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This Survey is published on the responsibility of the Economic and Development Review Committee of the OECD, which is charged with the examination of the economic situation of member countries.

The economic situation and policies of the United States were reviewed by the Committee on 14 May 2012. The draft report was then revised in the light of the discussions and given final approval as the agreed report of the whole Committee on 4 June 2012.

The Secretariat's draft report was prepared for the Committee by David Carey, Wendy Dunn, Oliver Denk, Robert Hagemann, Christopher Hill and Brian Kahin, with statistical assistance from Valery Dugain and Jérôme Brezillon, under the supervision of Patrick Lenain.

The previous Survey of the United States was issued in September 2010.

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BASIC STATISTICS OF THE UNITED STATES

THE LAND

Area (1 000 sq. km)	9 826	Population of major cities, including their metropolitan areas, 2011 (thousands):	
		New York-Northern New Jersey-Long Island	19 012
		Los Angeles-Long Beach-Santa Ana	12 945
		Chicago-Naperville-Joliet	9 505

THE PEOPLE

Resident population, 1 July 2011 (est.)	311 591 000	Civilian labour force, Q1 2012 (thousands)	154 658
Number of inhabitants per sq. km	31.7	of which :	
Annual net natural increase (average 2001-10)	275 590	Unemployed Q1 2012 (thousands)	12 746
Natural increase rate per 1 000 inhabitants (average 2001-11)	3.5	Net immigration (2011) thousands	1 062

PRODUCTION

		Origin of national income in 2011 (per cent of national income) ¹ :	
Gross domestic product in 2011 (billions of USD)	15 094	Manufacturing	9.9
GDP per head in 2010 (USD)	47 153	Finance, Insurance and real estate	18.4
Gross fixed capital formation		Services	31.2
Per cent of GDP in 2011	15.6	Government and government enterprises	12.6
Per head in 2011	7 552	Other	28.0

THE GOVERNMENT

		Composition of the Congress as of 2012:	
Government consumption 2011 (per cent of GDP)	16.9	House of Representatives ²	Senate
Government current receipts, 2011 (per cent of GDP)	31.8	Democrats	193
Federal government debt held by the public (per cent of GDP), end of year 2011	67.7	Republicans	242
		Independents	0
		Undecided	0
		Total	435
			100

FOREIGN TRADE

Exports:		Imports:	
Exports of goods and services as per cent of GDP in 2011	13.8	Imports of goods and services as per cent of GDP in 2011	17.7
Main exports, 2011 (per cent of merchandise exports):		Main imports, 2011 (per cent of merchandise imports):	
Foods, feeds, beverages	8.5	Foods, feeds, beverages	4.9
Industrial supplies	33.0	Industrial supplies	13.2
Capital goods	33.4	Petroleum	20.6
Automotive vehicles, parts	9.0	Capital goods	23.0
Consumer goods	12.0	Automotive vehicles, parts	11.4
		Consumers goods	23.2

1. Without capital consumption adjustment.

2. Voting members.

Executive summary

Economic policy should continue to sustain the recovery and address financial weaknesses and longer term fiscal sustainability. Monetary policy should continue to support the recovery. Legislative decisions are required to avoid the fiscal “cliff” in 2013 due to the scheduled expiration of tax cuts and automatic spending cuts, while further reducing the federal budget deficit at a gradual pace so as to put the federal debt-GDP ratio on a downward path and restore fiscal sustainability. The United States has been active in its efforts to reduce the risk of financial crises, thanks notably to the “Dodd-Frank Act”, which should be fully implemented. In addition, the Federal Reserve and other US agencies with financial responsibilities are engaged with regulators from other countries to find ways to address the vulnerabilities exposed by the crisis. Banking institutions should be encouraged to maintain high levels of equity capital, and efforts to develop improved analytical tools and information systems to monitor risks to the financial system should be continued.

Although job creation has improved and the unemployment rate has come down from a high of 10.0% in October 2009, the effects of the recession on the labour market remain. Unemployment duration is still extremely high, and about 40% of the unemployed have been out of work for 27 weeks or more. Policies should continue to promote job creation and facilitate the return to work. Recent reforms passed as part of the Middle Class Tax Relief and Job Creation Act of 2012 put more emphasis on labour activation to help the long-term unemployed search for jobs but there should also be more emphasis on helping them to find adequate training programmes. In the longer term, education and training are key to raising the skills and wages of the workforce, and in this regard, further enhancing the community college system would be a cost-effective way to provide more individuals with an affordable way to increase their human capital.

Income inequality and relative poverty are among the highest in the OECD. This is associated with a number of negative consequences, including low intergenerational social mobility. At the same time, there is no consensus in the economic literature that reducing inequality would be harmful to economic growth. High income inequality is attributable to a significant degree to the large dispersion of earned income, which should be addressed by reforming education, so as to provide disadvantaged students with the skills needed to fully realise their potential. To reduce both income inequality and distortions in resource allocation, tax expenditures that disproportionately benefit high earners should be limited over time. In particular, effective tax rates on debt-financed corporate investment and housing should be equalized at the higher rate on equity-financed corporate investment while simultaneously lowering the corporate tax rate. Social transfers could be more effective in alleviating poverty through better targeting of the truly needy and simplifying of transfer programmes.

The US economy is very innovative, but fissures have begun to appear. Innovation performance has weakened according to various indicators, although from a high level. To foster innovation and economic growth, reductions in the federal R&D budget should be as limited as possible. Ideally, funds would be appropriated to continue on the path approved in the 2007 America COMPETES Act of doubling the budgets for three key science agencies within a decade. Patent reform should be taken further than in the America Invents Act by ensuring that the legal standards for granting injunctive relief and damages awards for patent infringement reflect realistic business practices and the relative contributions of patented components of complex products. In light of spillover benefits from manufacturing activity, the measures proposed by the Administration to strengthen manufacturing competitiveness should be implemented. Education reform is needed to strengthen achievement and to address lagging tertiary attainment in the fields of science, technology, engineering and mathematics (STEM).

Key recommendations

Macroeconomic policies to promote a sustainable recovery

1. Monetary policy should continue to support the recovery. Current legislation should be amended to avoid a sharp fiscal contraction in 2013, which would derail the recovery. Rather, fiscal consolidation should occur at a gradual pace, and should be implemented as part of a commitment to a medium-term framework to restore fiscal sustainability.
2. Further measures to simplify procedures and expand eligibility for mortgage loan modification programmes are encouraged, as these programmes can aid financially-distressed home owners, facilitate recovery in the housing market, and strengthen an important transmission channel of monetary policy.
3. Reforms to reduce the risk of new financial crises should be fully implemented. Banks should be encouraged to maintain high levels of equity capital, and regulators should continue efforts to develop improved analytical tools and information systems to monitor risks to the financial sector.

Policies to promote job creation and earnings growth

4. Development of enhanced “activation” programmes would facilitate the return to work for many unemployed individuals and mitigate the risk of long-term unemployment becoming structural. A variety of proposals for training and re-employment services were presented in the Administration’s FY 2013 budget, and these plans should be implemented without delay.
5. Education and training are key to improving skills, reducing mismatches, and addressing the problem of slow wage growth. Programmes such as Race to the Top and measures to strengthen community colleges are steps in the right direction, but more could be done, such as reducing financial and other barriers to tertiary education and providing vocational training opportunities in secondary school.

Reducing income inequality and combating poverty

6. Comprehensive education reform should provide more disadvantaged students with valuable skills that would help them to raise their incomes and increase social mobility. States relying heavily on local property taxes to fund public elementary and secondary schools should move to state-level funding to increase the resources and quality of teachers available to socially-disadvantaged students.
7. A comprehensive approach to limiting tax expenditures that disproportionately benefit high earners is needed, for instance by limiting the marginal income tax rate at which deductions (such as for owner- occupiers’ mortgage interest payments) may be claimed and exclusions (such as for employer-provided health insurance cover) permitted to 28%, as proposed in the Administration’s FY 2013 budget.

8. The unequal tax treatment of income from different asset classes increases inequality in some cases and distorts the allocation of capital. Equalizing the effective tax rates on debt-financed corporate investment and on housing at the higher rate on equity-financed corporate investment while simultaneously lowering the corporate tax rate would reduce income inequality and improve the efficiency of investment. This is because capital income is highly concentrated in higher-income households and tenants, to whom much of the current relatively high effective taxation on tenancy-occupied housing is shifted, typically have lower incomes than owner occupiers.
9. The transfer system reduces poverty among specific groups, but leaves others unreached. An increased focus of eligibility criteria on income level is necessary. Simplifying the myriad of transfer programmes would lower administrative costs and increase take-up.

Fostering innovation

10. Given the importance of R&D for innovation and economic growth, reductions in the federal R&D budget should be as limited as possible. Ideally, funds would be appropriated to continue on the path approved in the 2007 America COMPETES Act of doubling the budgets for three key science agencies within a decade.
11. Patent reform (America Invents Act) needs to be taken further by ensuring that the legal standards for granting injunctive relief and damages awards for patent infringement reflect realistic business practices and the relative contributions of patented components of complex products.
12. Tertiary education attainment in STEM fields needs to be increased. An important step in doing so is improving access to quality secondary education so that students are better prepared for STEM tertiary studies.

Assessment and recommendations

Macroeconomic and financial policies

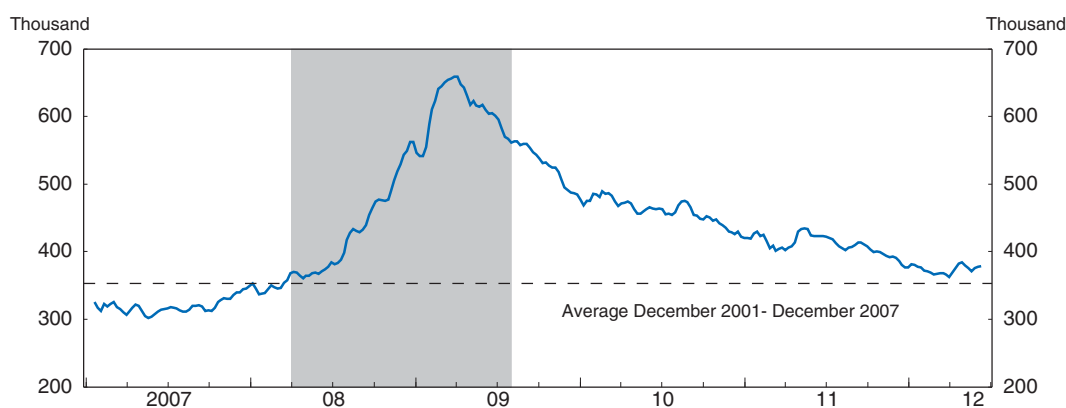
The economic recovery has begun to show some momentum

The economic recovery in the United States has gained momentum. Consumption spending has accelerated from its weak pace through most of 2011, and business investment has continued to record solid gains. Residential investment, meanwhile, has shown some signs of a sustained recovery. In the labour market, the pace of employment growth has risen early this year, and initial claims for unemployment insurance have dropped close to the levels observed prior to the recession (Figure 1). Although still high, the unemployment rate has fallen nearly 2 percentage points from its peak in 2009.

Even with these substantial improvements, however, the recovery is far from complete. Although demand for housing has picked up, the large overhang of unsold homes and the ongoing tide of foreclosures will continue to put downward pressure on house prices and residential investment in the short term (Figure 2). The lack of a robust pickup in construction activity from its recent very low levels is cause for concern because this sector is normally an important source of growth following recessions. In addition, macroeconomic imbalances have not been entirely eliminated, as uncertainty about the sustainability of the recovery has restrained business investment and slow growth in some trading partners has held back exports.

Figure 1. **Initial claims for unemployment insurance have dropped near their pre-recession average¹**

New claims per week, seasonally adjusted, four-week moving average



1. Shaded area shows NBER recession dates.

Source: US Bureau of Labor Statistics.


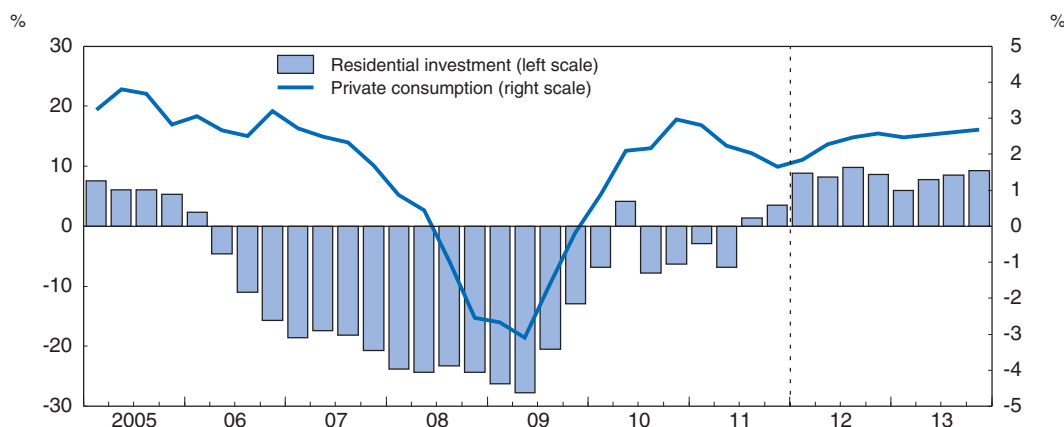
StatLink  <http://dx.doi.org/10.1787/888932637823>

Figure 2. **Private consumption and residential investment are picking up**
Year-on-year percentage change



Source: OECD, *Economic Outlook 91 Database*.

StatLink  <http://dx.doi.org/10.1787/888932637842>

Given these developments, real GDP growth is projected to remain moderate this year and next. Consumption growth will likely stay near its current pace, as the firming pace of labour income growth is partly eroded by the lagged effects of higher energy prices. Moreover, under current legislation the rate of fiscal consolidation is set to intensify sharply, which will significantly restrain aggregate demand. Meanwhile, the sovereign debt crisis in Europe remains a source of concern given the many linkages between US financial institutions and European financial markets. Taken together, the downside risks to the economy in the near term suggest that policy makers should continue to support the recovery and stand ready to act further if the more negative outcomes materialise.

Monetary policy continues to support the recovery in various ways

Since the onset of the financial crisis, the Federal Reserve has undertaken a variety of creative policy actions to support the recovery, anchor inflation expectations and promote the stable functioning of financial and credit markets. Monetary policy has remained extremely accommodative, as the Federal Open Market Committee (FOMC) has maintained a target range for the federal funds rate between 0 and 0.25% since December 2008, a stance reflecting generally subdued underlying inflation and high unemployment (Figure 3). With the nominal federal funds rate near its zero lower bound, the FOMC implemented several additional measures, including two rounds of purchases of long-term assets intended to put downward pressure on longer-term interest rates and improve conditions in credit markets. Finally, when financial market pressures in Europe became intense in the autumn of 2011, the Federal Reserve implemented a programme to extend the average maturity of its holdings of Treasury securities (the Maturity Extension Program, also known as 'operation twist'), in order to put additional downward pressure on longer-term interest rates. These policies are warranted in the current economic environment, but may need to be reversed sooner than anticipated to avoid inflationary repercussions if the financial crisis has reduced potential output by more than currently estimated.

Innovations in the Federal Reserve's communications have also enhanced the effectiveness of monetary policy: news conferences are held four times per year, immediately after the conclusion of policy meetings; FOMC statements include more

Table 1. **Main macroeconomic and financial indicators**

	2011	2009	2010	2011	2012	2013
	Current prices USD billion	Percentage changes from previous year, volume (2005 prices)				
Real GDP	15 094.0	-3.5	3.0	1.7	2.4	2.6
Private consumption	10 726.0	-1.9	2.0	2.2	2.3	2.6
Government consumption	2 547.3	2.0	0.9	-1.2	-1.3	-0.1
Gross fixed capital formation	2 353.2	-15.2	2.0	3.7	4.4	6.3
Final domestic demand	15 626.5	-3.6	1.8	1.8	2.0	2.7
Stockbuilding ¹	46.3	-8	1.7	-0.2	0.3	0.0
Total domestic demand	15 672.8	-4.4	3.4	1.6	2.3	2.7
Exports of goods and services	2 085.5	-9.4	11.3	6.7	4.9	6.7
Imports of goods and services	2 664.2	-13.6	12.5	4.9	3.9	6.2
Net exports ¹	-578.8	1.0	-0.5	0.0	-0.0	-0.2
Terms of trade	-	5.9	-1.6	-1.4	-2.1	-1.1
Consumer price index	-	-0.3	1.6	3.1	2.3	1.9
Private consumption deflator	-	0.2	1.8	2.5	2.0	1.8
Unemployment rate ²	-	9.3	9.6	8.9	8.1	7.6
Household saving ratio ³	-	5.1	5.3	4.7	4.3	4.0
General government financial balance ^{4, 5}	-	-11.6	-10.7	-9.7	-8.3	-6.5
General government gross debt ^{4, 5}	-	89.7	98.3	102.7	108.6	111.2
Current account balance ³	-	-2.7	-3.2	-3.1	-3.7	-4.3
Real GDI	-	-4.0	3.6	2.0	-	-
Memorandum items:						
Administration's FY 2013 budget						
Federal budget surplus/deficit ^{4, 6}	-	-10.1	-9.0	-8.7	-8.1	-6.1
Federal debt held by the public ^{4, 6}	-	54.1	62.8	67.7	73.7	78.7
OECD model ⁷						
Federal budget surplus/deficit ⁴		-10.1	-9.0	-8.7	-7.6	-6.1
Federal debt held by the public ⁴		54.1	62.8	67.7	73.2	77.1

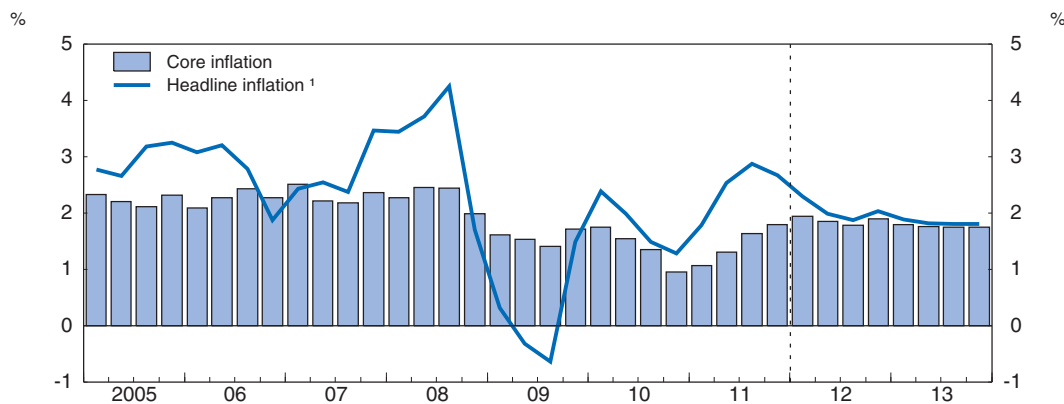
Note: National accounts are based on official chain-linked data. This introduces a discrepancy in the identity between real demand components and GDP. For further details see OECD *Economic Outlook Sources and Methods* (www.oecd.org/eco/sources-and-methods).

