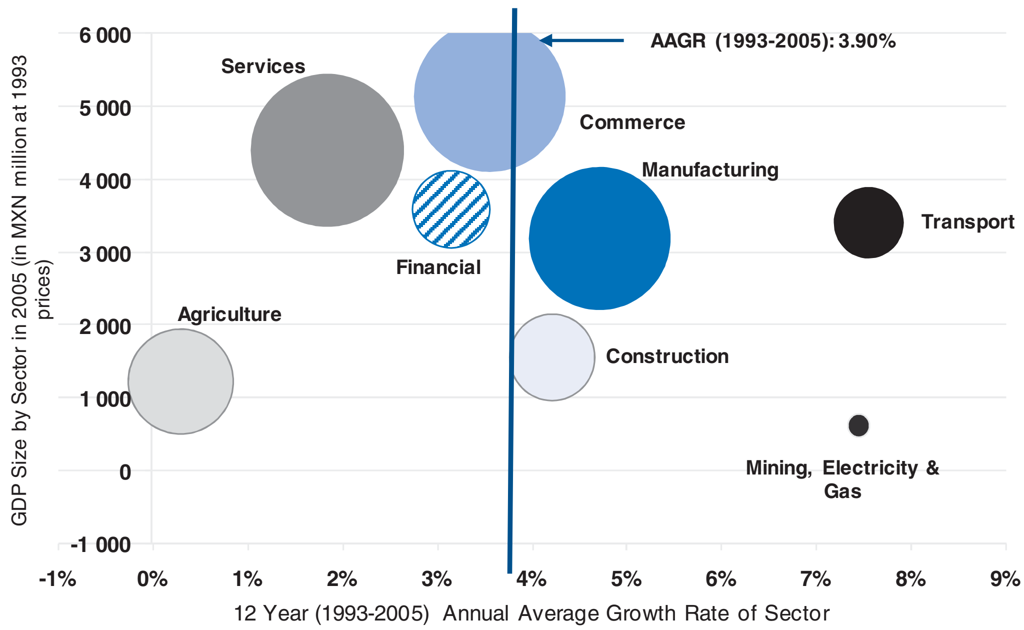
in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	3.9	0.2	13.2	8.9	1.4	22.6	10.8	13.5	25.6
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	7.9	0.5	12.2	6.3	1.3	22.5	9.4	16.5	23.5
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

The structure of the economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share by a half over the period, from 7.9% of Yucatan's GDP in 1993 to 3.9% in 2005. The state is an important national producer of the following agricultural products: sisal (100% of national production), Habanero chilli (54.2%), avocado (9%), and Persian lemon (4.5%). It is the first national producer of bee honey with 15.2% of the national total and is important pork, chicken and egg producer. It is also one of the largest players in terms of octopus. Tourism (including Chichen-Itzá and Uxmal Mayan ruins) has become a significant part of the state economy, where commerce, restaurants and hotels generated 22.6% of the state GDP in 2005. Manufacturing is not a very important activity in Yucatan, although it has been growing lately due to increasing *maquiladora* plants. The share in manufacturing increased slightly from 12.2% in 2003 to 13.2% in 2005. The service sector is the dominant one with 72.8% of the state GDP where communal, social and personal services, (including government) is the mayor contributor with 25.6% of total GDP, even higher than commerce, restaurants and hotels.

Figure 18.3. GDP by sector size and growth: Yucatan

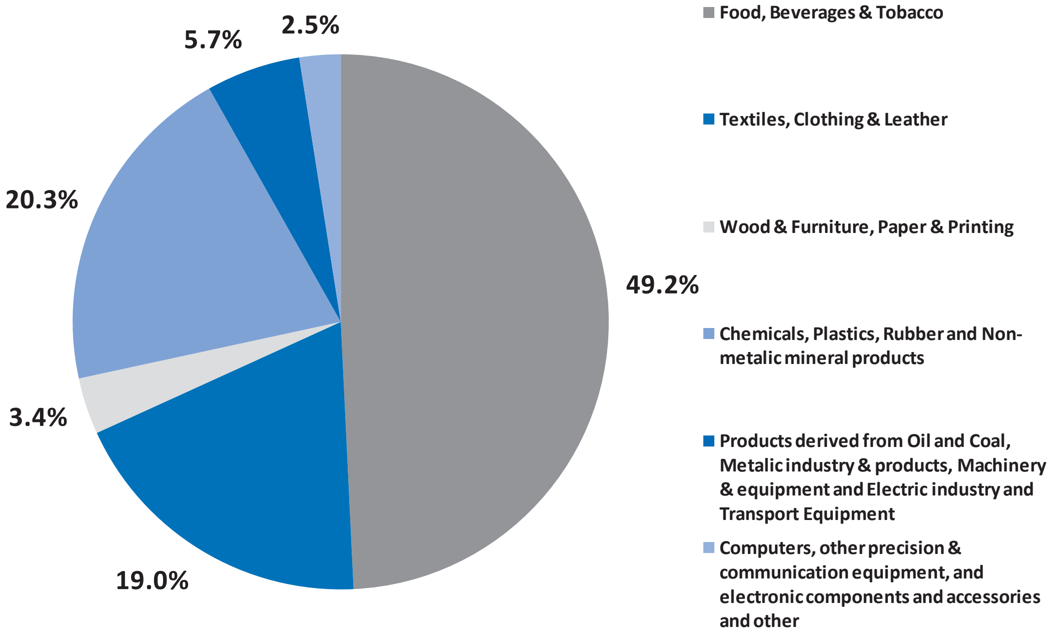


Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The sector that had the largest annual average growth was transport, communications and storage with 7.6%, the second largest growth was observed in mining, electricity, gas and water with an annual average of 7.5% during the period. Also, manufacturing grew at 4.7%, while commerce, restaurants and hotels grew at 3.6%. Agriculture, forestry and fishing did grow, albeit at a much lower annual rate of 0.3% and communal, social and personal services (including government) at 1.9%. The largest employer is communal, social and personal services with 191 229, followed closely by commerce, restaurants and hotels with 189 544. Manufacturing employs 163 282 workers. Agriculture, forestry and fishing employs 90 952, (just over half of the numbers in manufacturing) and accounts for 11.5% of the state's total employment.

Figure 18.4. Breakout of manufacturing sectors: Yucatan



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 18.3. GVA by technology level: Yucatan

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	68.1	32.1	27.4	24.7	3.2	31.6	1.3	11.6	760
Number of firms	86.1	61.8	13.3	35.3	0.4	2.1	0.3	0.8	10 771
Employment	77.6	44.1	17.8	25.0	2.6	21.5	1.9	9.4	83 865
Total assets	50.7	29.4	44.0	36.8	3.4	29.6	1.9	4.2	761
Investment	51.0	30.2	46.0	22.0	1.7	41.1	1.3	6.8	85
FDI (2007)	-34.5	9.8	37.9	40.5	62.1	32.5	34.5	17.2	3

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census using OECD industry classification by technology level.