- Contributions to changes in real GDP (percentage of real GDP in previous year), actual amount in the first column.
- As a percentage of the labour force.
- As a percentage of disposable household income.
- As a percentage of nominal GDP.
- General government shows the consolidated (i.e., with intra-government amounts netted out) accounts for all levels of government (central plus state/local).
- CBO (2012a) analysis of the Administration's FY 2013 budget, fiscal years. The CBO produces independent, nonpartisan and timely analysis of economic and budgetary issues to support the Congressional budget process. The Office of Management and Budget (OMB) projects a greater reduction in the deficit, to 5.5% of GDP in FY 2013, mainly because economic growth is assumed to be higher than in the CBO projection.
- The OECD model is described in Lenain *et al.*, (2010). It assumes that the budget deficit is reduced by 1.5% of GDP in FY 2013 and by 1% of GDP in each subsequent year until the deficit reaches 0.5% of GDP by FY 2019 and remains at that level thereafter.

Source: OECD *Economic Outlook 91 Database* and US Congressional Budget Office.

forward guidance about the anticipated policy path going forward, such as an explicit statement in March 2012 that the FOMC anticipates that economic conditions are likely to warrant “exceptionally low levels for the federal funds rate at least through late 2014”; a long-term inflation objective was announced (2% annual changes of the price index for personal consumption expenditures) as well as a longer-term goal for unemployment; and FOMC members’ projections for the “appropriate” federal funds rate path are published.

Figure 3. **The energy-related spike in inflation is projected to fade away**
Year-on-year percentage change



1. Headline inflation proxied by the private consumption deflator.

Source: OECD Economic Outlook 91 Database.

StatLink  <http://dx.doi.org/10.1787/888932637861>

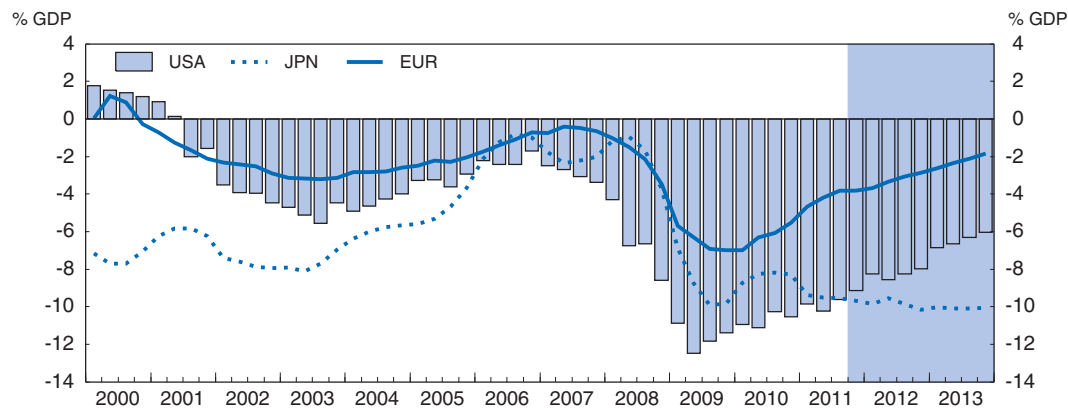
While the overall effect of these measures is difficult to quantify, it is clear that markets are functioning better and longer-term interest rates have remained quite low. Nevertheless, many financially-stressed home owners have been unable to participate in existing mortgage modification programmes because of overly restrictive eligibility requirements and complicated application procedures. Efforts to expand eligibility and simplify the process would allow more households to reduce their debt burdens and would support the housing market recovery, thereby strengthening an important transmission channel of monetary policy.

The United States has been active in its efforts to reduce the risks of financial crises. The monitoring of risks and financial supervision have improved noticeably following the passage of the 2010 Dodd-Frank legislation. Banks are now subject to greater scrutiny through the stress test requirements, and banks' capital requirements have become more stringent. Systemically important non-bank financial institutions will, upon designation, be supervised by the Federal Reserve Board, and could upon failure be taken into receivership by the Federal Deposit Insurance Corporation (FDIC). In addition, coordination among the various regulatory agencies has enhanced the government's ability to monitor risks from a broader, system-wide perspective. Furthermore, the Federal Reserve and other US agencies with financial stability responsibilities are engaged with regulators from other countries to find ways to address the vulnerabilities exposed during the crisis, under the auspices of the Financial Stability Board and the Basel Committee on Banking Supervision. Finally, the newly created Consumer Financial Protection Bureau (CFPB) is a major step aimed at protecting consumers from deceptive or predatory lending practices and ensuring that consumers have adequate information to make sound financial decisions. It is important that financial regulations are strictly enforced and that the full potential of these endeavours is realised.

The general government budget deficit has started to decline


As in other OECD countries, the US budget deficit increased sharply in the wake of the global financial crisis (Figure 4). With the economic recovery still weak, further fiscal stimulus was introduced and the budget deficit has declined only moderately during the

Figure 4. **Fiscal deficits are large**
General government net lending



Note: EUR is the 23 OECD European countries.

Source: OECD, *Economic Outlook 91 Database*.

StatLink  <http://dx.doi.org/10.1787/888932637880>

last several years. Though helpful in the short term, deficits of the present size are causing debt accumulation at a pace that cannot be sustained over time. This is likely to put upward pressure on global interest rates as the economy recovers.

Current legislation, if executed, builds in a large fiscal retrenchment in FY 2013. Adjusted for the cycle, the federal budget deficit would fall by 4.3% of GDP in FY 2013 (Table 2). Most of this consolidation is attributable to the expiry of various tax cuts and to the automatic spending cuts foreseen in the *Budget Control Act*. Such a large fiscal retrenchment would help to contain debt held by the public to 75% of GDP, but would be badly timed given the fragile state of the economy. The CBO projects that it would reduce GDP growth to 0.5% in 2013 and that the unemployment rate would rise again. On the other hand, avoiding fiscal consolidation (as in the CBO's alternative scenario, which represents a continuation of current policy) would result in a much higher and rapidly rising debt-GDP ratio (Figure 5). While bond-market investors have so far been willing to buy Treasury bonds at very low yields, this may not last forever, notably after the Federal Reserve's programme of security purchases has come to an end. The goal should therefore be to carefully balance the risks of insufficient consolidation against those of excessive short-term output costs.

The debt-GDP ratio could be stabilised by the middle of the decade and reduced further beyond then with a smoother and more gradual pace of deficit reduction such as that illustrated by the OECD model in Figure 5. The penalty in terms of the peak debt-to-GDP ratio for this much smoother consolidation path relative to implementing the "fiscal cliff" is just 5 percentage points of GDP (80% instead of 75%), although it would take many more years than in the CBO baseline scenario to reduce debt to 60% of GDP (reached by the early 2020s).

The Administration's FY 2013 budget proposal provides for deficit reductions of 2% of GDP in both 2013 and 2014 and smaller reductions until 2018 (Table 2). This is broadly similar to the OECD path and strikes a good balance between short-term growth and long-term debt sustainability. Most of the deficit reduction comes from allowing some of the revenue increases in current law to occur (expiry of the payroll tax cut and, for high-income

Table 2. Federal budget deficits will fall sharply in the next two years if current law is not amended

Percentage of GDP

Federal fiscal year	Budget balance under current law ¹	Cyclical effect ²	Cyclically-adjusted budget balance	Budget balances in the Administration's FY 2013 budget proposal ³
2008	-3.2	-0.1	-3.1	-3.2
2009	-10.1	-2.2	-7.9	-10.1
2010	-9.0	-2.5	-6.5	-9.0
2011	-8.7	-2.3	-6.4	-8.7
2012	-7.6	-2.2	-5.4	-8.1
2013	-3.8	-2.7	-1.1	-6.1
2014	-2.3	-2.7	0.4	-4.2
2015	-1.5	-1.6	0.1	-3.1
2016	-1.4	-0.6	-0.8	-2.8
2017	-1.0	-0.2	-0.8	-2.5
2018	-0.8	0.0	-0.8	-2.5
2019	-1.0	0.0	-1.0	-2.8
2020	-1.0	0.0	-1.0	-2.8
2021	-1.0	0.0	-1.0	-2.9
2022	-1.2	0.0	-1.2	-3.0

1. Data up to fiscal year 2011, CBO (2012a) baseline beyond then.

2. As estimated in CBO (2012b).

3. CBO's preliminary analysis of the Administration's FY 2013 budget proposal. This analysis uses the same economic projections as in the CBO's baseline (i.e., current law). In a subsequent analysis (CBO, 2012c), the CBO estimates that the Administration's budget would initially boost output relative to the baseline owing to lower taxes but subsequently reduce it because the deficits would exceed those projected under current law. The CBO estimates that allowing for these economic effects would reduce deficits under the Administration's budget proposal by USD 0 – 200 billion over 2013 – 2017 (from USD 3.2 trillion when these effects are not taken into account) but increase them by USD 100 – 400 billion over 2018 – 2022 (from USD 3.2 trillion when these effects are not taken into account).

Source: CBO (2012a, 2012b, and 2012c) and OECD Secretariat calculations.

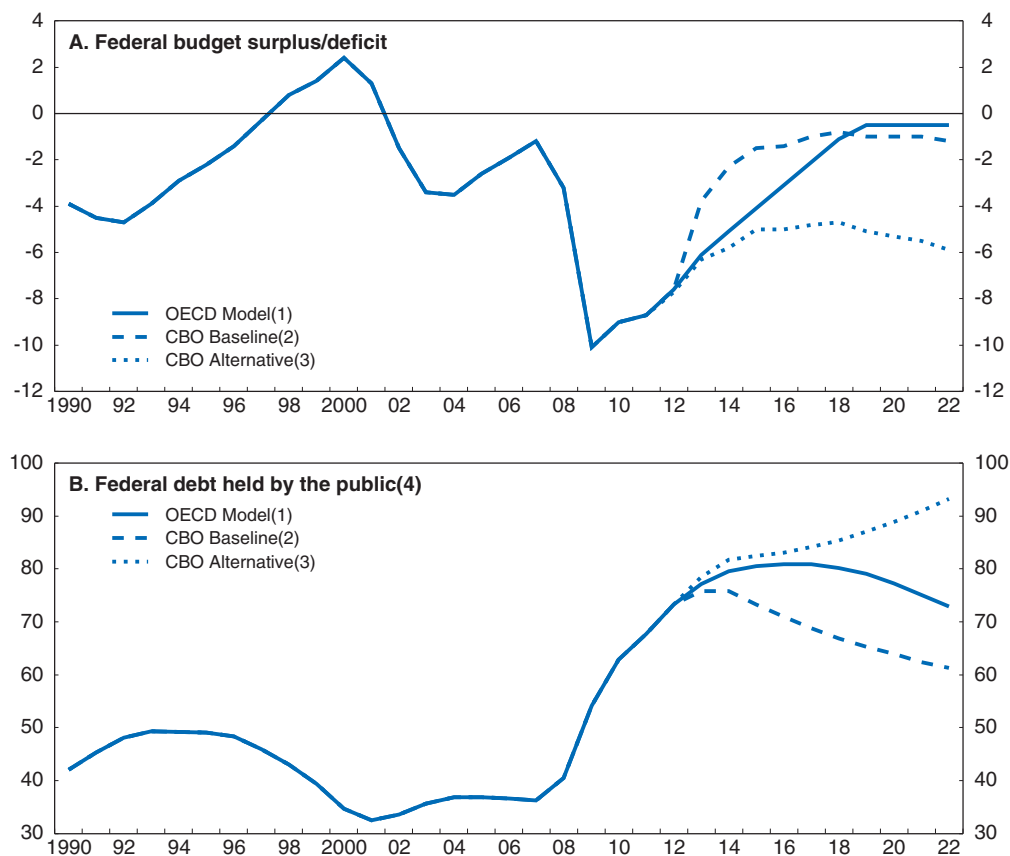
earners, of the Bush-era tax cuts). On the spending side, the caps in discretionary spending set in the Budget Control Act of 2011 are maintained and large cuts are made in funding for military operations in Afghanistan and related activities; the automatic spending cuts mandated by the Budget Control Act that are scheduled to begin in January 2013 are not, however, allowed to take effect. Looking further out, however, the budget deficit rises beyond 2018 owing to population ageing and rising health-care costs. As a result, the debt-to-GDP ratio could begin to rise again in the first half of the 2020s.

Consolidation measures should be chosen to enhance long-term growth prospects and reduce inequality

Lawmakers need to implement further fiscal consolidation measures when economic recovery is secure. Such measures should ideally enhance long-run growth prospects and reduce income inequality. For this purpose, there is considerable scope to widen tax bases by cutting tax expenditures that distort economic incentives and benefit mainly high-income earners. For instance, the Administration has proposed to limit the marginal income tax rate applicable for various exclusions and deductions to 28%, thus reducing their generosity for top-income taxpayers. The Administration has also proposed to achieve USD 1 trillion in discretionary spending savings over the next 10 years through the budgetary caps established by the Budget Control Act and a variety of other measures, including notably cuts in defence and military outlays (Overseas Contingency Operations). These proposals provide a good basis for implementing expenditure reductions. They also


Figure 5. **Federal budget balances and debt held by the public under various consolidation scenarios**

As a percentage of GDP



1. See footnote 7 in Table 1.
2. The CBO baseline assumes that current law remains unchanged (CBO, 2012b). This results in a large fiscal consolidation in FY 2013.
3. The CBO alternative scenario assumes that policymakers override current law so that certain temporary provisions continue, as has occurred repeatedly in the past. In other words, this scenario reflects the continuation of current policy as opposed to current law. The differences from current law are that: all expiring tax provisions (other than the payroll tax reduction) are extended; the Alternative Minimum Tax (AMT) is indexed for inflation after 2011 (starting from the 2011 exemption amount); Medicare's payment rates for physicians remain unchanged from current amounts; and the automatic spending reductions required by the Budget Control Act do not take effect (CBO, 2012b).
4. End of the year.

Source: Congressional Budget Office (2012b) and OECD calculations.

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have the advantage of protecting spending, such as for research and education, that enhances long-term growth prospects.

In the medium to long term, the greatest challenge to fiscal sustainability comes from the federal health-care programmes. The CBO currently projects that federal health spending will grow by almost 2 percentage points of GDP over the next decade from this year's level of 5.5% of GDP, with further significant increases in prospect beyond then. The key driver over the coming decade is population ageing; beyond that, it is growth in expenditure per enrollee. The Affordable Care Act offers hope that cost growth can be

permanently reduced, although there is much uncertainty about how effective it will be. The Medicare Trustees estimate that reforms foreseen in the Act will reduce annual average growth in Medicare spending per enrollee by 1.3% over the coming decade. If this proves not to be possible, policymakers will need to take further measures. One possibility in this regard would be to align the age of entitlement to Medicare benefits to the age of entitlement to social security benefits, although mechanisms (such as those in the Affordable Care Act) would need to be available to provide access to affordable health insurance for persons who are retired, and no longer covered by employment-based insurance, but not yet old enough to be eligible for Medicare.

The other main pressure in the long term comes from increasing social security outlays owing to population ageing, which are projected to increase from 5% of GDP currently to 6% of GDP by 2035 (CBO, 2011a). Such pressures could be eased by indexing the retirement age to life expectancy beyond 2025, when the current scheduled increases to age 67 will be completed, and introducing a higher degree of progressivity in after-tax social security pension benefits by taxing them as regular income, increasing the share of the benefit that is a lump sum and raising the cap on contributions.

In view of these challenges, it is essential that the US authorities achieve bipartisan commitment to a medium-term fiscal plan. Adopting a medium-term fiscal framework could entail fiscal rules or transparency requirements that would increase accountability for fiscal outcomes and reduce uncertainty.

Box 1. **Recommendations for macroeconomic and financial policies**

Key recommendations:

- Monetary policy should continue to support the recovery. Current legislation should be amended to avoid a sharp fiscal contraction in 2013, which would derail the recovery. Rather, fiscal consolidation should occur at a gradual pace, and should be implemented as part of a commitment to a medium-term framework to restore fiscal sustainability.
- Further measures to simplify procedures and expand eligibility for mortgage loan modification programmes are encouraged, as these programmes can aid financially-distressed home owners, facilitate recovery in the housing market, and strengthen an important transmission channel of monetary policy.
- Reforms to reduce the risk of new financial crises should be fully implemented. Banks should be encouraged to maintain high levels of equity capital, and regulators should continue efforts to develop improved analytical tools and information systems to monitor risks to the financial sector.

Other recommendations:

- Design fiscal consolidation measures that as far as possible enhance long-term growth prospects and that seek to reduce income inequality.
- Implement the cost-saving measures in the Affordable Care Act but if necessary stand ready to introduce further measures.

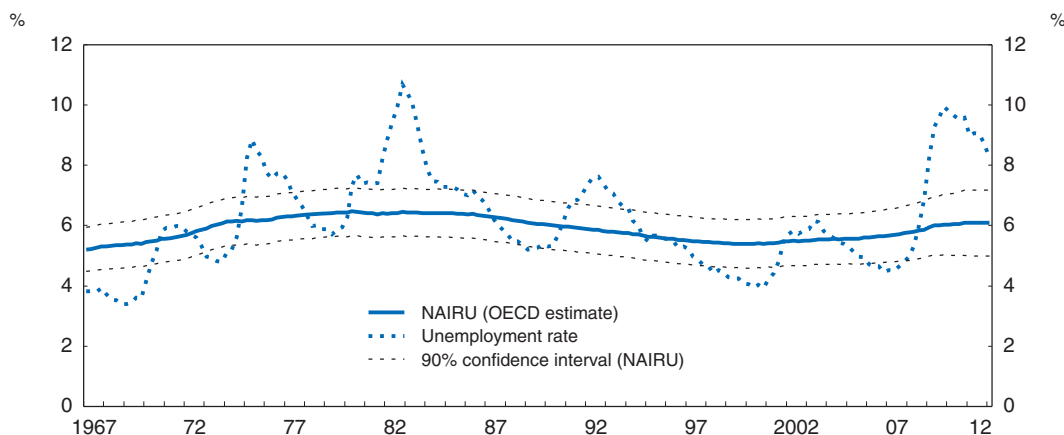
Labour market policies

The US labour market was hard hit during the economic downturn

The US labour market was extremely hard hit by the Great Recession. The unemployment rate shot up from its pre-crisis level of 4.4% of the labour force to a high of almost 10% in the fourth quarter of 2009 (Figure 6). With demand growth sluggish in the nearly three years since the peak was recorded, the normalisation of labour market conditions has been a slow process; the current episode marks the first time since the Great Depression that the US unemployment rate has been above 8% for more than two years. Although the recovery in private-sector job creation thus far has been substantial, OECD estimates indicate that the non-accelerating inflation rate of unemployment (NAIRU) has increased slightly, to around 6%, and that cyclical unemployment is still more than 2% of the labour force. However, structural unemployment may well already have risen more than this estimate would suggest, and there is a risk that it could increase still further given the high levels of long-term unemployment.

Furthermore, labour market participation in the United States typically exhibits a moderate degree of cyclicity (Aaronson *et al.*, 2006a), yet it has edged down despite the increase in employment thus far in the recovery (Van Zandweghe, 2012). While part of these declines reflect the fact that ongoing weakness in labour demand has led some individuals to give up their job search, the recent behaviour has also occurred in the context of a longer-term decline in the participation rate, which will present challenges to the government in meeting its long-term fiscal objectives. Demographic factors, especially the ageing of the baby-boom generation, have been putting downward pressure on potential labour supply for more than a decade, and researchers have projected that these effects will continue in the years ahead (Figure 7; Toossi, 2012). In addition, participation rates for youth have been trending down since the mid-1990s, and this pattern accelerated during the recession. While rising school enrolments can partly explain the declines in labour market participation for youth, other contributing factors are more worrisome, such as the declining concentration of jobs in the middle of the skill distribution, which has led to increased competition from adults for entry-level jobs (Aaronson *et al.*, 2006b; Smith, 2011).

Figure 6. **The unemployment rate has fallen substantially but is still high**



Note: More information about the NAIRU can be found in Guichard and Rusticelli (2011).

Source: OECD, *Economic Outlook 91 Database and Analytical Database* and OECD calculations.


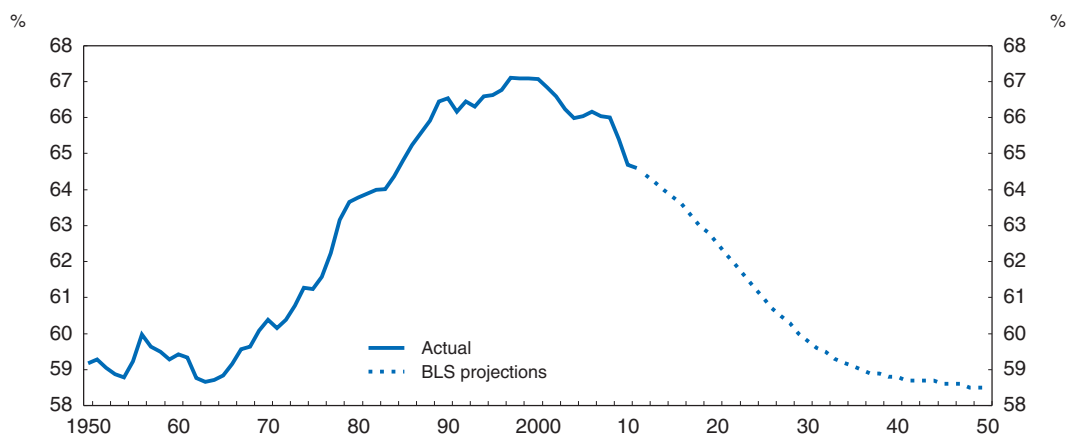

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Figure 7. **Demographic changes will continue to push down labour force participation**

Actual and projected participation rate, age 16 and over



Source: US Bureau of Labor Statistics projections through 2050 provided by Toossi (2012).

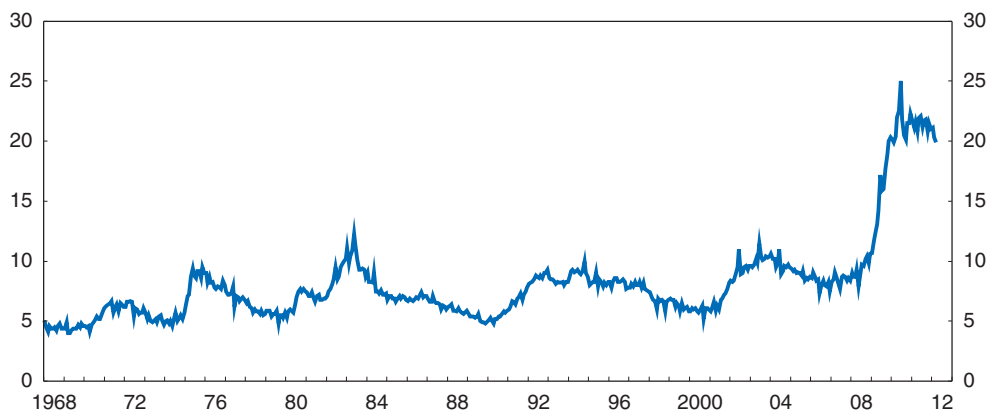
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Long-term unemployment may be becoming structural


Another development in recent years that is highly unusual for the US labour market is the dramatic rise in long-term unemployment (Figure 8). From 2003 to 2007, prior to the onset of the crisis, the median duration of unemployment reported in the BLS survey of households was about 9 weeks. By early 2010, this figure had risen to almost 26 weeks, although since then it has edged down to around 20 weeks. The increased duration reflects the slow recovery and may also owe, in part, to the lengthened eligibility period for unemployment benefits. The persistence of high unemployment duration is worrisome because the experience of other OECD countries has been that long-term unemployment can become structural or lead to permanent reductions in labour force participation.

Figure 8. **The duration of unemployment has risen dramatically**

In median weeks



Source: US Bureau of Labor Statistics, Current Population Survey Database 2012.

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Unemployment benefits should be combined with a more “active” set of re-employment services

In response to the recession, and to provide income to the long-term unemployed, the period of eligibility for unemployment benefits was increased in steps from 26 weeks to 99 weeks. This year, the maximum period of eligibility moves down gradually to 73 weeks. These emergency unemployment benefits have provided a much-needed cushion for many of the most financially-stressed households. The programme is an effective tool for stimulating aggregate demand and boosting economic activity, because benefit recipients are likely to be liquidity-constrained households who have a high propensity to consume (Johnson et al., 2006; Parker et al., 2011). Although there is little evidence that the benefit extension has significantly reduced job search intensity, this could occur if such benefits remain in place long enough. To avoid this outcome, the duration of unemployment benefits should be pared back gradually toward its pre-recession baseline of 26 weeks as the labour market improves.

Furthermore, these “passive” forms of assistance would provide much greater value to the unemployed if they were offered in tandem with a more “active” set of re-employment services that can connect job seekers with job opportunities, facilitate job search, and guide individuals towards training and education. Job counsellors should be used to provide active case management, especially to those who appear to be at an elevated risk of becoming structurally unemployed. Evaluation studies show that additional job-search assistance and expanded opportunities for training can also be cost-effective (Card et al., 2009). Relative to other OECD countries, the United States currently spends little on these types of re-employment services (OECD, 2011a), and developing an effective activation system will require significantly more resources. Some steps have been taken in this regard. The American Recovery and Reinvestment Act of 2009 included additional funds for states to expand the services provided by One-Stop-Career-Centers, and the Middle Class Tax Relief and Job Creation Act of 2012 added a requirement that all Extended Unemployment Compensation (EUC) recipients receive eligibility assessments and re-employment services, including labour market information, skills assessments and a re-employment plan. Moreover, the Act introduced other innovative measures to move the unemployment compensation system in the direction of becoming a re-employment system, such as allowing the flexible use of unemployment benefits by individuals seeking to launch their own businesses or who are undergoing short-term, on-the-job training. The Administration’s FY 2013 budget proposal included several other measures aimed at investing in a more comprehensive activation system, and these should be implemented in full. Additional efforts to integrate the existing programmes that provide income support, re-employment services and training are also encouraged, as the current system is very piecemeal. The development of a coherent system for activation services would also help ensure that scarce fiscal resources are directed toward the programmes that will generate the highest return.

Subsidies to employers for recruiting new employees are another effective way to raise the jobs intensity of output growth, and such measures should be considered in the short run. The 2010 Hiring Incentives to Restore Employment (HIRE) Act provided a tax credit for employers who hired individuals who had been unemployed more than 60 days, but the take-up rates for the credit were disappointing. The subsidy expired before the pace of job creation had become self-sustaining. Part of the problem was that the size of the credit was

quite small. The programme also had several design features that limited its effectiveness in stimulating higher employment.

The tax credit proposed in the American Jobs Act (AJA) appears more promising than the HIRE Act subsidy because it is targeted on net increases in payrolls; research conducted by the OECD and others indicates that these types of marginal subsidies can stimulate job creation in a depressed economy (OECD, 2011a; Neumark, 2011). The AJA policy would be made more cost effective, however, if the tax credit were limited to net increases in employment and not wages, as labour supply on the employment margin is much more responsive to wages than labour supply on the hours margin. A second component of the AJA proposal was a separate USD 4 000 credit for hiring new employees who had previously been unemployed more than six months. But targeted credits like these are generally not recommended, as eligibility for the credit may transmit a negative signal to employers that offsets the positive effect of the credit (Dickert-Conlin *et al.*, 2000).

Disability programme reforms are needed to stem the tide of new enrolments

Another factor contributing to the decline in participation rates has been the dramatic increase in the number of people receiving disability benefits. The share of the working-age population between the ages of 20 and 64 enrolled in disability programmes rose from 3.6% in 1980 to 6.1% in 2007 and to 6.6% in 2010. Much of the increase in recent decades reflects a relaxation of eligibility restrictions and increased replacement rates, as well as an influx of disabled war veterans (Autor, 2011; Autor, Duggan and Lyle, 2011). Further increases in the number of applications for disability benefits are likely, mainly because there is often a considerable lag between the rise in unemployment during a recession and an upward ratchet in disability rolls. Efforts are needed to reduce the reliance on disability benefits because few of the recipients ever return to the workforce. Successful reforms that dealt with similar problems in the Netherlands can provide a useful model for establishing more stringent eligibility requirements and discouraging fraud (OECD, 2008a). In addition, measures such as workplace accommodation, rehabilitation services and partial income support could encourage more workers with disabilities to remain in employment (Autor and Duggan, 2010).

A longer-run concern is the slow growth in labour income for much of the population

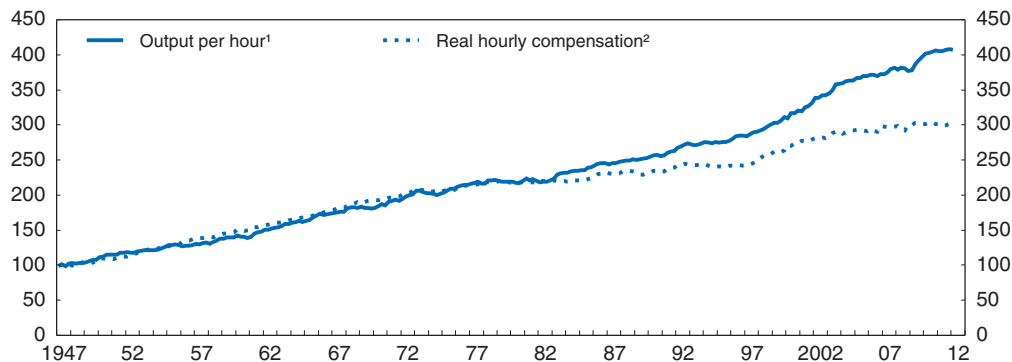
Since the early 1980s, real compensation growth has lagged far behind the gains in labour productivity (Figure 9), partly reflecting higher growth in consumer prices than in producer prices. Separately, information on earnings by level of education show that while earnings for college graduates have held steady or increased slightly over this period, earnings for workers with lower educational attainment have declined, with the result that the college/high school wage premium surged from 35% in 1980 to 60% in 2005 (Goldin and Katz, 2008).

Progress in education attainment is critical to securing future gains in income

An important factor contributing to the rise in the college/high school wage premium is that the growth in the supply of tertiary graduates slowed sharply in the 1980s while the demand for skills continued to grow at more or less the same rate as before (Goldin and Katz, 2008). The slowdown in growth in tertiary attainment rates in the United States contrasts with the large increases in most other OECD countries, which began their transition to high rates of tertiary education attainment later. Indeed, tertiary attainment


Figure 9. **Hourly compensation has lagged behind the gains in labour productivity**

Index base 1947 = 100



1. Output data are based on estimates of nonfarm business output in constant dollars from the National Income and Product Accounts. Hours data are from the Bureau of Labor Statistics.
2. Compensation includes wages and salaries of employees plus employers' contributions for social insurance and private benefit plans, and it reflects the adjustment of hourly compensation for changes in consumer prices. The price changes for recent quarters are based on the BLS Consumer Price Index for all urban consumers (CPI-U). For earlier periods consumer prices are based on the BLS Consumer Price Index research series (CPI-U-RS).

Source: US Bureau of Labor Statistics, *Productivity and Cost Database 2012*.

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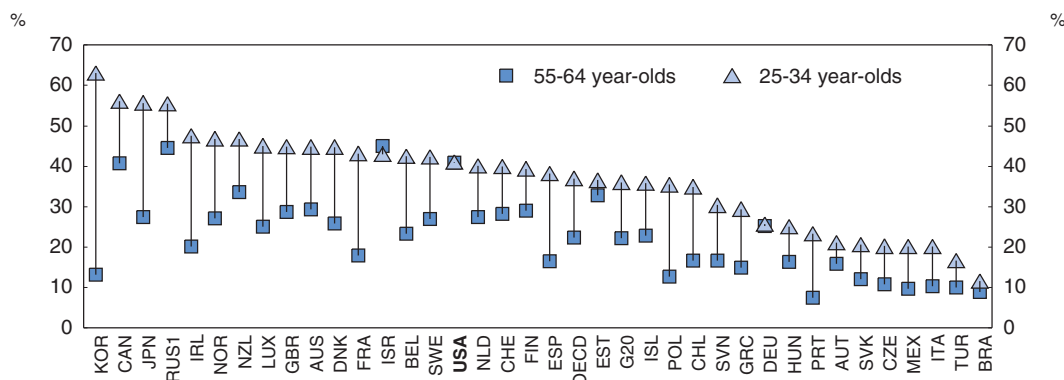
rates for older and younger cohorts are the same in the United States, a pattern in contrast to virtually all other OECD countries (Figure 10). As a result, whereas US tertiary attainment rates are amongst the highest in OECD countries for the older generation, they are exceeded in many countries for the younger generation, although US rates remain above the OECD average.

Tertiary attainment rates could be boosted by raising degree completion rates. These have increased somewhat in recent years, but still only 57% of full-time bachelor's degree-seeking students complete their degrees within six years of starting (US Department of Education, National Centre for Statistics). Completion rates for community college degrees and for part-time students are considerably lower. Completion rates could be increased by making remedial education programmes more effective, shortening pathways to graduation, and by helping part-time students to reconcile work and study schedules (Complete College America, 2011).

Improving secondary school education so that more students are college-ready would also help to increase completion rates at the tertiary level. One half of students seeking an associate degree (a two-year degree from a Community College) require remedial education, with this proportion falling to 21% for those seeking a bachelor's degree (Complete College America, 2011). Students requiring remedial education have much lower completion rates than other students.

Educational reforms are needed to upgrade US secondary school student achievement. Based on practices in the top-performing countries in the PISA study, the OECD has identified several key elements necessary for high student achievement (OECD, 2011b). The educational system should define clear standards of competencies that students should achieve. Schools need the freedom to determine how to achieve these standards, and should be held accountable for the outcomes. The teaching profession also needs to be upgraded, both by raising its low pay relative to that for other professions with similar qualification levels to attract more able candidates – for example, a US high school

Figure 10. **US tertiary attainment rates have stagnated in recent decades**
Population that has attained tertiary education



Note: Countries are ranked in descending order of the percentage of 25-34 year-olds who have attained tertiary education.

1. Year of reference 2002.

Source: OECD, *Education at a Glance 2011*.