Table 18.4. Firm demographics: Yucatan

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	612 968	100.0	100.0
Micro	363 454	59.3	54.8
Small	114 664	18.7	20.3
Medium	82 251	13.4	13.5
Large	52 599	8.6	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

Manufacturing is less prominent in the state of Yucatan than in many other Mexican states, with the secondary sector being the 23rd out of 32 in terms of share of state GDP. In the textile, clothing and leather sector 63.5% of its value added comes from *maquiladoras* linked to global trends and markets. The 88 *maquiladora* plants in 2004 exported USD 968 million (only 1.1% of the national total *maquiladora* exports) and represented a high share (82.2%) of the state's exports. Most of Yucatan's manufacturing is centred in the domestic market, sometimes with a lower value added, such as the foods, beverages and tobacco sector that accounts for 49.2% of all manufacturing. Chemicals, plastics, rubber and non-metallic minerals represents 20.3% of the manufacturing gross production, some of it linked to the food, beverages and tobacco industries.

Almost all of the state's economy is in low technology and mid-low technology sectors. The state's GVA at 68.1% in low technology industries is more than double the national share. Mid-low technology industries represent 27.4% of the state's GVA, more than the 24.7% national share. Finally, there is only 4.5% of GVA in mid-high or high technology sectors, *versus* over 43% nationwide. These results do not mean that technology is not relevant, as tremendous productivity improvements can be made in industries that are classified as low technology from innovation and technological transfers.

Yucatan's employment is generally found in smaller firms than the national average. It has a higher percentage of employment in micro enterprises, with 59.3% which is above the national average of 54.8%. There is also a lower share of employment in large firms (8.6% *versus* 11.5% at the national average). Employment in SMEs is similar to that observed nationally.

Strategies and policies to support sectors and clusters

Sectors targeted: Textile and Clothing, Logistics, Agro-industrial, Educational services, Health services, Electronics, Auto, Aerospace, IT, Tourism, Crafts, Alternative energies (Source: Secretary of Economic Promotion).

According to different sources, Yucatan's industry had the following specific characteristics:

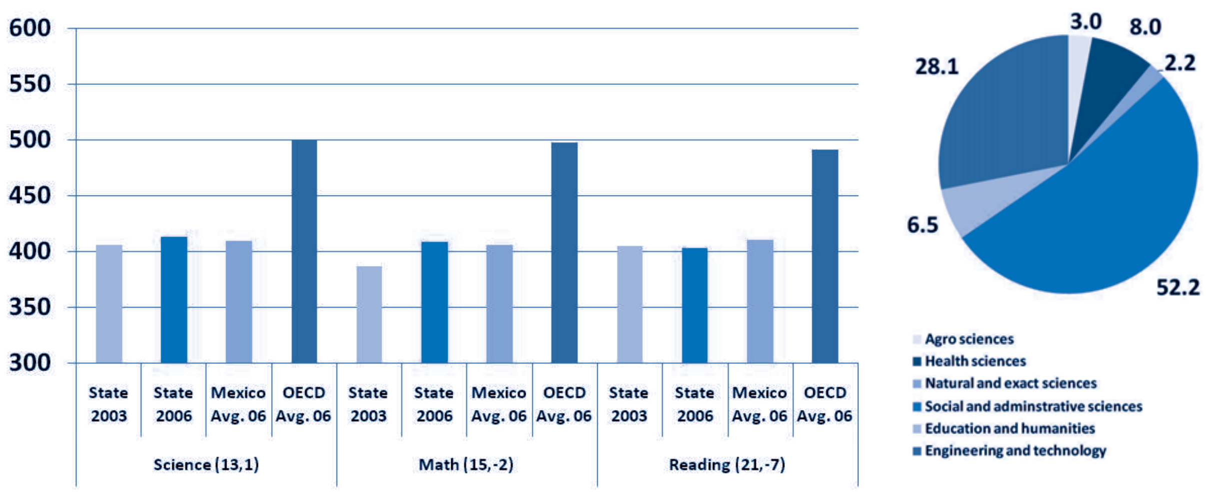
- It has nine industrial parks, cities and corridors (Source: Secretary of Economic Promotion, 2008).
- The state possesses 88 exporting *maquiladoras* (3.1% of the national total) (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 376.6 million for 0.2% of the national total (Source: Ministry of Economy 2008).

Innovation system

Figure 18.5. Education: Yucatan

PISA performance

Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

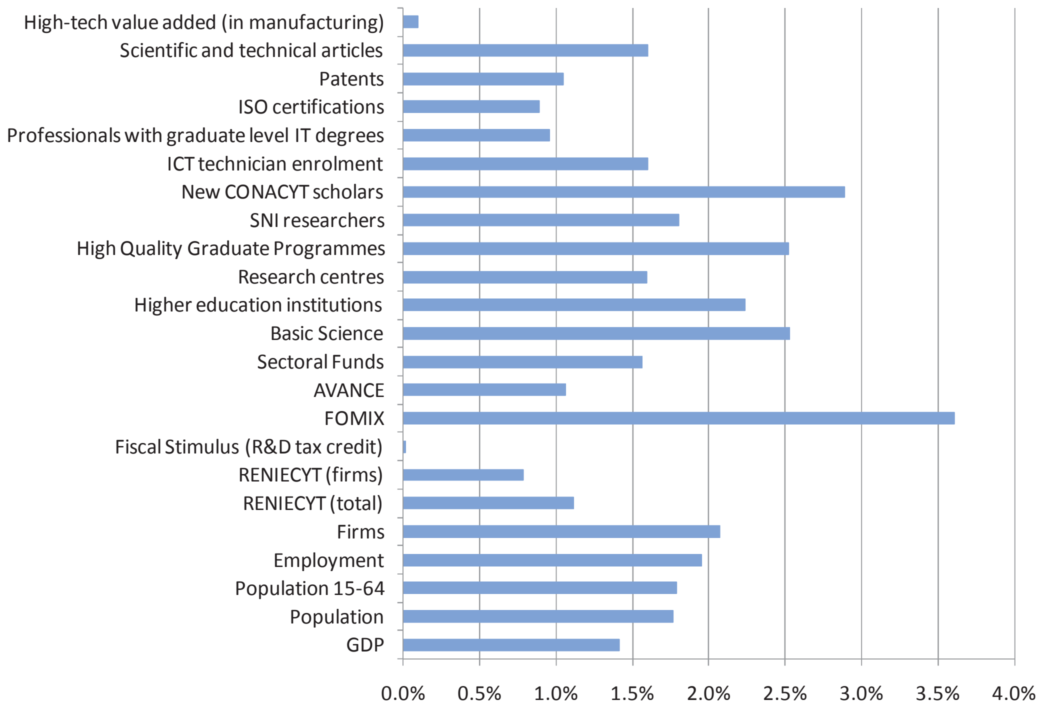
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Yucatan has average PISA (Programme for International Student Assessment) performance for Mexico, ranking 13th in science, 15th in math and 21st in reading. It is nevertheless behind OECD averages by more than almost 2.5 standard deviations in all three areas. Compared to the Mexico average, Yucatan lost ground in two out of three scores in the 2006 PISA evaluation from those observed in the 2003 evaluation. The state gained one place in science but lost two places in math and seven in reading.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies with respect to what is observed nationally. Yucatan has a significantly higher concentration of students in social and administrative sciences programmes than the national average (52.2% *versus* 46.9%). The state also has a disproportionately lower share of students in engineering and technology related programmes, at only 28.1% *versus* the national average of 33.4%.