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teacher with 15 years of experience can expect to receive only 65% of the earnings of a tertiary-educated individual working in another profession, a proportion substantially below the 85% observed, on average, in other OECD countries (OECD, 2011c) – and by developing teachers' skills to identify students with learning difficulties and to propose pedagogical solutions for them.

The Administration has taken measures to promote these and other reforms, notably through the Race to the Top (RTT) programme. Launched in 2010, RTT encourages US states to raise their aspirations and change their organisational culture by: i) adopting internationally-benchmarked state-developed standards and assessments that prepare students for success in college and the workplace; ii) recruiting, developing, rewarding, and retaining effective teachers and principals; iii) building data systems that measure student success and inform teachers and principals how they can improve their practices; and iv) turning around the country's lowest-performing schools (White House, 2012; Office of Management and Budget, 2012).

Part of the reason that tertiary education completion rates are so low is that students drop out for financial reasons. Many individuals have difficulty financing their education because they need to support themselves and a family at the same time; furthermore, tuition has increased at an annual average real rate of 4% over the past three decades, outpacing family incomes and student loans by a considerable margin. Oliviera Martins *et al.* (2007) find that easing liquidity constraints on students could increase the US graduation rate by 1.5 percentage points, which is one of the largest increases achievable in this way among OECD countries.

Measures have been implemented recently that will help students and their families pay for college – for example Pell Grants have been increased and Congress extended until 2012 the Opportunity Tax Credit Award – but such measures should be taken further. Students would also benefit greatly from an expansion in other types of assistance, such as child care and other family support services, which could be made available to students at reasonable cost.

Community colleges are a cost-effective means of raising human capital

One of the most cost-effective approaches to raising human capital is to enhance the community college system, which provides an affordable and accessible opportunity to obtain postsecondary education. Federal government funding for these programmes is currently modest, as most direct federal funding for higher education goes to public four-year colleges and universities. And although previous studies have demonstrated that the payoffs for a community college degree are greatest when studies are concentrated in technical fields, these courses require expensive investments in laboratory or technology equipment, which are inhibited by funding constraints (Greenstone and Looney, 2011).

Local and regional businesses are a valuable, yet under-utilized, resource in raising the returns to educational offerings at community colleges. Colleges should encourage potential employers to provide inputs regarding their specific needs for skills and training, so that degree programmes and even individual courses can be tailored to the needs of the local job market. In addition, a combination of appropriate incentives and regulations could establish relationships among community colleges, regional technical schools, other postsecondary institutions, and employers that could expand opportunities for workplace training in the form of internships or shorter workplacements. Efforts to encourage these types of programmes have been proposed in the Administration's FY 2013 budget, which calls for USD 8 billion in funding for the Departments of Education and Labor to support state and community college partnerships.

Advance the skills of high school graduates with high-quality vocational training

Of course, every individual has different aptitudes, and many will not go beyond a high-school education. In this context, the strong vocational component of the German and Swiss educational systems can provide useful models for improving the earnings and participation of lower-skilled workers, particularly youth. Germany's secondary education, for example, follows a dual system, in which the two-thirds of students who enrol in the vocational tracks alternate between a few days in school and a few days at the workplace. The system is notable for its success in enabling young people from widely varying social backgrounds to integrate the learning of academic skills with the mastery of job-specific skills (OECD, 2010a). Switzerland's highly developed vocational system is strongly market and employer driven; school and work-based learning are well integrated, and workplace training is not too company-specific (OECD, 2009a).

For many students, this practice-based, highly applied style of learning can be far more effective than studying classroom material with no obvious application to anything they know or care about. In addition, OECD research suggests that workplace training facilitates recruitment of employees because potential employers and employees get the chance to get to know each other and apprentices make productive contributions such that employers benefit directly from the training (OECD, 2011b). One might argue that the German or Swiss educational systems depend on an industrial structure that is very different from that of the United States, and thus is not easily transferable. But pilot programmes could explore how to adapt these effective school-to-work systems to the US context in ways that could produce major gains for employers, youth, and the educational system. Switzerland's apprenticeship-based vocational education programmes have been shown to pay for themselves, in the sense that benefits to most employers outweigh the costs (OECD, 2009a).

Box 2. Recommendations for promoting job creation and earnings growth**Key recommendations:**

- Development of enhanced “activation” programmes would facilitate the return to work for many unemployed individuals and mitigate the risk of long-term unemployment becoming structural. A variety of proposals for training and re-employment services were presented in the Administration’s FY 2013 budget, and these plans should be implemented without delay.
- Education and training are key to improving skills, reducing mismatches, and addressing the problem of slow wage growth. Efforts such as Race to the Top and measures to strengthen community colleges are steps in the right direction, but more could be done, such as reducing financial and other barriers to tertiary education and providing vocational training opportunities in secondary school.

Other recommendations:

- Strengthen and enhance the community college system, especially in technical fields and through collaboration with local employers.
- Offer high-quality vocational education in secondary schools with a substantial work-experience component, organised jointly with local employers.
- Reduce reliance on disability benefits by making eligibility requirements more stringent, and by enhancing workplace accommodations, rehabilitation services and partial income supports.

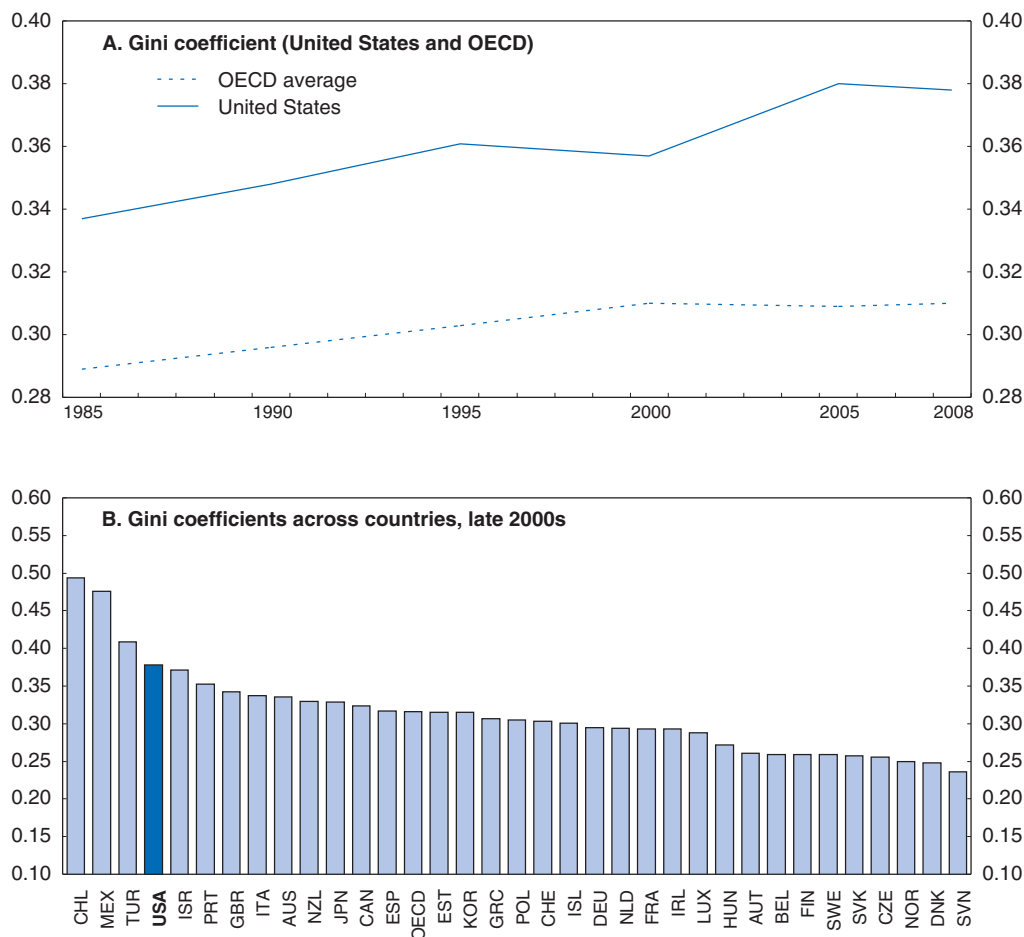
Income inequality

Income inequality in the United States has continuously increased over the last four decades (Figure 11, Panel A), and the Gini coefficient for disposable income is the fourth highest in the OECD (Figure 11, Panel B). Incomes of the top 1% of earners have skyrocketed, and their share in total disposable income has more than doubled between 1979 and 2007 to reach nearly 20% (CBO, 2011b).

The high degree of income inequality implies a number of potentially undesirable consequences. High income inequality is associated with low intergenerational mobility (Krueger, 2012). Some have identified income inequality as one of the causes of the financial crisis since it may have encouraged subprime borrowing by households who tried to make up for their lack of income (*e.g.* Rajan, 2010). Inequality has been argued to be bad for health, education and innovation (Wilkinson and Pickett, 2009) and economic well-being (OECD, 2008b). The rise in income inequality is reflected in rising consumption inequality between 1980 and 2010 (Attanasio *et al.*, 2012). Impoverishment of some parts of the population may also result in support for anti-market and protectionist measures, while excessive concentration of wealth on a small group could lead to their having disproportionate political influence. In addition, there is no consensus that reducing inequality is harmful to economic growth (OECD, 2012). The remainder of this section outlines recommendations that could lower income inequality without having a harmful impact on economic growth.


Several factors have contributed to a rise in income inequality

Higher labour earnings inequality accounts for some of the rise in income inequality. Greater openness to international trade has meant that low-income workers may have

Figure 11. **Income inequality has increased to a high level**

Notes: The Gini coefficients are after household taxes and cash transfers. For Panel A, the OECD average contains the following countries: Austria, Belgium, Canada, Denmark, Finland, Germany, Greece, Ireland, Israel, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Spain, Sweden, United Kingdom and the United States. The years indicated are proximate.

Source: OECD, *Income Distribution and Poverty Database*.

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been affected disproportionately by import competition (Autor *et al.*, 2011), and the offshoring of activities in the tradable goods and services sectors has led to a fall in the demand for less skilled labour (Feenstra, 2010). This may have been reinforced by skill-biased technical change, which induced a shift in labour demand towards higher skills (Acemoglu, 2002; Levy and Murnane, 1992). While the demand for skilled workers has increased, the supply of such individuals has not kept pace, as indicated by the slowing growth of tertiary attainment (Goldin and Katz, 2008). Also, the significant decline in union membership since the mid-1980s (Card *et al.*, 2004) and the reduction in the minimum wage in real terms (Lee, 1999) have arguably reduced the incomes of low earners.

The tax-and-transfer system has also contributed less to income redistribution over time. Compared to 1980, taxes and transfers decrease the Gini coefficient for disposable income by about 30% less (CBO, 2011b). The inequality-reducing power of both taxes and

transfers has fallen. On the tax side, although the middle class have seen their taxes remain roughly constant, or slightly increase, average income tax rates have significantly declined for the most wealthy, especially the 1% top earners and, within this group, the relatively small number of households with extremely high earnings. On the transfer side, spending has become increasingly less targeted, reflecting the rising importance of public pensions and Medicare, which are not means-tested.

Education reform has the potential for a double dividend: higher growth and less inequality

The US education system is less effective than those of other countries in helping children realise their potential, as illustrated by a much greater impact of the socio-economic background on education achievement (OECD, 2009b). To reduce this impact, more resources need to be directed towards disadvantaged students. Currently, the United States is one of only three OECD countries that on average spend less on students from disadvantaged backgrounds than on other students (OECD, 2011b). Moreover, the most able teachers rarely work in disadvantaged schools in the United States, the opposite of what occurs in countries with high-performing education systems (OECD, 2011b). These resource allocations reinforce the disadvantages of social segregation, which results in children in poorer schools having lower educational expectations and outcomes.

The key to redirecting resources towards students in most need is to replace the local-property tax system of financing schools by state-level financing where this is not already so. Canada had similar arrangements but reformed them by moving school funding to the provincial level. This contributed to Canada now having one of the smallest influences of socio-economic background on achievement and having high average levels of achievement. While desirable, such a reform would likely be difficult for many states to implement owing to fierce opposition from residents of affluent localities.

Some of the measures in the Administration's Race to the Top (RTT) programme would help to reduce the impact of socio-economic background on outcomes. In particular, RTT encourages states to implement reforms to turn around the lowest-performing schools and improve their programmes of early learning and care (White House, 2012). Many of the other reforms needed to improve education achievement in general (discussed above) would also likely benefit disadvantaged students disproportionately.

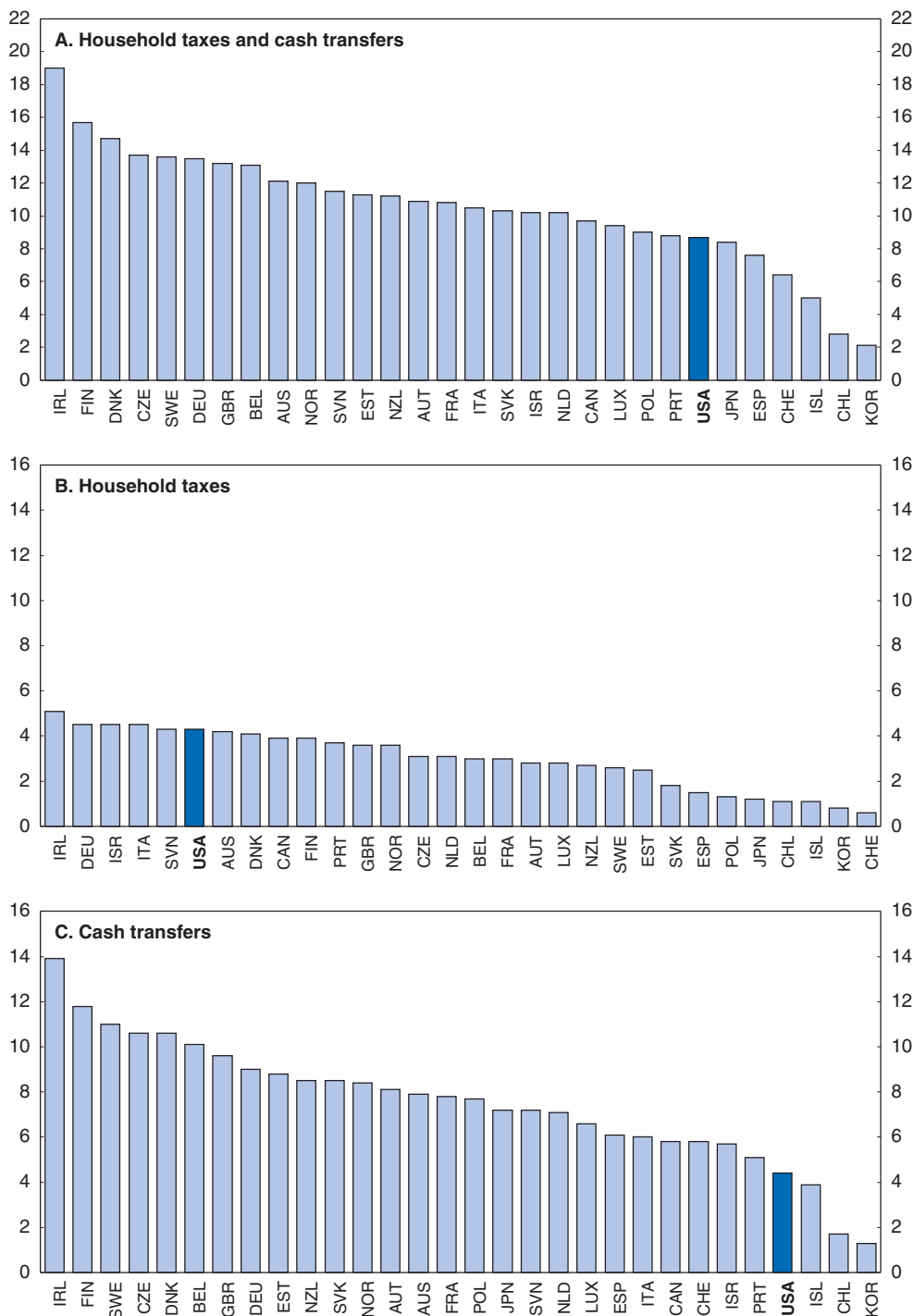
Reforms to the tax system can help in reducing income inequality

Income redistribution has also a role to play, though the US tax-and-transfer system reduces income inequality by less than in other OECD countries (Figure 12; Joumard et al., 2012). This is due primarily to the relatively lower impact of the cash transfer system, which represents a smaller amount of spending relative to GDP than elsewhere and comprises several programmes provided to recipients irrespective of their income levels. Federal taxes on personal incomes reduce inequality significantly, reflecting average tax rates rising with income levels, though the most wealthy benefit from lower average tax rates mainly thanks to the lower taxation of capital income, which constitutes a significant source of their earnings (Figure 13).

There are good reasons for personal income tax rates on capital income to be lower than on labour income, including the attenuation of the effects of double taxation of corporate income. Nevertheless, taxation of capital income often implies a trade-off between income redistribution and economic growth, but there are avenues to reform that

Figure 12. **The US tax system is effective in reducing inequality by OECD standards; but not the transfer system**

Percentage point reduction in the Gini coefficient in the late 2000s

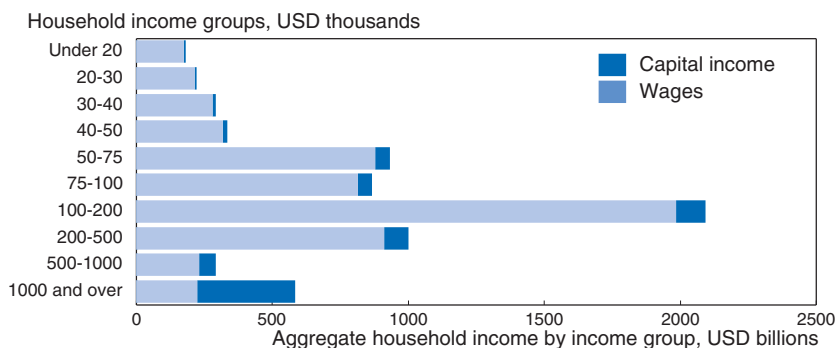


Note: Income inequality is measured by the Gini coefficient. The Earned Income Tax Credit enters cash transfers. In-kind transfers are not included.