Figure 18.6. Innovation snapshot: Yucatan

Percent of national total



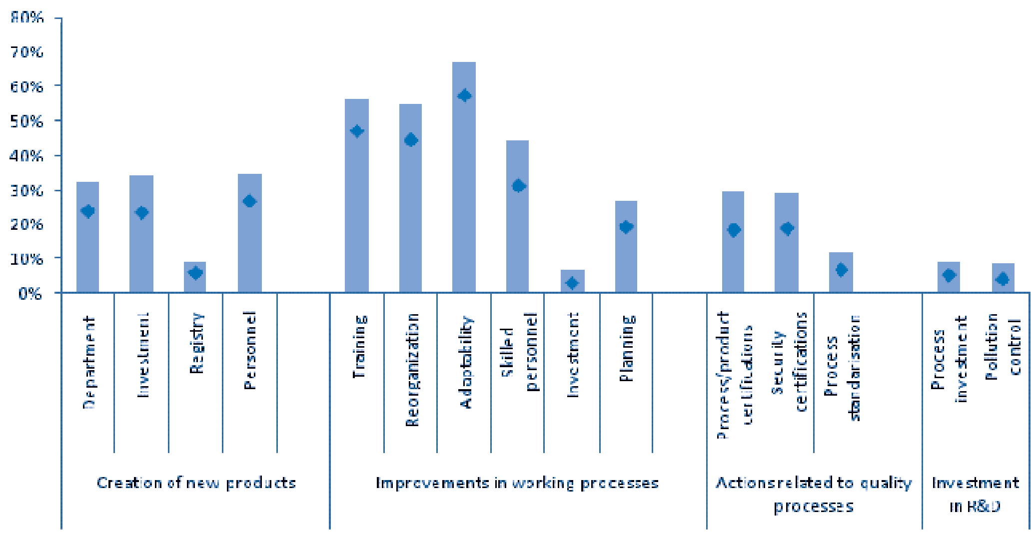
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

Yucatan's GDP accounts for 1.4% of the national total, and on several indicators of scientific capacity the state performs better than its share of GDP. Particularly high are the state's FOMIX funds at 3.6% of the national total. Also high are the number of high quality graduate programmes (2.5%), the number of new CONACYT scholars (2.9%) and resources from Basic Science (2.5%). The state does have a CONACYT public research centre, and three research centres in total according to ADIAT's directory that may contribute to this scientific capacity performance. However, the lack of industrial capacity is also reflected in the data including a low number of ISO certification (0.9% of the national total) and patents (1.05%). State firms are also underrepresented in accessing the R&D tax credit (Fiscal Stimulus) programme at almost 0%.

Figure 18.7. Innovation by manufacturing firms: Yucatan

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, Yucatan's firms generally show lower results than the nation as a whole. In terms of the creation of new products, the state ranks relatively lower than the national average, especially in terms of investment (24% *versus* 34% nationally). Investments on improvements of the working process are also lower than the national average by four percentage points. Process certifications are much lower than the nation as a whole, and investment in R&D also shows a lower level than the national average.

State Science and Technology Council and other major innovation initiatives

- Yucatan has constituted a state system for research, innovation and technological development that has helped position the state as the meso-regional leader in terms of SNI researchers and high quality graduate programmes.
- One of the key objectives of this system is to reorient and redesign educational curricula to better match with the state's industrial and sectoral needs.
- The state's S&T plan contains several regional social priorities and seeks to address them through the different scientific and technological available resources.
- Yucatan's S&T strategy aims to strengthen traditional sectors that are already developed in the state, as well as others that are more advanced (and seen as priorities for future development).

Chapter 19

Zacatecas

Strengths
-Good regulatory framework
-Important mining sector
-Strong flows of remittances
-Strong primary sector with increasing agro-industry
-Relatively low informality rate
-Successful use of FOMIX programme

Weaknesses
-High disparities, low Human Development Index with a very high migration rate
-Below average patenting and scientific articles production
-Low schooling and tertiary attainment rate

The state of Zacatecas is the northernmost state of the Centre-West meso-region. It is the eighth largest in surface area, about the size of the Czech Republic. However, with a population of just over 1.4 million, (1.3% of Mexico's population), it is the 26th most densely populated. It has a high share of rural population of 42.8% (23.5% national average). Among the largest cities are Zacatecas City, Fresnillo, Guadalupe, Jerez, Pinos, Sombrerete and Rio Grande, although the capital Zacatecas is by far the most significant. The state population is growing very slowly at only 0.2% per year (one fifth of the national average annual growth rate of 1.0%) due to massive migration of the working age population to the US and other neighbouring states. Consequently, the state is the largest recipient of remittances from abroad. In terms of educational attainment, it is far behind the national averages in both schooling years and in the proportion of its population over 15 years that completed secondary schooling.

The state's GDP of USD 6.5 billion is 0.8% of the national economy (28th largest). Its GDP per capita is almost half that of the national average (USD 4 719 *versus* USD 8 241), making it the fifth lowest in the country. It is the first producer of silver and zinc, second producer of copper and lead and sixth of barite. It is the largest producer of forage dry oat, dry chilli and beans. *Maquiladora* plants in the state are generally relatively new, among which Delphi's (cable) plant is the largest with over 5 000 employees. The state is below most others in Human Development Index, ranking 25th out of 32 states, having a medium level of marginalised population in the country (13th place) and a more uneven income distribution than most of Mexico.

Table 19.1. Socio-economic snapshot: Zacatecas

Indicator	State value	Average or % of national	Rank	Indicator	State value	Average or % of national	Rank
Population (million)	1.4	1.3	25	GDP (USD million)	6 537	0.8	28
Area (sq. km)	75 416	3.9	8	GDP per capita (USD)	4 719	8 241	28
Population density[1]	18.3	97.9	26	GDP yearly growth 1996-2006 (%)[4]	3.2	3.6	20
Population 0-14 (%)	32.5	31.1	9	Primary sector (%)	12.8	5.5	2
Population 15-64 (%)	60.9	63.7	28	Industrial sector (%)	25.6	27.5	18
Population 65+ (%)	6.6	5.3	2	Services sector (%)	61.6	67.1	25
Rural population (%)[2]	42.8	23.5	5	Employment rate (%)	61.3	62.9	22
Population annual growth (2000-2005) (%)	0.2	1.0	29	Unemployment rate (%)	2.8	3.0	16
Yearly migration to the US[3]	65 631	7.8	8	Participation rate (%)	63.6	64.9	22
Population with at most lower secondary education (%)	77.3	66.9	2	Average yearly FDI 1999-2007 (USD million)	10	0.0	29
Population with upper secondary education (%)	10.5	16.7	32	Exporting maquiladora industry production (2004 USD million)	189	0.2	19
Population with tertiary education (%)	12.3	16.4	30	Marginalisation index	0.16	0	13
Households with a PC (%)	15	19	21	Gini coefficient	0.653	0.616	28
Municipalities (number)	58	2.4	14	Human Development Index	0.772	0.803	25

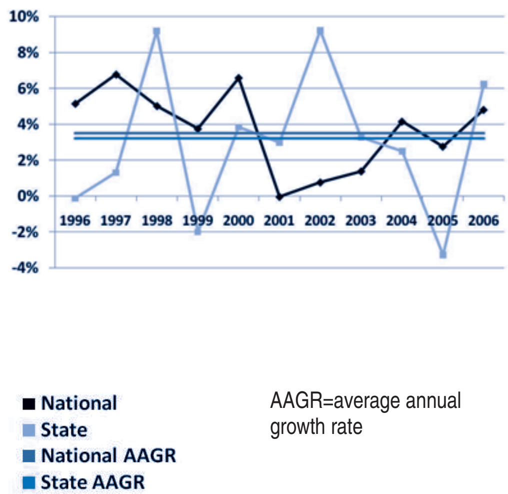
Notes: *i*) The population density calculation excludes the Federal District. *ii*) Rural population corresponds to the percent of population living in cities of under 2 500 inhabitants. *iii*) The yearly migration is as a percent of the state's population 15-64; the ranking is based on the absolute number of migrants. *iv*) The national average growth rate corresponds to the average growth rate of all states and not to the country's overall average annual growth rate.

Source: Latest year available in the OECD Regional Database (2008) for most variables. The Human Development Index is produced by the UNDP. Data for the rural population and households with a PC is from INEGI's 2005 Population Census. Number of municipalities, migration to the US, and economic breakout by sector are based on data from INEGI. GDP yearly growth calculated based on INEGI's System of National Accounts (SCNM). The marginalisation index is produced by the National Council of Population (CONAPO). FDI figures are from the Ministry of Economy. Data for exporting *maquiladora* industry production is from INEGI's Dataset of Economic Information (*Banco de Información Económica* – BIE). The Gini coefficient is from CONAPO 2000 (*La desigualdad en la distribución del ingreso monetario en Mexico*).

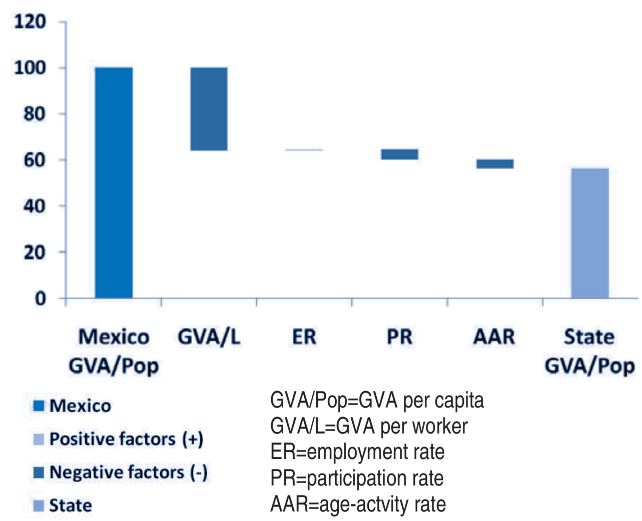
Economic growth

Figure 19.1. GDP growth and GVA per capita: Zacatecas

growth (1996-2006)



GVA per capita of state *versus* national average, 2004



Source: Figure Left: INEGI's System of National Accounts (*Sistema de Cuentas Nacionales de Mexico* – SCNM), 2008; Figure Right: OECD Regional Database, 2008.

The state's GDP had an average growth rate of 3.2% from 1996 to 2006, below the national average of 3.6%. The annual growth rates are highly variable and do not appear to track the growth patterns of the nation as a whole. The overall growth trend shows marked differences with what is observed nationally with pronounced peaks implying well above average growth rates in some years and substantially below in others. In order to increase the welfare of the population, faster growth rates will have to be sustained over longer periods of time.

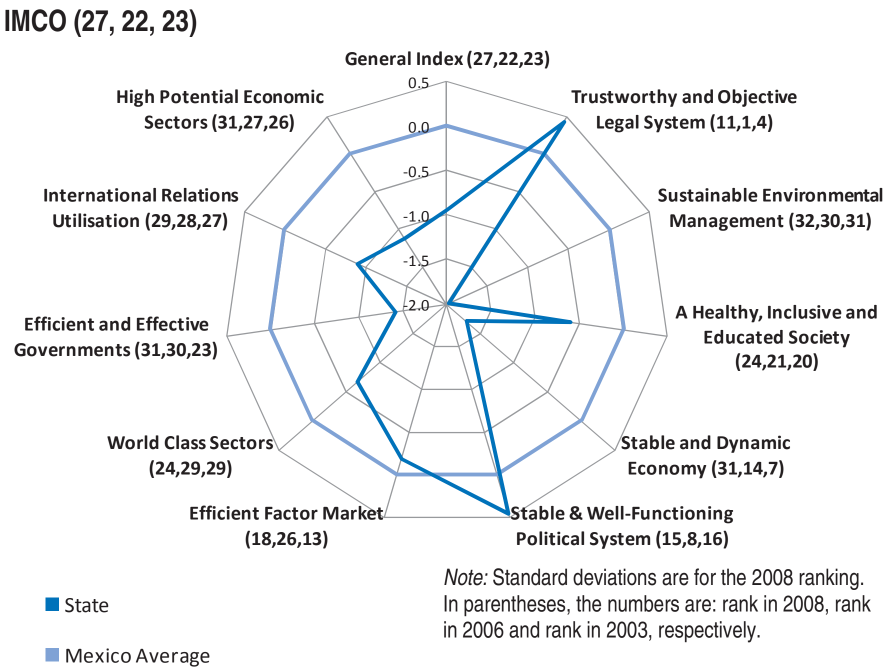
Zacatecas has a GVA per head that is only 56% of the national average. Most of this differential is due to a GVA per worker (labour productivity) that is significantly below the national average (-35.9%). Other factors driving a lower GVA per head include a lower participation rate (-4.38%), implying a lower share of the working age population that is economically active. The age activity rate is also several percentage points below the national average (-4.08%) presumably due to massive out migration of the working age population.