Source: Joumard et. al. (2012), using the OECD Income Distribution and Poverty Database.

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Figure 13. **A significant part of the income of the wealthy comes from capital, 2011**
By annual income group, pre-tax^{1, 2, 3}



1. Capital income consists of capital gains, dividend income and interest income.
2. The income concept used to place tax returns into income categories is adjusted gross income (AGI) plus: [1] tax-exempt interest, [2] employer contributions for health plans and life insurance, [3] employer share of FICA tax, [4] workers' compensation insurance, [5] non-taxable social security benefits, [6] insurance value of Medicare benefits, [7] alternative minimum tax preference items, and [8] excluded income of US citizens living abroad. Categories are measured at 2011 levels.
3. Includes non-filers, excludes dependent filers and returns with negative income.

Source: Joint Committee on Taxation (Sept. 2011), "Federal tax treatment of individuals", Senate Committee on Finance, JCX-43-11.

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are compatible with both objectives. Empirical research (e.g. Feldstein, 1995; Gruber and Saez, 2002) shows that wealthy households respond significantly to high marginal tax rates by reorganising their affairs to benefit from the way different types of income are taxed. Broadening the tax base by closing loopholes in the current tax code therefore has the potential to raise both efficiency and equity. As noted, this is particularly the case for the taxation of capital income: capital income is highly concentrated among wealthy households and represents a significant fraction of their total income (Figure 13).

The unequal tax treatment of income from different asset classes (Table 3) undermines revenue collection, and therefore the effectiveness of the capital income tax as a redistribution instrument; at the same time it distorts the allocation of capital. Aligning effective tax rates (ETRs) on both debt- and equity-financed corporate investment and owner- and tenant-occupied housing investment would hence reduce avoidance opportunities for the wealthy and improve the efficiency of investment. Several options could be considered to achieve this, in the case of corporate investment, for example, through phasing out interest deductibility and treating interest income as equivalent to dividend income at both the corporate- and recipient levels. The returns to owner-occupied housing (imputed rents and capital gains) should ideally be subject to the same tax rates as income from corporate investment, while maintaining mortgage interest deductibility. Given the political and practical difficulties of taxing imputed rents experienced in many OECD countries, an alternative – though less desirable – option is to phase out or reduce the cap on mortgage interest deductibility for owner-occupied housing.

Raising the taxation of capital income would be conducive to equity, but it is likely to reduce efficiency. For example, the proposal by the Administration to raise the tax rate on dividend income from 15% to 45% (39.6% combined with other provisions) would significantly increase the ETR on equity income. As equity income is highly concentrated among the rich, this measure would be redistributive, but it would also amplify the existing

Table 3. **Effective tax rates on real income vary widely across asset classes**

Percentage	
Corporate investment:	
Debt-financed	-6.4
Equity-financed	36.1
Housing investment:	
Owner-occupied	-5.1
Tenant-occupied	18.2

Note: The effective tax rates account for federal but not state and local taxes and are hence somewhat lower than the actual effective tax rates.

Source: Congressional Budget Office (2005).

disadvantageous tax treatment of equity-financed corporate investment compared to other investments. It would thus likely give rise to an increase in the distortions to the allocation of capital, while not reducing income inequality very much as it would encourage further the shifting of income toward less-taxed asset classes. Overall, CBO (2012c) finds that the various tax proposals contained in the Administration's FY 2013 budget would increase the marginal tax rate on capital income, with a likely negative impact on the capital stock.

A more growth-friendly approach to reduce income inequality would be to focus reform efforts on other provisions in the personal income tax system that favour households at the upper end of the income distribution. Some tax expenditures are justifiable on economic or social grounds, but several are not. For example, tax breaks to encourage the accumulation of individual private pensions could in principle be desirable, but in practice they frequently lead to a re-allocation of existing savings to retirement accounts and benefit primarily high earners (Toder, Harris and Lim, 2009). Such tax expenditures should therefore either be phased out or progressively more tightly capped, for instance by adopting a limit of 28% on the marginal income tax rate at which the relevant deductions (such as for owner occupiers' mortgage interest payments) may be claimed and exclusions (such as for employer-provided health insurance cover) permitted, as proposed by the Administration, which would be good for both efficiency and equity as well as reducing the deficit, as pointed out above. So-called carried interest in private investment funds is now taxed at the low capital income tax rate, but arguably should be taxed at the higher rate on labour income, although such a change would raise very little revenue (CBO, 2011a; Viard, 2008). On the administrative side, policies to improve tax compliance are likely to bear particularly on those with the highest incomes.

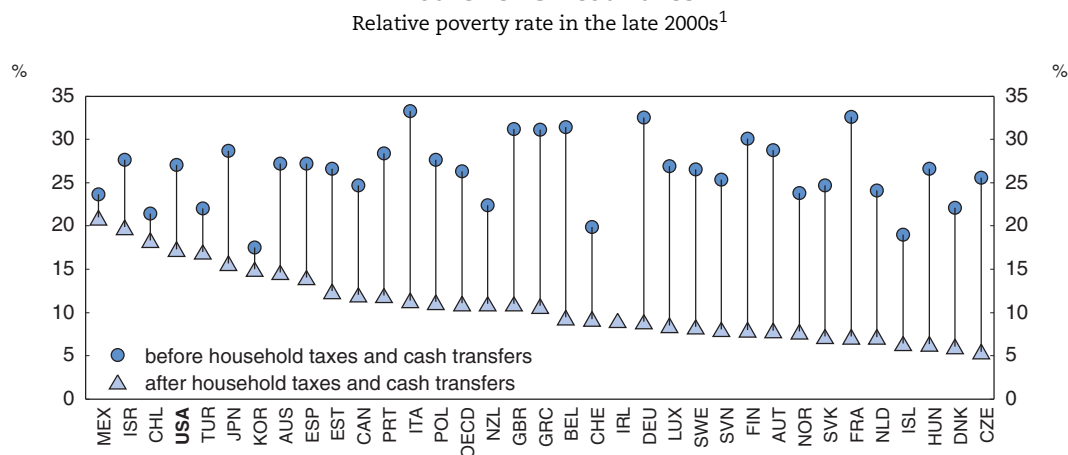
US revenues from the taxation of wealth transfers, *i.e.* gifts, estates and inheritances, have over the past decade continuously fallen and are now close to the OECD average. The United States taxes estates (levied on the donor) rather than inheritances (levied on the recipient). The estate tax is highly progressive relative to income; the top 10% of income earners pay virtually all of the tax and over half is paid by the richest 0.1% (Tax Policy Center, 2008). Its design nonetheless provides for avoidance opportunities by the wealthy. For example, capital gains on bequeathed assets are tax exempt. They should be taxed to avoid undermining the effectiveness of the gift and estate tax and providing undue incentives for old individuals to hold their capital until they die. Citizens also make use of trusts to avoid the estate tax, although wealth transfers to trusts incur gift duties beyond a certain level.

Most OECD countries, in contrast to the United States, tax inheritances rather than estates, and the past several decades have seen a shift away from estate taxes, as for example in Ireland. From the perspective of intergenerational mobility and equality of opportunity, taxing inheritances is preferable to taxing estates since what matters is how much a person receives from others, not how much a person leaves to others, and taxing inheritances would reduce income inequality if implemented in a revenue-neutral way (Batchelder, 2008).

Better targeting and simplifying of transfer programmes would help combat poverty

The government runs a multitude of transfer programmes with the objective of reducing income inequality and poverty. These can be grouped into *social insurance* (old-age and survivors' insurance, disability insurance, workers' compensation, unemployment insurance), *means-tested cash benefits* (Temporary Assistance for Needy Families, Supplemental Security Income, Earned Income Tax Credit) and *means-tested in-kind benefits* (Medicaid, Supplemental Nutritional Assistance Program, Housing Assistance, Head Start, Supplemental Nutrition Program for Women, Infants and Children, school food programmes). While these programmes significantly reduce poverty (e.g. White House, 2012; Ziliak, 2011), they do so less than in other countries: the relative poverty rate after taxes and cash transfers is 17%, one of the highest in the OECD (Figure 14; Pisu, 2012). Accounting for in-kind transfers further reduces poverty, and potentially more so than in other countries given the targeting of Medicaid to low-income individuals.

Figure 14. **The tax-and-transfer system reduces poverty less than in other OECD countries**



1. The relative poverty rate is defined as the share of individuals with equivalised disposable income less than 50% of the median income of the whole population. Data for France, Ireland and the Netherlands refer to the mid-2000s.

Source: OECD, *Income Distribution and Poverty Database* and OECD calculations.

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To combat poverty, the government should restore the inequality-reducing power of the transfer system that has been lost over time (CBO, 2011b). Ben-Shalom *et al.* (2011) find that the safety nets have increasingly tilted towards the disabled and elderly and away from the “deep-poor”. An increased focus on those with low income levels, rather than on specific demographic groups, would help to ensure that the truly needy are reached. As

well, simplifying the myriad of means-tested programmes, of which there are currently 82 distinct ones at the federal level alone (Haskins, 2011), would lower administrative costs and increase take-up, which is often low, reflecting the difficulty of understanding eligibility requirements (Currie, 2006). It would also reduce the scope for fraud and, if implemented smartly, improve work incentives. The United Kingdom, for instance, is in the process of introducing a thoroughgoing welfare reform; it involves combining the UK equivalent of Housing Assistance, Earned Income Tax Credit, Child Tax Credit, unemployment insurance and other welfare programmes into a universal credit (UK Department for Work and Pensions, 2010), with the reform broadly judged as likely to be positive (Institute for Fiscal Studies, 2011).

The United States is unique among OECD countries in relying on in-kind transfers for food and nutrition rather than simple cash transfers. While on the one hand some of these programmes have been shown to reduce poverty (*e.g.* Tiehen *et al.*, 2012), on the other they can restrict the recipient's choice in using the funds for other purposes and are an administratively expensive way of providing benefits.

Box 3. Recommendations to reduce income inequality and combat poverty

Key recommendations:

- Comprehensive education reform should provide more disadvantaged students with valuable skills that would help them to raise their incomes and increase social mobility. States relying heavily on local property taxes to fund public elementary and secondary schools should move to state-level funding to increase the resources and quality of teachers available to socially-disadvantaged students.
- A comprehensive approach to limiting tax expenditures that disproportionately benefit high earners is needed, for instance by limiting the marginal income tax rate at which deductions (such as for charitable donations) may be claimed and exclusions (such as for employer-provided health-insurance cover) permitted to 28%, as proposed in the Administration's FY 2013 budget.
- The unequal tax treatment of income from different asset classes increases inequality in some cases and distorts the allocation of capital. Equalizing the effective tax rates on debt-financed corporate investment and on housing at the higher rate on equity-financed corporate investment while simultaneously lowering the corporate tax rate would reduce income inequality (capital income is highly concentrated in higher-income households and tenants, to whom much of the current relatively high effective taxation on tenancy-occupied housing is shifted, typically have lower incomes than owner occupiers) and improve the efficiency of investment.
- The transfer system reduces poverty among specific groups, but leaves others unreached. An increased focus of eligibility criteria on income level is necessary. Simplifying the myriad of transfer programmes would lower administrative costs and increase take-up.

Other recommendation:

- To effectively pursue the objectives of intergenerational mobility and equality of opportunity, capital gains on bequeathed assets should be taxed at the standard rate and the estate tax should be replaced with an inheritance tax.

Innovation policy

The US innovation system has many strengths but fissures have begun to appear

The strengths of US innovation system include world class research universities, firms that thrive in innovation-intensive sectors such as ICT, biotechnology, energy and agriculture, and a scale of both R&D and market demand for innovative products that is unmatched globally. In addition, the United States has competitive product markets and flexible labour markets, facilitating the reallocation of resources triggered by innovation to more efficient products and processes (creative destruction). However, fissures have begun to appear, as shown by some indicators, and revitalizing the dynamism of innovation has become a priority for US policymakers.

Innovation occurs at the point where knowledge is transformed into valuable new products or processes. While business enterprises or government agencies effect this transformation, it is built upon the flow of new knowledge from universities and research laboratories, most of which is funded by the Federal government. Government influences firms' incentives to innovate through policies that affect framework conditions such as competitiveness of product markets, flexibility of labour markets, development of financial markets, supply of skilled labour, strength of public research capabilities and taxation, most of which also impact government agencies' incentives to innovate. Framework conditions are generally strong in the United States although, as noted above, there are concerns about the supply of skilled labour.

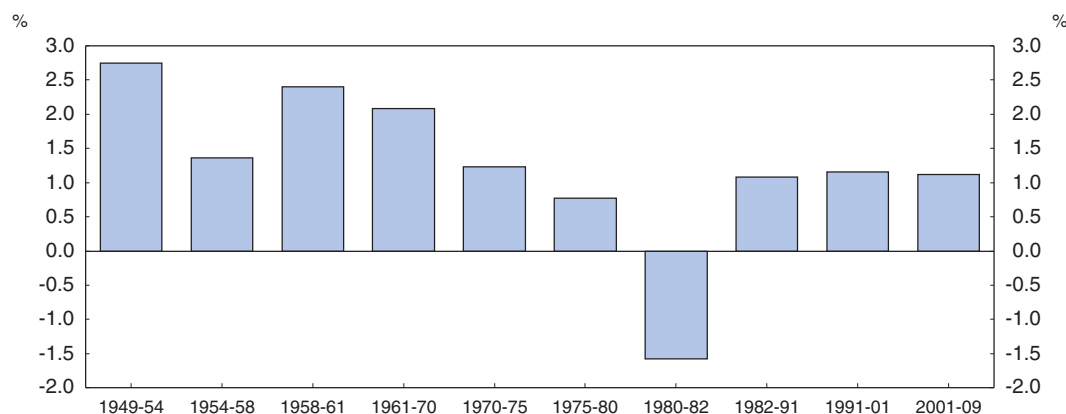
One longstanding approach to measuring innovation performance is to infer it from Multifactor Productivity (MFP) growth (see for example US Department of Commerce, 2012; White House, 2012). Although MFP incorporates many factors, innovation is, nevertheless, arguably the primary source of long-run increases in MFP (Grossman and Helpman, 1991). The decline in MFP growth rates in business cycles (trough-to-trough, as identified by the National Bureau of Economic Research [NBER]) since the 1970s suggests that there has been some long-run deterioration in innovation performance (Figure 15), although MFP growth was higher in the last three business cycles than over 1975-82 and still compares favourably with that in other OECD countries.

A more direct approach to measuring innovation performance is to conduct surveys of innovation outputs. These show that the proportion of US firms that report introducing a new or significantly improved product or process may be around the average for OECD countries (NSF, 2010; OECD, 2010b).

The other main approach to measuring innovation performance is the proxy method, where indicators such as patents or R&D spending are tracked as a proxy for the level or rate of change of innovation, although these measures too are necessarily imperfect (US Department of Commerce, 2012; White House, 2012). Innovation surveys show that firms that invest in R&D are much more likely to innovate than are other firms (NSF, 2010; OECD (2011d). Such measures point to high but stagnating levels of innovation activity, with the result that the United States is slowly slipping down the global rankings (Figure 16).


Government plans to increase federally-funded R&D should be implemented

Federal R&D spending has been increasing in the past decade and was temporarily boosted to 1.2% of GDP by the Recovery Act of 2009, the highest ratio in the OECD. However, such spending will fall sharply if the expenditure reductions mandated by the Budget Control Act of 2011 are implemented. In view of the high social rates of return on R&D and

Figure 15. Multifactor productivity growth has slowed since the 1970s¹

1. Non-farm business sector, annual average growth rate. Periods correspond to business cycles (trough to trough) identified by the National Bureau of Economic Research (NBER).

Source: US Bureau of Labor Statistics and OECD calculations.