Zacatecas ranks relatively low on traditional general competitiveness indicators. In the 2008 IMCO ranking, the state is 27th, down five places from the 22nd position in 2006 (23rd in 2003). Zacatecas is over 0.9 standard deviations lower than the Mexico average. Of the ten component indices, the state is lower than the national average on eight factors and above average on two. The areas of above average performance include Trustworthy and objective legal system (albeit experiencing a drop from first position in 2006 to 11 in 2008) and Stable and well functioning political system (currently in position 15). IMCO ranked the city of Zacatecas as the 26th most competitive in the country. The state ranked 19th in the Knowledge Economy Index.

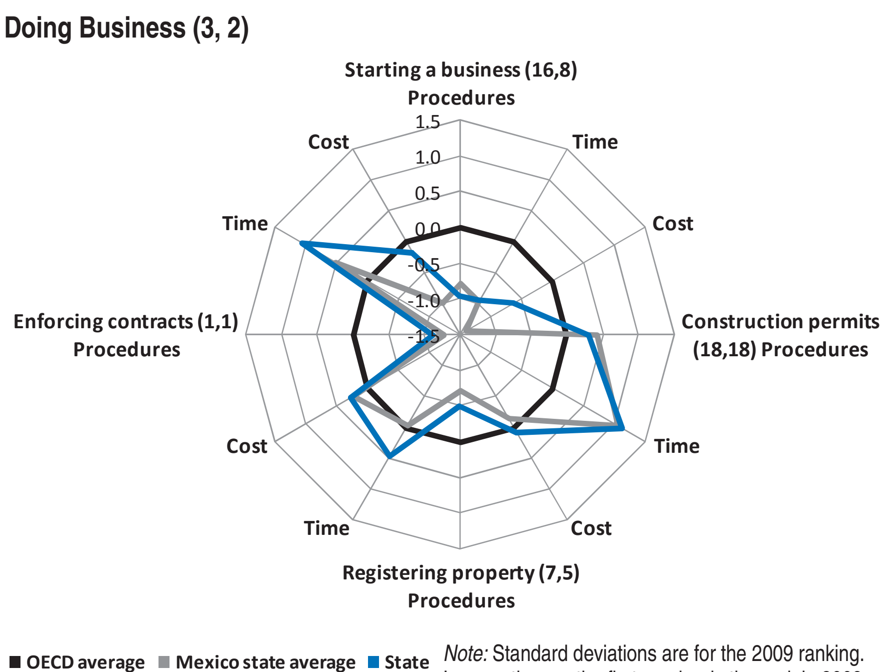
Competitiveness indices

Figure 19.2. Example competitiveness rankings: Zacatecas

Standard deviations from the mean (0)



Note: Standard deviations are for the 2008 ranking. In parentheses, the numbers are: rank in 2008, rank in 2006 and rank in 2003, respectively.



Note: Standard deviations are for the 2009 ranking. In parentheses, the first number is the rank in 2009 while the second number is the rank in 2007.

Source: Figure Top: IMCO—*Instituto Mexicano para la Competitividad* (2003, 2006, 2008); Figure Bottom: World Bank's *Doing Business* (2007, 2009).

In terms of regulatory measures of competitiveness, Zacatecas performs very well. It is ranked third in Doing Business in 2009, down from second place in 2007. The state is more competitive than OECD values for six out of 12 factors, mainly in the categories of registering property and construction permits. Relative to the national average, the state scores better on ten of the 12 factors. Factors where Zacatecas performs below the average are the procedures both for starting a business and construction permits. The state's strength is in the enforcing contracts category, where it has been top ranked nationally in the last two evaluations.

In terms of the federal SARE system to facilitate firm registration and development, three of 58 municipalities have a SARE office. These three municipalities (Fresnillo, Zacatecas and Guadalupe) cover only 33.5% of the state's population; however the state still performs very high in Mexico in terms of indicators for starting a business.

Competitiveness committees and policies

- The state has constituted a trust fund with resources from the collection of the state 2% payroll tax. A committee that includes all state chambers and government officials determine the state's priorities in terms of economic development for which such resources are employed.
- The state has developed a programme Zacatecas Online which identifies all economic activities in the state and classifies them by sector. This sort of regional "economic Google" helps map existing industries in the state and hence facilitates the integration of industries and value chains.
- The state government supports SME competitiveness through fully funding patents, registries, bar codes and branding of such firms with the objective of incorporating them into wider or even global value chains.

Industrial structure and clusters

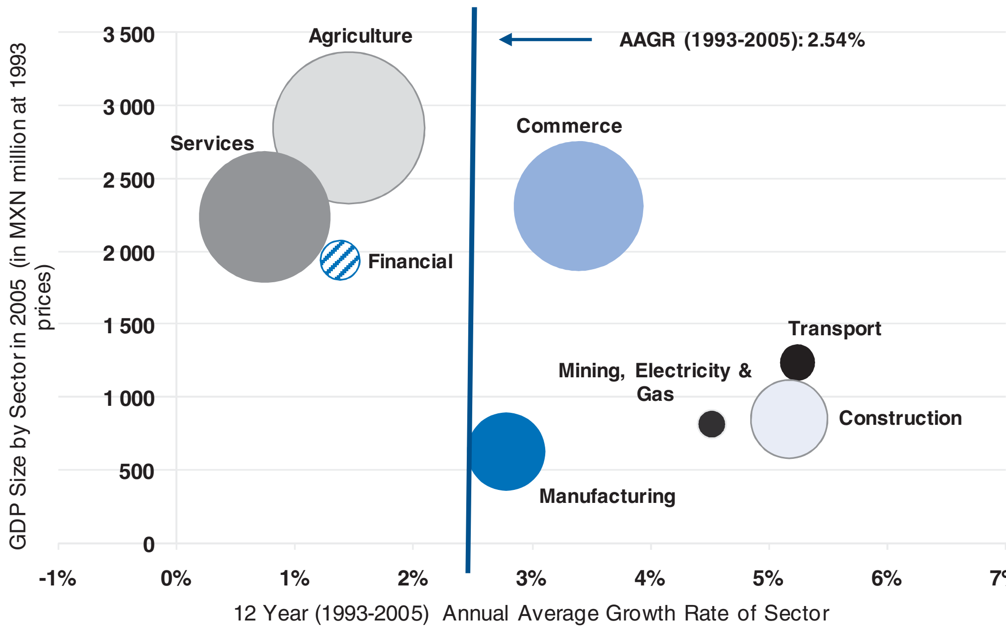
Table 19.2. Sectoral breakout: Zacatecas