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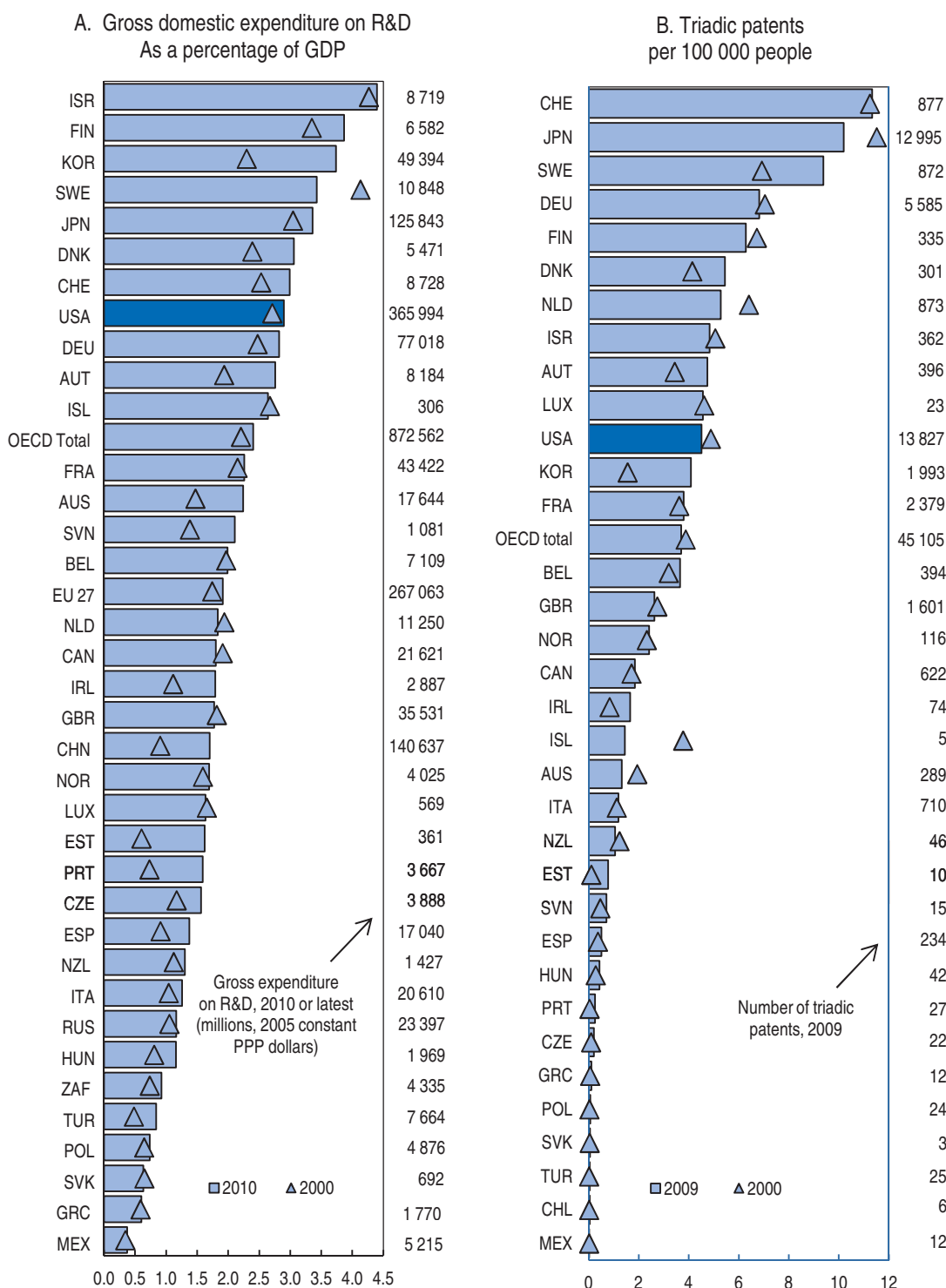
the need for stable funding for R&D to be most productive, reductions in the federal R&D budget should be as limited as possible. It would be preferable to cut non-R&D expenditures (including tax expenditures) for legacy or incumbent sectors, as this would facilitate the flow of resources to more productive uses. Ideally, Congress would go further by appropriating the funds approved in the 2007 America COMPETES Act, which called for doubling the funding of three key basic research agencies – the National Science Foundation (NSF), the Office of Science in the Department of Energy, and the National Institute of Standards and Technology – within a decade. Amongst other benefits, this would help to increase the probability of developing backstop technologies that would reduce future Greenhouse Gas (GHG) emissions abatement costs, although such investments would be more effective if they were complemented by pricing GHG emissions.

Further improving the patent system

Patent protection is one of the main ways in which government encourages innovation. Patents grant time- and scope-limited exclusive rights over the use of a new product or process, rewarding the patent holder and helping to address a possible market failure in the supply of technology and knowledge.

Some of the major concerns about the performance of the US patent system were addressed in the America Invents Act of 2011. In particular, this Act aims to reduce both review times and improve the quality of patents. The US Patent and Trademark Office (USPTO) will offer a new fast track for reviewing certain patents, enjoy additional resources for reducing the backlog of patent applications and improving the quality of patent awards, and provide new procedures for challenging patent validity that may allow patent disputes to be resolved more quickly and at lower cost (US Department of Commerce, 2012). The Act also replaces the “first to invent” rule by a “first to file” rule, which is more in line with international practice. At the same time, unlike many other jurisdictions, US law retains a 12-month grace period that gives patent priority to the first inventor to publish within a

Figure 16. **R&D spending and patent activity are slipping in global rankings but remain high¹**



1. In panel A, 2001 and 2010 for Sweden, Denmark and Norway, 2000 and 2009 for Japan, USA, China and OECD total, 2000 and 2008 for Australia, Iceland and Switzerland, 2001 and 2007 for Greece, 2000 and 2007 for Mexico and 2001 and 2008 for South Africa.

Source: OECD, Main Science and Technology Indicators Database.

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year prior to filing. This grace period may promote earlier disclosure of new scientific knowledge, helping to foster a more rapid rate of cumulative innovation.

A number of observers have expressed concern that patent policy and law do not adequately address the challenges posed by complex technologies, as was evident in the inter-industry debate over patent reform. While it is important to support the ability of patent holders to enforce their rights in a meaningful way, policy should work to minimise distortions created by hold-up opportunities and high litigation costs. In complex technologies, which are characteristic of the information and communications technology (ICT) sector, a patent holder may be able to demand disproportionate licensing fees from a producing firm using a minor patented function within a rich and sophisticated product because of the possibility of a court order forcing the entire product off the market. The growing activities of patent assertion entities (firms that hold patent rights, but licence them rather than using them to produce products) remain largely confined to the ICT sector, where patent holders can assert leverage over complex products by seeking injunctions (sometimes forcing products off the market) or damages. The calculation of appropriate damages for infringement is a hotly contested but unresolved issue in the patent reform debate, although US courts have been taking steps in an appropriate direction, such as rejecting a 25% rule-of-thumb royalty rule.

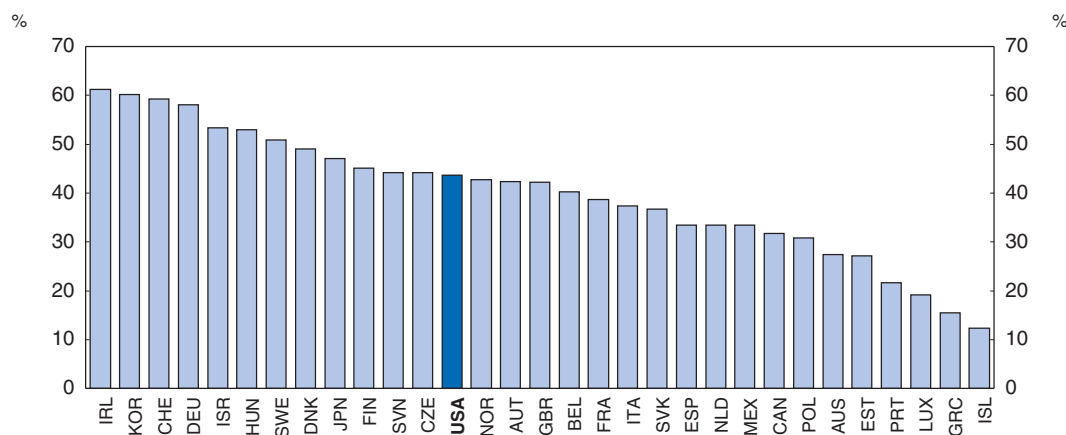
The availability of injunctions was limited by the Supreme Court (in its *eBay* decision), so patent holders now turn to the International Trade Commission (ITC) to seek exclusionary orders that prohibit importation of infringing products. This is a powerful weapon for ICT products because most of them are imported. This has led to costly dual proceedings as patent holders both sue in court for damages and seek exclusionary orders from the ITC.

In line with the Federal Trade Commission's (FTC) recent analysis (Federal Trade Commission, 2011), damages awarded for patent infringement should reflect the relative contribution of the patented function relative to the product as a whole based on what a willing licensee would have paid had they known about the patent ahead of time. While there is evidence that the courts may be moving to more rigorous assessment of damages, there remains a long way to go to get a consistent standard. Meanwhile, non-producing patent assertion entities retain considerable ability to hold up producing companies, while at the same time having no exposure to the patents that producing companies have in their arsenals. This has recently led large producing companies to spin off portions of their portfolios to patent assertion entities that can maximise payoffs from the patents and raise rivals' costs. The net effect is to impose growing costs and risks on companies engaged in innovation.

Strengthening innovation in manufacturing

The manufacturing sector has steadily shrunk as a share of GDP over recent decades, as in most other OECD countries. This is of concern from an innovation perspective because the sector accounts for 70% of privately funded business R&D and a significant proportion of business R&D performed in other sectors is done in close collaboration with or in direct service of manufacturing. This role is likely to be most important for high and medium-high tech sectors, which in the United States account for a middle-ranking share of manufacturing value added in comparison with other OECD countries (Figure 17).

Figure 17. The share of high- and medium-to-high tech manufacturing in total manufacturing value added in the United States ranks around the middle of OECD countries' shares (2009)



Note: Data for Germany, Switzerland, Israel and France refer to 2008. Data for Norway, The United Kingdom and Poland refer to 2007. Data for Portugal refer to 2006. Data for Australia refer to 2005.

Source: OECD, STAN Database, 2012.

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Economic studies show that there are agglomeration- (Greenstone, Hornbeck and Moretti, 2008) and knowledge (Keller, 2010; Branstetter, 2001) spillover benefits from manufacturing activity that benefit locations that have such activity. In light of these spillovers, measures to promote innovation in manufacturing are warranted, such as those proposed by the Administration in the FY 2013 budget. They include making the Research and Experimentation (R&E) tax credit permanent and less complicated, investing in transport infrastructure, creating a fund for community colleges to partner with businesses to train workers in a range of high-growth areas like advanced manufacturing, increasing financial support for basic research relevant to advanced manufacturing and creating a network of manufacturing institutes to facilitate the transfer of new technology from invention to product development to manufacturing at scale.

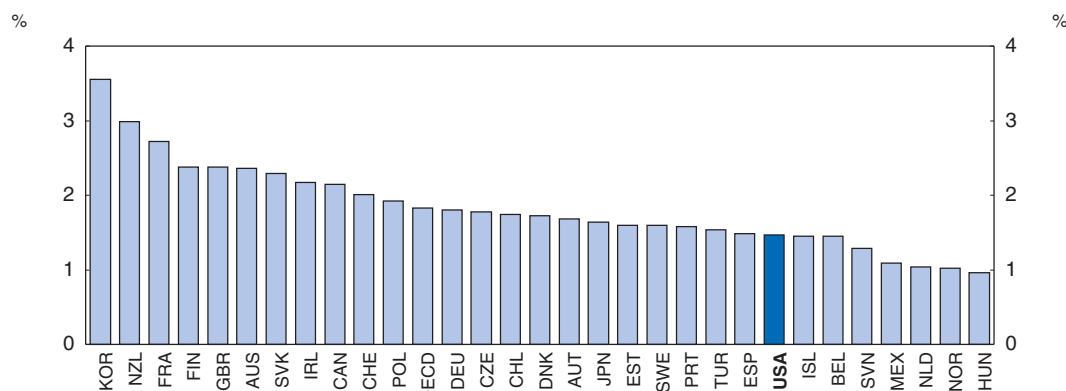
Reducing barriers to graduating in STEM disciplines and to immigration of STEM qualified personnel

STEM graduates are a key input to innovation. However, they represent a relatively low share of persons aged 25-34 years in employment in the United States (Figure 18). Moreover, below the PhD level the share of STEM in total graduations has not increased over the past decade (Table 4), despite wage data pointing to persistent, and at lower qualification levels, worsening shortages of STEM workers (Figure 19).

Many students enter college intending to major in a STEM field but fewer than 40% of these students complete a STEM degree (President's Council of Advisors on Science and Technology, 2012). A major problem is that many students are not well prepared for STEM tertiary studies (OECD, 2009b). The Administration has launched a variety of initiatives to improve secondary-school student achievement in STEM fields. They focus on improving science and mathematics teachers' subject knowledge, pedagogical skills and compensation, as well as their evaluation and professional development. Efforts should also be made to increase female achievement, which lags further behind male achievement in these subjects than in most other countries (OECD, 2009b), and

Figure 18. **The number of STEM graduates in relation to total employment of persons aged 25-34 is relatively low in the United States (2009)¹**

Number of graduates (science and engineering) divided by the total number of 25-34 year-olds in employment, per cent



Note: Science-related fields include life sciences, physical sciences; mathematics and statistics, computing, engineering and engineering trades, manufacturing and processing, architecture and building.

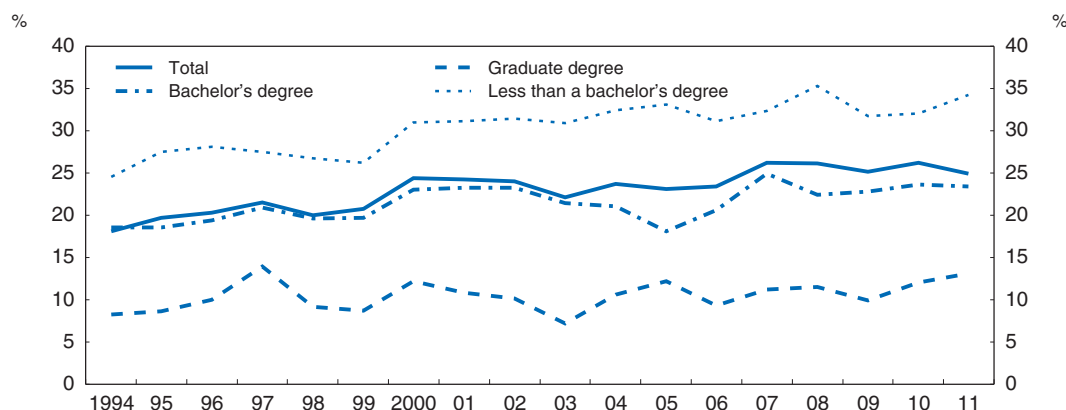
1. Data for Australia and Canada refer to 2008.

Source: OECD, *Education at a Glance 2011*.

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Figure 19. **STEM workers receive a significant earnings premium over other workers with the same level of education¹**

Private wage and salary workers aged 25 and over



1. Regression-based hourly earnings premiums for STEM workers over non-STEM workers with the same level of education, 1994-2010. These earnings regressions (log earnings is the dependent variable) control for age (up to a fourth degree polynomial of age), gender, marital status, race and Hispanic origin, nativity and citizenship, educational attainment, metropolitan area, region, union representation, major industry, STEM occupation, time, and STEM occupation interacted with time (Langdon et al., 2011). The regressions use Current Population Survey public use micro-data files of annual merged outgoing rotation groups from the National Bureau of Economic Research for 1994-2010.

Source: Langdon et al. (2011).

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achievement of other under-represented groups (Cook and Kongcharoen, 2010). This would help to narrow gaps in STEM graduation rates and hence, increase the supply of STEM graduates and workers in STEM fields.

State governments should also encourage tertiary institutions to take measures to increase STEM completion rates. They should take greater responsibility for bringing first-

Table 4. **STEM degrees have grown more slowly than non-STEM degrees, except at the doctoral level**

	2000-09 Percentage		STEM share of all degrees	
	Annual average growth rate		2000	2009
	STEM ¹	non-STEM		
Doctoral				
All citizenships	5.7	1.5	62.0	66.6
Males	3.5	0.5	67.9	71.3
Females	9.5	2.5	54.5	62.0
US citizen/permanent resident	5.9	1.2	56.9	61.6
Males	3.1	-0.1	61.5	64.3
Females	9.9	1.9	52.0	59.5
Master's				
All	3.0	4.0	21.0	20.0
Males	3.4	3.6	28.3	27.9
Females	3.4	4.7	15.6	15.2
Bachelor's				
All	2.0	3.1	31.8	31.2
Males	2.2	3.1	36.9	36.3
Females	1.8	3.0	28.0	27.5
Associate's²				
All	2.9	3.8	5.4	5.0
Males	5.3	2.8	7.8	9.5
Female	-1.5	4.3	3.8	2.3

1. Excludes social scientists.

2. Associate's degrees are the degrees earned from two-year programmes offered by community colleges.

Source: National Science Foundation (2012), *Science and Engineering Indicators*; OECD Secretariat calculations.

year students up to the required level. To this end, remedial programmes need to be made more effective (Complete College America, 2011). For engineering, where some 50% of freshmen do not complete the programme, universities should consider introducing an intermediate year so that only students likely to be able to cope are accepted into engineering schools. Moreover, engineering programmes should include more applied content and teamwork in the early years as this has been shown to increase completion rates.

Action also should be taken to make it easier for graduates of US STEM programmes to gain permanent residence, which would expand the pool of highly skilled talent needed for innovation. At the PhD level, one third of STEM graduates are not US citizens or permanent residents (rising to almost 60% in engineering) (National Science Foundation, 2012). Most of these students plan to stay in the United States after graduating. Yet, they often encounter considerable difficulties as few visas are available per capita for citizens of large countries. The share of US visas that are employment based should be increased and the limits per country should be removed.

Encourage entrepreneurship and firm start-ups

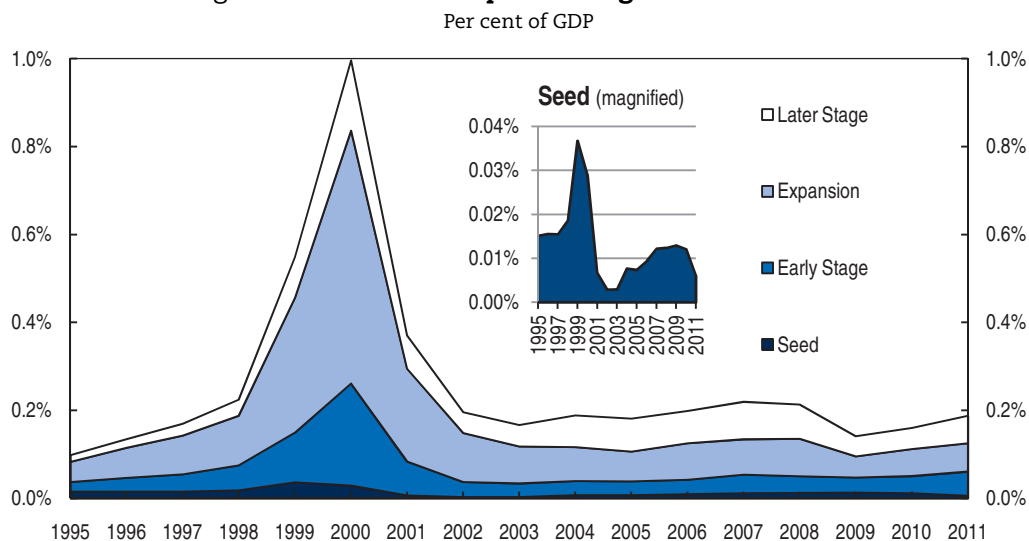
The rate of new business start-ups has been declining over the past two and a half decades, resulting in fewer would-be entrepreneurs turning new ideas into new businesses (US Department of Commerce, 2012). One factor that may have contributed to this trend is that access to the seed/start-up capital on which innovation-based entrepreneurial firms

depend has diminished (Figure 20). Following the “dot-com” bust of a decade ago, and reinforced by the economic downturn of the past three years, a greater share of high-risk capital is invested in later stage of development innovative firms, which tend to be less risky than start-ups, than before.

A variety of approaches to alleviate these pressures are being publicly discussed and, in some cases, implemented. These include: federal R&D agencies financing very early-stage companies through add-ons to existing grants to support taking spin-offs to market; creation of a new federal programme to provide competitive funding to support proof-of-concept research at universities; “crowd funding”, under which entrepreneurs with ideas seeking financing use the Internet to advertise their ideas and to seek investments in small amounts from many small investors, as authorized in the Jumpstart Our Business Startups (JOBS) Act; and providing matching funds and various forms of non-financial assistance to entrepreneurs with good ideas that are worthy of financing but are at too early a stage, and therefore, too risky to attract private capital. Following careful analysis and evaluation, the federal government should implement the most promising of these approaches.

These proposals fall within the scope of the Startup America initiative launched by the Administration in 2011 to improve the environment for high-growth entrepreneurship. They would usefully be complemented by the other main aspects of this initiative: creating mentorship and educational opportunities for entrepreneurs; reducing regulatory barriers; and driving a nationwide effort to engage potential new opportunities in industries like healthcare, clean energy, and learning technologies (US Department of Commerce, 2012).

Figure 20. **Seed/start-up financing has diminished**




Notes: Seed/Start-up stage: the initial stage. The company has a concept or product under development, but is probably not fully operational. Usually in existence less than 18 months.

Early stage: The company has a product or service in testing or pilot production. In some cases, the product may be commercially available. May or may not be generating revenues. Usually in business less than three years.

Expansion stage: Product or service is in production and commercially available. The company demonstrates significant revenue growth, but may or may not be showing a profit. Usually in business more than three years.

Later stage: Product or service is widely available. Company is generating on-going revenue; probably positive cash flow. More likely to be, but not necessarily profitable. May include spin-offs of operating divisions of existing private companies and established private companies.

Source: PricewaterhouseCoopers/National Venture Capital Association MoneyTree™ Report, Data: Thomson Reuters.

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The federal government also runs a number of programmes to promote high-growth potential entrepreneurship at the regional level, including through the development of innovation clusters.

Entrepreneurial activity could be further enhanced by limiting clauses in employment contracts that expressly prohibit individuals from competing with their former employers. Stricter enforcement of such contracts is associated with lower rates of entrepreneurial start-ups, innovation and employment growth (Samila and Sorenson, 2011; Marx *et al.*, 2010).

Building a better social safety net would also encourage firm start-ups by reducing the potential costs of failure for entrepreneurs and their families. The Health Care Act of 2010 makes an important contribution to improving the safety net for entrepreneurs and making small firms more attractive to work for by reducing the costs of individual or small group policies. Similarly, the reforms proposed in the FY 2013 budget to encourage small firms to offer qualified employee retirement plans for the first time will help to make working for small firms more attractive.

Establish a national innovation agency to recognize that innovation is a national priority

In contrast to other advanced economies, the United States does not have an agency responsible for national innovation policy. Instead, innovation policy (or strategy) is developed by the White House. While there have been institutions to provide line agency support for technology policy, such as the former Office of Technology Policy, they have lacked the scale and stature needed to sustain a disciplined evidence-based focus on innovation policy and strategy. At the very least, there should be permanent capacity to address the changing technological, market, and geopolitical environment, *i.e.*, expertise and institutional memory that carries forward from each Administration and Congress to the next. This resource would serve as a point of coordination for other agencies' activities and as a regular interface with experts in the private sector, state and local governments, think-tanks, academia, and other national governments.

Box 4. Recommendations for strengthening innovation

Key recommendations:

- Given the importance of R&D for innovation and economic growth, reductions in the federal R&D budget should be as limited as possible. Ideally, funds would be appropriated to continue on the path approved in the 2007 America COMPETES Act of doubling the budgets for three key science agencies within a decade.
- Patent reform (America Invents Act) needs to be taken further by ensuring that the legal standards for granting injunctive relief and damages awards for patent infringement reflect realistic business practices and the relative contributions of patented components of complex products.
- Tertiary education attainment in STEM fields needs to be increased. An important step in doing so is improving access to quality secondary education so that students are better prepared for STEM tertiary studies.

Box 4. Recommendations for strengthening innovation (cont.)

Other recommendations:

- Implement the measures proposed by the Administration to strengthen manufacturing competitiveness, including lowering corporate tax rates and discouraging corporations from shifting profits offshore, making the R&E tax credit permanent and less complicated and creating a network of manufacturing institutes to facilitate knowledge transfers.
- Encourage universities to take measures to increase STEM degree completion rates by improving remedial programmes and mentoring especially women and other under-represented groups, and in engineering, also by including more applied and team work in the early years.
- To increase the retention rate of foreign STEM PhD graduates, the share of visas that are employment based should be increased and restrictions on country of origin removed.
- Encourage innovation-based entrepreneurship by increasing access to capital that supports young firms and by limiting non-compete covenants in employment contracts.
- Establish a national innovation office to increase coherence and continuity in implementation of the national innovation strategy.

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ANNEX A1

Progress in structural reform

This annex summarises recommendations made in previous Surveys and action taken since the last Survey was finalised in July 2010.

Recommendations	Action taken since the previous Survey (September 2010)
A. LABOUR MARKETS	
The Earned Income Tax Credit (EITC) should be increased.	The temporary expansions in EITC that were passed in the American Recovery and Reinvestment Act of 2009 (ARRA) have been prolonged by the Tax Relief, Unemployment Insurance Authorization and Job Creation Act until the end of 2012.
Implement strategies to increase employment of the disabled.	No action.
Provide additional support for job training and education for unemployed workers whose skills have deteriorated.	The Recovery Act (ARRA) of 2009 included additional funds for states to expand the services provided by One-Stop career centers. The Recovery Act also expanded the coverage of the Trade Adjustment Assistance (TAA) programme to workers whose jobs were moved overseas to any country. In 2011, the TAA was reauthorized through December 2013. The Middle Class Tax Relief and Job Creation Act of 2012 was signed into law in February 2012 and requires all people receiving emergency unemployment benefits to participate in skills assessments and receive job counselling. The Act also allows states to apply for waivers that will allow them to temporarily divert UI funds to create wage subsidy programmes. Many other planned measures have been introduced, but not implemented, as part of the American Jobs Act and the Administration's FY 2013 budget plan. Most importantly, the Universal Dislocated Worker Program was proposed. This program would replace the existing WIA Dislocated Worker and Trade Adjustment Assistance programs and, according to the US Department of Labor, represents USD 28 billion of new spending on workforce development initiatives. Other proposals include: 1) Pathways Back to Work Fund, to help create jobs for low-income and unemployed youth and adults; and 2) the Community College to Career Fund.
Monitor whether guidelines for labour market programmes are being followed	No action.
Return the duration of unemployment benefits to pre-recession levels as the labour market improves.	Current extensions of unemployment benefits are being gradually reduced in 2012 and are scheduled to expire altogether in 2013.
B. EDUCATION	
The No Child Left behind (NCLB) framework of standards, assessment and accountability should be extended through upper secondary education.	The Race to the Top Fund provides competitive grants to reward and encourage states that have taken strong measures to improve teacher quality, develop meaningful incentives, incorporate data into decision-making, and raise student achievement in low-achievement schools. Almost all states have adopted common standards for English and mathematics.

Recommendations	Action taken since the previous Survey (September 2010)
Greatly raise limits on Stafford loans, especially for unsubsidised direct loans, so that they cover the full cost of study. The interest rate on these loans should vary with the long-term bond rate. The default repayment plan should be income-contingent.	The limits have not been increased since July 2008. Interest rates on subsidised loans (for undergraduate students) may increase from 3.4% in 2011/12 to 6.8% in 2012/13 but may remain unchanged at 6.8% on unsubsidised loans. Income-contingent loans are offered by the US Department of Education only, not from banks or other private institutions making government-guaranteed loans through the Federal Family Education Loan (FFEL) Program.
Simplify or abolish tax preferences for higher education expenses.	No action.
C. HEALTH CARE	
Reform the individual and small-group market to facilitate greater risk pooling. To this end, require community-rated and guaranteed issue policies and make health insurance compulsory. Introduce means-tested subsidies to help low-income persons afford health insurance.	These were key features of the Affordable Care Act of 2010. These reforms have not yet come into effect and may not do so in their current form if the Supreme Court finds that the requirement to buy health insurance is not constitutional.
Replace the health tax exclusion (<i>i.e.</i> , the exclusion from taxable personal income and payroll tax of compensation paid in the form of health insurance cover) with more efficient subsidies that are independent of the health plan (subject to minimum standards of coverage being satisfied).	The Affordable Care Act includes an excise tax that will be levied on high cost plans from 2018. It would have been preferable, however, for the limit for this tax to be adjusted for regional and individual factors that affect plan costs. The FY 2013 budget proposes to limit the marginal tax rate applicable for the exclusion to 28%.
Roll out Medicare provider-payment reforms that prove to be successful in pilot tests across the programme, as planned.	The pilot tests have not yet been completed.
Enhance the dissemination of information on the effectiveness and cost of treatments and procedures.	ARRA and the Affordable Care Act included funding for comparative effectiveness research (which compares the efficacy of treatments). The funding has been provided on the condition that such research never deals with economic issues. The <i>Patient Centered Outcome Research Institute</i> has been created to carry out such research.
Gradually lower Medicare Advantage payments to the level of traditional fee-for-service Medicare plans.	The Affordable Care Act lowers excess payments for Medicare advantage plans.
Decrease the generosity of supplemental Medicare insurance designs for beneficiaries without chronic conditions to reduce moral hazard risks.	No action.
Ensure that prescription drug benefits do not jeopardise Medicare's long-run solvency.	The comparative effectiveness pilot study provided for in the Affordable Care Act could reduce pharmaceutical costs if successful and rolled out nationally by helping to determine the prices to pay for new drugs. However, the Act added to Medicare prescription drug benefit costs by providing USD 250 rebates to beneficiaries who reach the coverage gap (also known as the donut hole) between the basic coverage limit and catastrophic coverage.
Do not delay further the use competitive tenders for Medicare purchases of medical equipment and supplies.	No action.
D. AGEING	
Speed up the phased increase in the official retirement age (at which full social security benefits are paid) from 65 to 67. Link the retirement age to active life expectancy thereafter such that the ratio of the expected duration of active retirement to working life remains constant.	No action.
Reduce the replacement rate for higher earners and raise the Social Security tax cap.	No action.
E. PRODUCT MARKETS	
Improve energy infrastructure, in particular electricity transmission.	The electricity network is being upgraded, in particular to facilitate the use of renewable electricity, with funds from ARRA.
Roll back extra support given to farmers in recent years.	Tariffs on sugarcane-based ethanol and ethanol subsidies lapsed at the end of 2011. Otherwise, no action has been taken.

Recommendations	Action taken since the previous Survey (September 2010)
F. FINANCIAL MARKETS	
Subject systematically important financial institutions to strict and conservative prudential standards. These institutions should hold capital against off-balance sheet risks and be subject to counter-cyclical capital requirements.	Capital adequacy ratios are being revised in co-ordination with the Basel Committee on Banking Supervision. These ratios are likely to be increased, account for off-balance sheet exposures, and to include counter-cyclical adjustments.
Leave the securitisation of mortgages to the private sector. This would entail privatising the Government Sponsored Enterprises, cutting off their access to preferential lending facilities with the federal government, subjecting them to the same regulation and supervision as other issuers of mortgage-backed securities, and dividing these entities into smaller companies that are not too big to fail.	Fannie Mae and Freddie Mac remain under government stewardship.
Reduce legal impediments to voluntary mortgage restructuring.	The various programmes to encourage mortgage restructuring that have been initiated (HARP, HAMP) have had disappointing take-up rates, reflecting complicated procedures and restrictive eligibility requirements.
G. TAXATION	
Reduce deductions for mortgage interest and state and local income tax.	The Administration has proposed in the FY 2013 budget to reduce the rate at which high-income earners (married couples with incomes of over USD 250 000 per year and singles with incomes exceeding USD 200 000 per year) can claim tax deductions or exclusions to 28%.
Increase reliance on consumption taxation and consider the introduction of a value added tax.	No action.
H. ENVIRONMENT	
Implement comprehensive pricing of Greenhouse Gas (GHG) emissions.	No action has been taken since the Senate failed to pass legislation authorizing a cap-and-trade system for domestic GHG emissions.
Support multilateral actions to strengthen emissions monitoring in developing countries and work with other countries to ensure that a large supply of genuine offsets is available. Work with other countries to harmonise cap-and-trade programmes so that they can eventually be linked.	A number of multilateral activities have been undertaken to promote enhanced GHG emissions monitoring and reporting in developing countries' energy and land-use sectors, including through strengthened national greenhouse gas inventories, facility-level monitoring and reporting, and capacity building for market and results-based instruments.
Remove import barriers against sugarcane-based ethanol and eliminate subsidies for domestic producers of corn-based ethanol.	The import tariff on sugarcane-based ethanol and domestic subsidies for corn-based ethanol expired at the end of 2011.
In the event that it is not possible to pass legislation pricing GHG emissions, reduce emissions using the next most cost-effective instruments available, such as energy taxes and regulation.	The United States Environmental Protection Agency (EPA) has introduced regulations limiting GHG emissions from new vehicles, including passenger vehicles as well as medium- and heavy-duty trucks, and has proposed regulations to limit carbon dioxide emissions from new power stations to 1 000 pounds CO ₂ /MWh, in line with the emissions of natural gas combined-cycle generation, and below that of coal-fired generation without carbon capture and storage.

Chapter 1

Labour market policies

Although job creation has improved, the effects of the recession on the labour market remain severe. Unemployment duration is still extremely high, and many have withdrawn from the labour market altogether. Because the weakness is largely cyclical in nature, policy makers should place a high priority on supporting aggregate demand in the short term. Even so, policies are needed to help individuals return to work, as there is a risk that high long-term unemployment and weak labour market participation could evolve into structural problems. Greater emphasis should be put on activation measures that help individuals search for jobs more effectively or find adequate training programmes. In the longer run, education and training are key to raising the skills and wages of the workforce. In this regard, educational reforms are needed to increase student achievement at all levels. High-quality vocational training can also be used to advance the skills of high-school graduates. College completion rates could be improved by reducing financial and other barriers to education, and enhancing the community college system would be a cost-effective way to provide more individuals with an affordable way to obtain tertiary education. Disability insurance reforms are needed to reduce dependency on these programmes and encourage participation in the workforce.

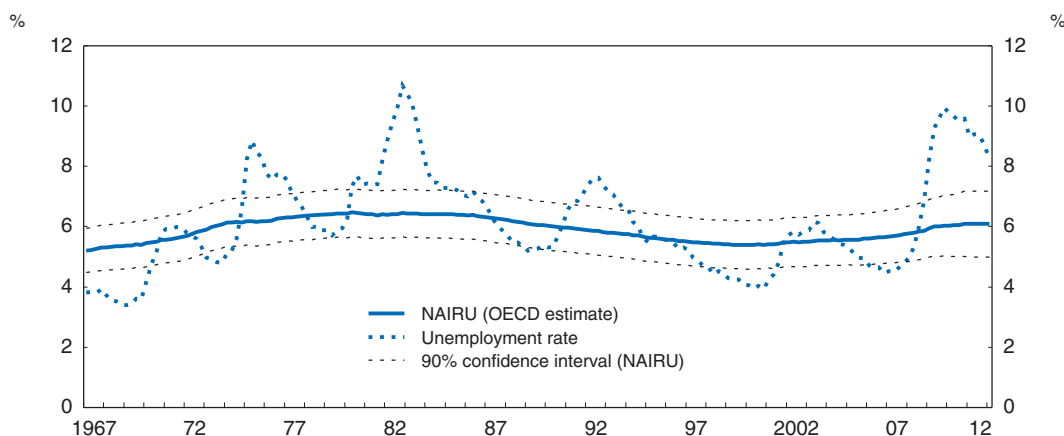
The labour market has strengthened since early 2011, with increased job creation helping to reduce the number of job seekers. Nevertheless, the employment situation has not yet normalised. This chapter first describes labour market developments since the 2008-09 recession and how the current experience compares with historical episodes in the United States and in other OECD countries. The next section documents the sharp rise in unemployment duration, a development that is atypical for the United States. Although the labour market weakness is judged to be largely cyclical in nature and is therefore expected to wane as the economy recovers, the risk is that long-term unemployment could evolve into chronic problems that persist even after aggregate demand has fully recovered. The next section presents several policy recommendations to support job creation in the short term and help individuals return to work. Within this context, the experience of other OECD countries is presented, particularly as it relates to the use of active labour market programmes. Turning to an examination of long-run developments, the chapter describes another worrisome pattern, the decades-long stagnation in real earnings for much of the population. The final sections outline a variety of approaches to address these issues, with an emphasis on measures to promote growth in human capital and encourage participation.