in %

	Agriculture Forestry & Fishing	Mining	Manu-facturing	Construction	Electricity Gas & Water	Commerce Restaurants Hotels	Transport Comm. & Storage	Financial Serv. Insurance & Real Estate	Communal Social & Pers. Serv.
State 2005	12.0	6.0	6.0	8.7	2.2	16.7	7.9	13.7	26.9
National 2005	3.4	1.5	17.9	5.4	1.4	21.2	10.6	12.0	26.7
State 1993	24.7	3.4	4.6	4.8	1.6	16.0	6.9	16.9	21.1
National 1993	6.3	1.4	19.0	4.8	1.6	21.8	9.3	12.9	22.9

Source: INEGI Dataset of Economic Information (*Banco de Información Económica* – BIE).

Figure 19.3. GDP by sector size and growth: Zacatecas

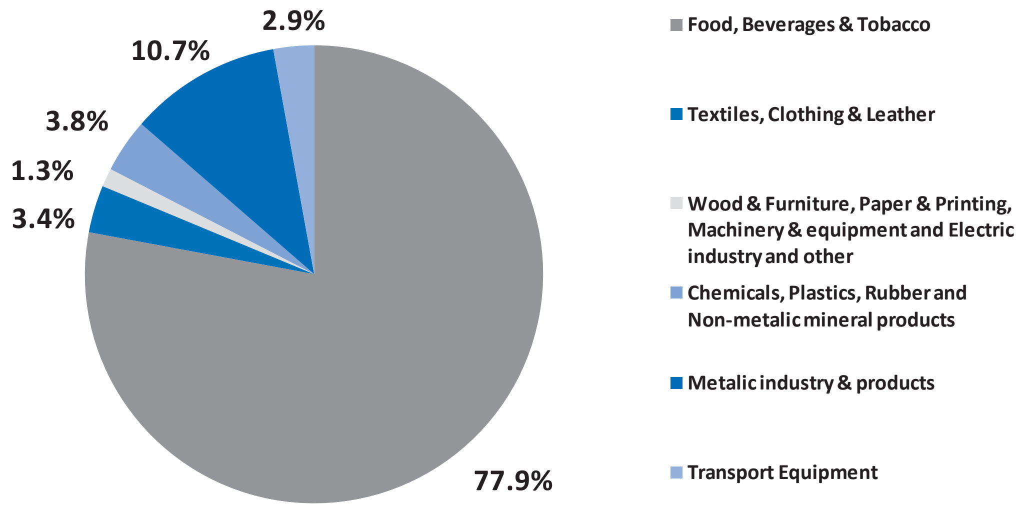


Note: The size of the circles represents the size of employment in each sector. The vertical axis corresponds to the size of GDP in MXN million at 1993 prices. The horizontal axis is the average annual growth rate of each sector. The state's overall average annual growth rate (AAGR) corresponds to the weighted average of all sectors.

Source: INEGI, Dataset of Economic Information (*Banco de Información Económica* – BIE) for the GDP annual data at 1993 prices and the absolute values by sector of economic activity; figures for sectoral employment from the National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE 2005).

The structure of the economy varied substantially by sectors between 1993 and 2005. Agriculture, forestry and fishing reduced its share of GDP by more than half over the period, from 24.7% in 1993 to 11.9% in 2005. The state is an important national producer of the following agricultural products: dry forage oats (59.3% of national production), dry chillies (51.7%), beans (36.5%), prickly pear (20.8%), guava (30.5) and carrots (23.3%). It is also a large producer of lamb meat, goat meat and cheese. Most of its agriculture is seasonal since the state has scarce water resources. Manufacturing is not a significant part of the state's economy with a GDP share of 6% in 2005. Mining, a traditionally large sector in the state, has been growing and already represents about the same share of GDP as manufacturing, at 6% of GDP. By far, the service sector is the dominant one with 61.6% of the state GDP, where communal, social and personal services, (including government) are the major contributor with 26.9%, while commerce, restaurants and hotels account for 16.7%.

Figure 19.4. Breakout of manufacturing sectors: Zacatecas



Source: INEGI Economic Census 2004 (*Censos Económicos* 2004).

Table 19.3. GVA by technology level: Zacatecas

% of row total for state or Mexico, 2004

	Low Tech		Mid-Low Tech		Mid-High Tech		High Tech		Total (USD million or number)
	State	Mexico	State	Mexico	State	Mexico	State	Mexico	State
GVA	82.5	32.1	12.2	24.7	5.3	31.6	0.0	11.6	505
Number of firms	57.2	61.8	42.2	35.3	0.0	2.1	0.6	0.8	3 598
Employment	65.4	44.1	19.1	25.0	15.3	21.5	0.2	9.4	25 455
Total assets	85.7	29.4	13.8	36.8	0.5	29.6	0.0	4.2	881
Investment	46.1	30.2	52.7	22.0	1.1	41.1	0.1	6.8	27
FDI (2007)	0.0	9.8	2.5	40.5	65.3	32.5	32.1	17.2	28

Note: Classification based on the OECD classification of industries by technology level.

Source: Ruiz Duran 2008 using data from INEGI 2004 Economic Census.

Table 19.4. Firm demographics: Zacatecas

Firm Size	Employment	% of Employment	% of Employment (National Average)
Total	296 501	100.0	100.0
Micro	187 126	63.1	54.8
Small	67 007	22.6	20.3
Medium	26 284	8.9	13.5
Large	16 084	5.4	11.5

Notes: **Micro:** Economic units from one to 15 employees in manufacturing; one to five in commerce and one to five in services. **Small:** Economic units from 16 to 50 employees in manufacturing, six to 15 in commerce and six to 50 in services. **Medium:** Economic units from 51 to 250 employees in manufacturing, 16 to 250 in commerce and 51 to 250 in services. **Large:** Economic units with over 250 employees in manufacturing, commerce or services.

Source: INEGI, National Survey on Employment (*Encuesta Nacional de Ocupación y Empleo* – ENOE) 2005.

The sector that had the largest annual average growth was transport, communications and storage with 5.3%. Construction, the second largest, grew at an annual average rate of 5.2% during this period. Mining, electricity, gas and water grew at 4.5%, while commerce, restaurants and hotels (which includes tourism) grew at 3.4%. Manufacturing had an average growth of 2.8%, and agriculture, a major employer, only grew at 1.5%. The largest employer is however agriculture, forestry and fishing 168 573 (32.2% of the state total), followed by communal, social and personal services (including government) with 124 066, while commerce, restaurants and hotels employs 118 742. Manufacturing employs only 43 343 people, 8.3% of the state's total employment.

The level of industrialisation is low, ranking 25th in terms of the share of the GDP in the industrial sector, albeit only somewhat below the national average (25.6% *versus* 27.5%). In manufacturing, the category of foods, beverages and tobacco dominates, accounting for 78% of all manufacturing. Metallic minerals and products (mainly silver, zinc, copper, and lead processing) accounts for 10.7%. Recently some *maquiladora* plants have been established in the state. Currently 78.9% and 100% of the state's gross production of textiles, clothing and leather, and transport equipment (auto parts), respectively, comes from *maquiladoras*.

The GVA of Zacatecas is almost entirely in low and mid-low technology sectors. The share in low technology industries is extremely high, 82.5% *versus* 32.1% nationally. Another 12.2% of the GVA is in mid-low technology sectors, as compared to 24.7% nationally. The remaining 5.3% is in mid-high technology sectors with no share in high technology sectors. These results do not mean that technology is not relevant, as tremendous productivity improvements can be made in industries that are classified as low technology.

Employment in Zacatecas is more skewed towards smaller firm sizes than in Mexico overall. For example, there is a very high share of employment in micro enterprises (63.1% *versus* 54.8%). It also has less employment in large firms, 5.4% *versus* a national average of 11. 5%. These smaller firm sizes can be a barrier to technology upgrading and innovation investments.

Strategies and policies to support sectors and clusters

Sectors targeted: ICT, Software, Mining, Tourism, Agro-industry, Auto and auto parts, Electronics (Source: Economic Development Secretary).

According to different sources, Zacatecas' industry and mining had the following specific characteristics:

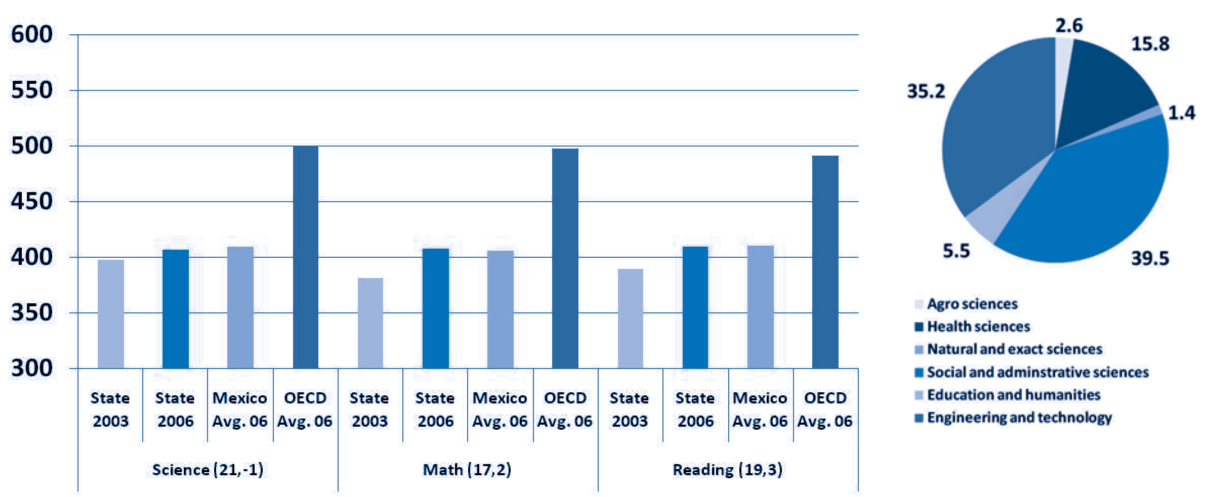
- Second nationwide in terms gross value of mineral production with over 17% of total national mining production (Source: Zacatecas Economic Development Secretary with data from the Ministry of Finance, the Ministry of Economy, PEMEX, INEGI and the Mining Department).
- First national silver and zinc producer and second in copper and plumb (Source: CONACYT 2006).
- It has three industrial parks, cities and corridors (Source: CONACYT 2006).
- FDI flows for all sectors in the state between 1999 and September 2008 of USD 2.317 billion for 1.1% of the national total, registered mainly in 2007 and 2008 (Source: Ministry of Economy 2008).

Innovation system

Figure 19.5. Education: Zacatecas

PISA performance

Undergraduate education enrolment



Notes: The first number in parentheses is the ranking within Mexico in 2006. The second number is the changing in that ranking from 2003.

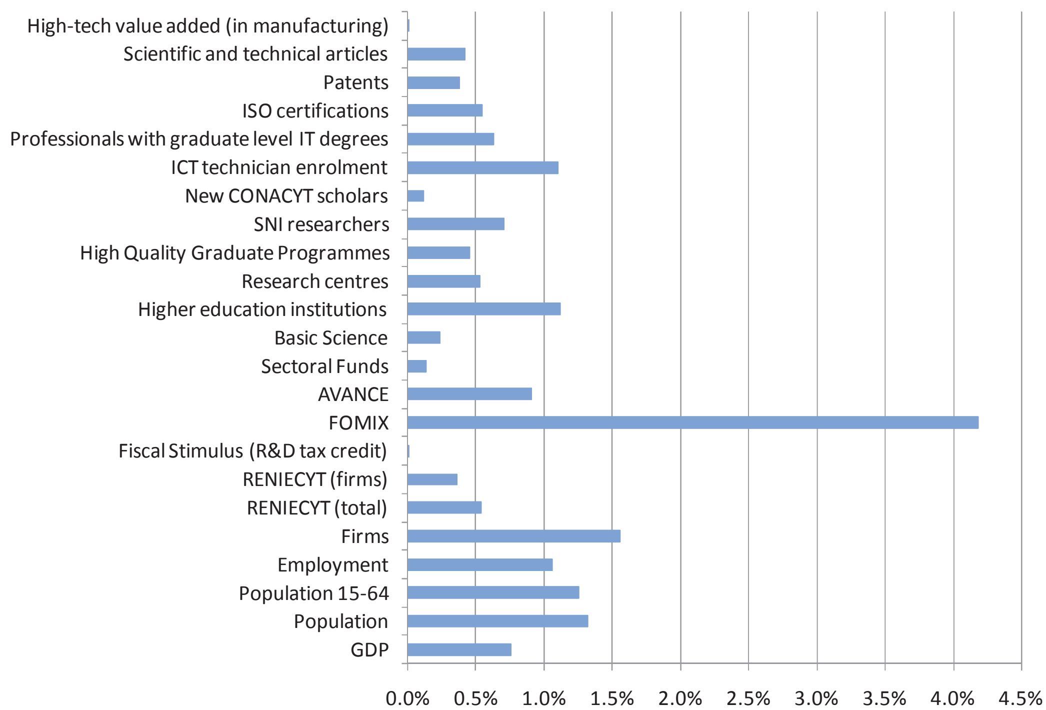
Source: Figure Left: Díaz G., María Antonieta, Gustavo Flores V. and Felipe Martínez R. *(Instituto Nacional para la Evaluación de la Educación* – INEE) (2007), *PISA 2006 en México,* Mexico, INEE, 2007.based on the OECD Programme for International Student Assessment. Figure Right: *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), 2004 data.

Zacatecas performs below average for Mexico with respect to the PISA (Programme for International Student Assessment) evaluations. The state is ranked 21st in science, 17th in math and 19th in reading. When measured in terms of standard deviations from the OECD average, the state scores lower in each of the evaluations, and in all cases the mean is several standard deviations below that average. Some progress has been observed from the evaluation of 2003, while it lost one place in science, the state gained two places in math and four places in reading.

Current enrolment for undergraduate degrees (in universities and technological institutes) in the state varies little with respect to what is observed nationally. Like most states, Zacatecas shows a relatively high concentration of students in social and administrative sciences programmes, albeit a lower share than the national average (39.5% *versus* 46.9%). Engineering and technology related programmes account for the second highest enrolment in the state with 35.3% of the total, similar to the Mexico average of 33.4%. Where the state is most different from national averages is in health sciences, with 15.8% of enrolment, noticeably more than the national average of 9.4%.

Figure 19.6. Innovation snapshot: Zacatecas

Percent of national total



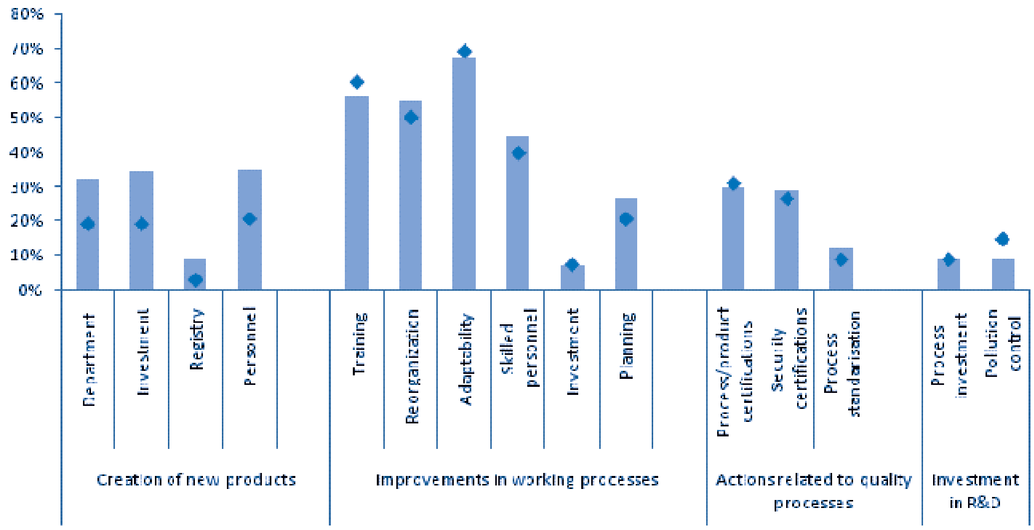
Notes: i) FOMIX data includes resources from 2002 through November 2008. *ii*) Research Centres reported by CONACYT through *Estado del Arte de los Sistemas Estatales de Ciencia y Tecnología 2006* based on ADIAT's Research Centre Directory and does not only include CONACYT Public Research Centres. *iii*) Scientific and technical articles correspond to the total for 1996-2005. *iv*) Patents correspond to the total for 2001-05. *v*) ISO certifications correspond to the total for 2000-06. *vi*) Basic Science resources correspond to the total for 2002-05. *vii*) Sectoral Funds correspond to the total for 2002-06. *viii*) AVANCE resources correspond to the total for 2003-06. *ix*) FOMIX data for Puebla and Chihuahua includes resources at the municipal level for the City of Puebla and Ciudad Juarez, respectively.

Source: Latest year available data from CONACYT for most variables. Latest year available data in the OECD Regional Database (2008) for GDP, Population, Population 15-64 and patents. Employment and Firms from INEGI Economic Census (2004). SNI Researchers, New CONACYT Scholars, ICT Technician Enrolment, Professionals with graduate level IT degrees and ISO Certifications obtained from INEGI, available at www.inegi.org.mx. Data for Scientific and technical articles from *Fundación Este País* (2007). High-tech value added figures from Ruiz Duran (2008) based on INEGI Economic Census (2004).

The GDP of Zacatecas accounts for 0.76% of the national total. With respect to this benchmark, particularly high is the state's usage of FOMIX funds with more than 4% of the national total. In other matters related to the funding for S&T and innovation, the state performs relatively less well as exemplified by the nil usage of the tax-credit (Fiscal Stimulus) programme, the low number of RENIECYT firms (0.36%) and entities (0.53%), Sectoral Funds (0.13%) and Basic Science Funds (0.23%). This means that indicators of technological development are low, as would be expected given the state's industrial structure. Such low values include patents (0.37%), ISO certifications (0.55%), scientific and technical publications (0.42%), as well as high-tech value added in manufacturing (0%). The state has a more average performance when considering SNI researchers and the usage of the AVANCE programme with 0.7% and 0.9% of the national total respectively.

Figure 19.7. Innovation by manufacturing firms: Zacatecas

% of firms reporting an innovation-related action or investment



Source: INEGI, Innovation and Research Module of the 2004 Economic Census.

Regarding innovations among manufacturing firms, the state's firms generally show lower results than the nation as a whole. In terms of the creation of new products, the state ranks relatively lower than the national average, especially in terms of investment (19% *versus* 34% nationally). Investments on improvements of the working process are a bit higher than the national average one percentage point. Process certifications are better ranked than the nation as a whole, and investment in R&D shows a similar level to the national average.

State Science and Technology Council and other major innovation initiatives

- The state is currently producing a catalogue for firms with all regional information regarding researchers and their capabilities.
- Similarly, a catalogue is being produced for the state researchers to have access to information regarding what kind of processes firms undertake and the technologies they use.
- The state is actively promoting the formation of an ICT cluster (having created a special under-ministry for such purpose) that integrates with the region (including bordering states) and improves the technological sophistication of the state.

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15 MEXICAN STATES

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This report reviews how both national and state policies in Mexico can better support regional innovation systems and includes profiles of 15 states. It will be of interest to policy makers, firms and others active in promoting innovation and regional economic development.

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