US unemployment is largely cyclical

The US labour market was hard hit by the Great Recession. The unemployment rate shot up from its pre-crisis level of 4.4% to a high of almost 10% in the fourth quarter of 2009 (Figure 1.1). With aggregate demand growth extremely sluggish in the nearly three years since the peak was recorded, the normalisation of labour market conditions has been a slow process; the current episode marks the first time since the Great Depression that the US unemployment rate has been above 8% for more than two years. Although the recovery in private-sector job creation thus far has been substantial, the OECD estimates that the non-accelerating inflation rate of unemployment (NAIRU) has increased slightly, to around 6%, and that cyclical unemployment is still more than 2% of the labour force. However, structural unemployment could already have risen more than this estimate would suggest, and there is a risk that it could increase still further given the high levels of long-term unemployment.

Furthermore, the headline measure of unemployment does not incorporate the fact that ongoing weakness in labour demand has led some individuals to give up their job search and exit the labour force. Labour market participation in the United States typically exhibits a moderate degree of cyclicality (Aaronson *et al.*, 2006a), yet it has edged down further thus far in the recovery (Van Zandweghe, 2012). Alternative measures of unemployment that include discouraged workers and those marginally attached to the workforce thus provide a broader depiction of the weak situation of the labour market (Figure 1.2).

As is now well known, the contraction in output and employment during the recession was large in relation to most earlier US cycles, and the recovery in activity has been more

Figure 1.1. **The unemployment rate has fallen substantially but is still high**

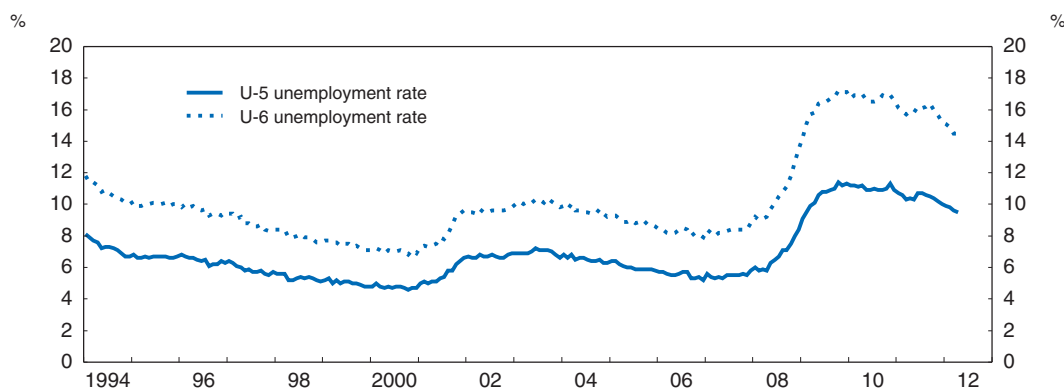
Note: More information about the NAIUR can be found in Guichard and Rusticelli (2011).

Source: OECD, OECD Economic Outlook 91 and Analytical Database and OECD calculations.

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Figure 1.2. **Broader measures of labour inactivity show additional weakness**


U-5 and U-6 unemployment rates^{1, 2}



1. U-5 Total unemployed, plus discouraged workers, plus all other persons marginally attached to the labour force, as a per cent of the civilian labour force plus all persons marginally attached to the labour force.

2. U-6 Total unemployed, plus all persons marginally attached to the labour force, plus total employed part time for economic reasons, as a per cent of the civilian labour force plus all persons marginally attached to the labour force.

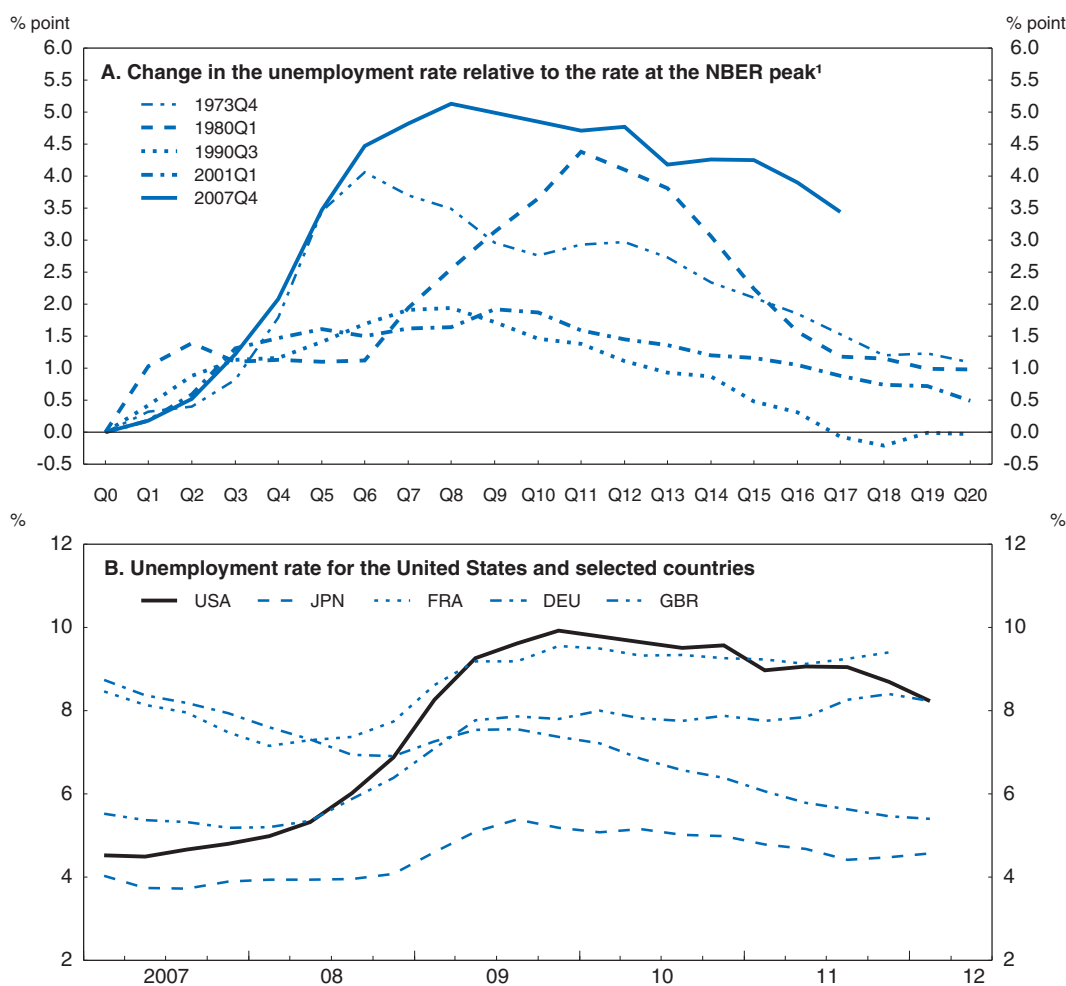
Source: US Bureau of Labor Statistics, Current Population Survey 2012.

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protracted than in most earlier episodes (Figure 1.3, Panel A). The impact of the financial crisis on the US unemployment rate was also large from an international perspective (Figure 1.3, Panel B). In the major European countries, relatively strong employment protection laws prevented businesses from shedding employment as sharply as businesses in the United States, and governments encouraged firms to keep workers on the job through various incentive schemes. As a result, productivity in these countries fell over the recession, while employment declined relatively little. Participation rates also held up better in these countries than in the United States.

Indeed, even with the significant improvement in aggregate employment during the recovery to date, unemployment rates for certain sub-groups of the US population have

Figure 1.3. Unemployment has fallen more slowly than in previous recoveries



1. Based on NBER-defined recession dates. Peak in 1981 Q3 not shown separately.

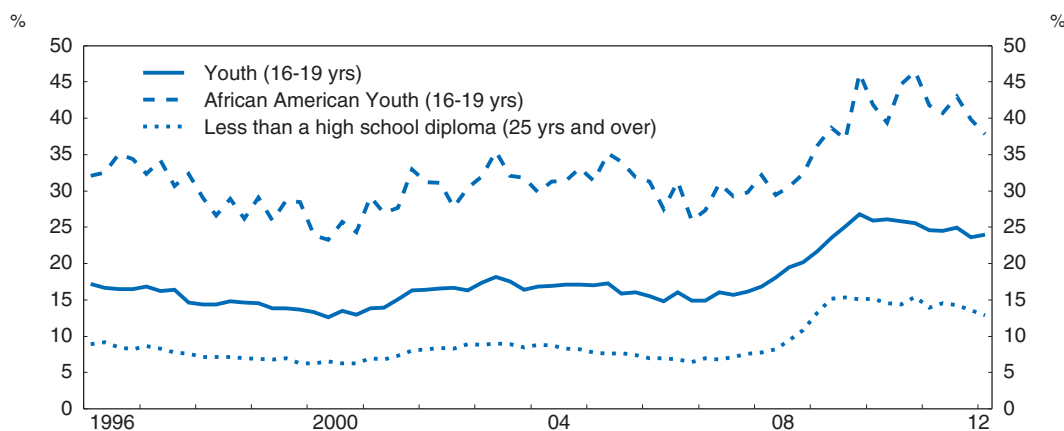
Source: OECD, Analytical Database.

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remained extremely high (Figure 1.4). In March 2012, the unemployment rate for those without a high-school diploma was nearly 13%, the rate for youth (aged 16 to 19) was 25%, and the jobless rate for African American youth was still close to 40%.

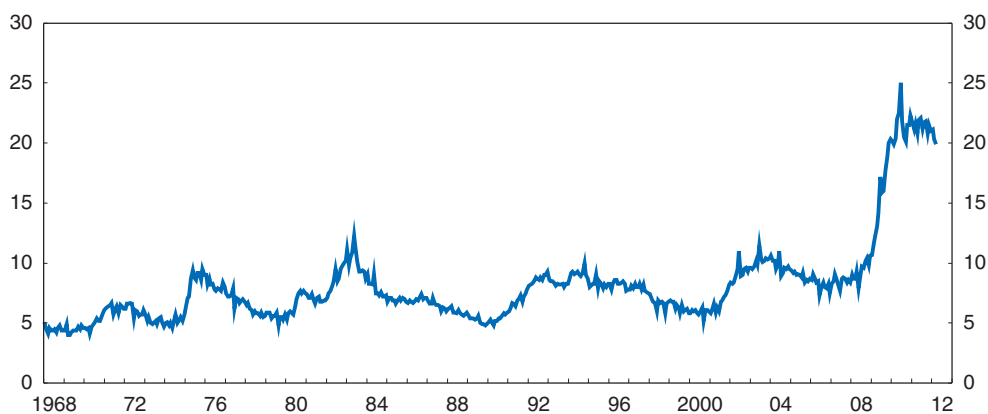
Another development in recent years that is unusual for the United States is the dramatic rise in the duration of unemployment (Figure 1.5). From 2003 to 2007, prior to the onset of the crisis, the median duration of periods of unemployment reported in the BLS survey of households was about 9 weeks. By early 2010, this figure had risen to almost 26 weeks, though since then it has edged down to around 20 weeks.

Although the rise in unemployment duration over this period can be attributed largely to the severe contraction in aggregate activity and the attendant effects on labour demand, other factors have also contributed to the increase. As documented by Aaronson *et al.* (2010), the gradual shift in the composition of the workforce toward older workers has pushed up unemployment duration by a small amount. Young people tend to experience comparatively short unemployment spells because they move into and out of the labour


Figure 1.4. **Unemployment rates for some groups are still extremely high**

Source: US Bureau of Labor Statistics, Current Population Survey 2012.

StatLink  <http://dx.doi.org/10.1787/888932638260>

Figure 1.5. **The duration of unemployment duration has risen dramatically**
In median weeks

Source: US Bureau of Labor Statistics, Current Population Database Survey 2012.

StatLink  <http://dx.doi.org/10.1787/888932638279>

force more frequently than older individuals, and older workers who lose their jobs typically take longer to find a new job than do younger workers.

Some critics of the recent extensions to unemployment insurance (UI) benefits have argued that, by raising recipients' reservation wages, UI benefits might push down labour supply and thus contribute to a higher duration of unemployment. But one must also consider that, in the absence of UI benefits, many of those who are unable to find work might have given up searching and dropped out of the labour force altogether. By encouraging continued job search activity, UI benefits therefore may actually raise the re-employment prospects of displaced workers. Supporting this view, Krueger and Mueller (2011) find that that increased time spent on job search is associated with faster exits from UI benefit dependency. Indeed, given the especially weak labour demand conditions in the

current episode, the positive effects of encouraging labour supply are likely to be larger than usual.

Some economists have theorized that the unusually sharp rise in unemployment duration over the Great Recession may be, in part, a consequence of the burst in the housing market bubble, which led to a rise in mismatches between labour supply and demand (e.g. Estevão and Tsounta, 2011). A popular argument in this vein is that the housing boom diverted an unusually large number of workers into construction-related jobs, and these jobs call for a set of skills that are not easily transferable to other careers. With construction activity severely reduced for an extended period, there may exist an unusually large pool of workers whose skills are not well suited for the existing job openings.

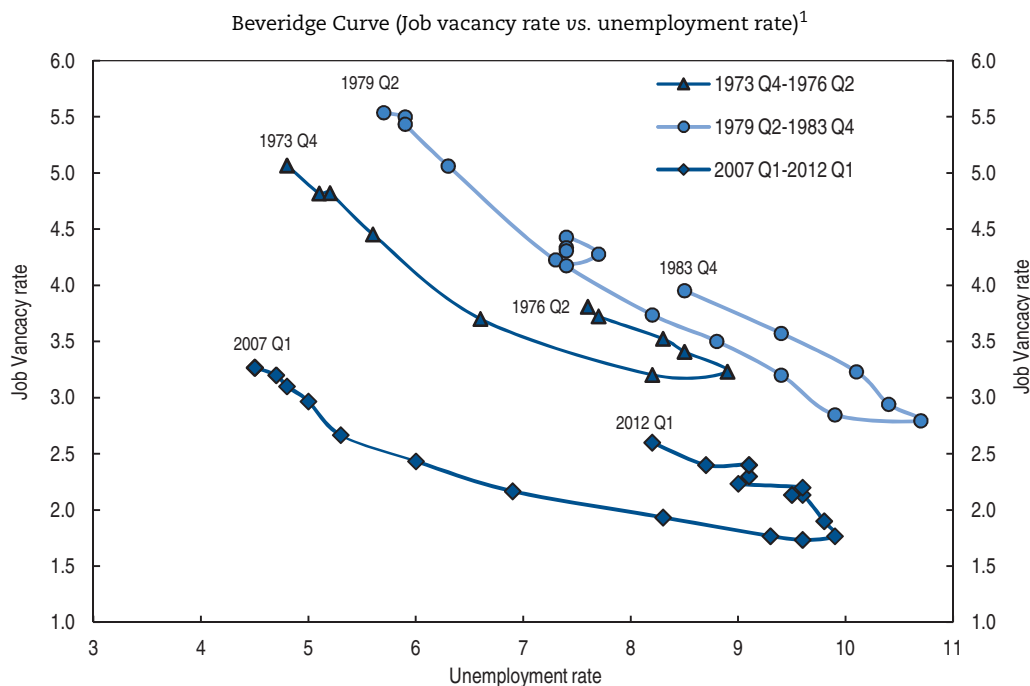
Others have argued that the housing market downturn may have led to labour matching problems by constraining the mobility of home owners, who are unable to relocate to where there are job openings or higher wages because they have negative home equity, or because they anticipate serious difficulties in selling their current home (Chan, 2001; Karahan and Ree, 2011). Given the severe contraction in the housing market, the potential magnitude of this problem is significant. Estimates from Corelogic indicate that roughly a quarter of the 50 million residential mortgages in the United States are currently “under water”, meaning that the amount owed exceeds the value of the home.

Nevertheless, the empirical evidence suggests that the two sources of mismatches mentioned above are small, and that the housing market contraction has played only a limited role in the labour matching inefficiencies observed during the current episode (Molloy *et al.*, 2011). Broadly speaking, research studies indicate that a rise in the rate of labour mismatches is a normal symptom of the business cycle that eventually unwinds as the economy recovers. For instance, Elsby *et al.* (2010) found that labour-market developments during the Great Recession were similar to the patterns observed in previous cycles, and that the rise in unemployment duration was largely consistent with the severity of the contraction and with the particularly sharp rise in layoffs over the period. Indeed, as Haltiwanger (2011) noted, the dynamic process of job creation, destruction, and reallocation is a large and significant component of any healthy, productive economy.

A comparison of movements in the Beveridge curve over various cycles provides support to this view. The Beveridge curve illustrates the contemporaneous relationship between the number of job vacancies and unemployment. It follows from a basic job search model, and captures the idea that the rate of flow of workers from unemployment to employment is determined by the number of job vacancies that exist relative to the number of job seekers (Mortensen and Pissarides, 1994). Theoretical explanations for the existence of unfilled vacancies involve various frictions that result in inefficiencies in matching labour supply and demand. A graphical representation of the Beveridge curve is convex and downward sloping, owing to the fact that in prosperous times the unemployment rate is low and unfilled vacancies are high, while in bad times there are few vacancies and a high rate of unemployment. A given curve is therefore the locus of vacancy rates and unemployment that are consistent with a stable unemployment rate given the flows that they induce.

Consistent with the theory, empirical observations of the Beveridge curve using data from the Job Openings and Labor Turnover (JOLTS) survey exhibit a downward sloping curve (Figure 1.6). Notably, however, observations since 2009 seem to indicate an outward

Figure 1.6. **The relationship between job vacancies and unemployment changes in severe recessions**



1. The vacancy rate from 1973 Q4 to 1983 Q4 is given by an index of help-wanted advertisements divided by the labour force.

Source: For the unemployment rate, US Bureau of Labor Statistics; Current Population Survey 2012. For the job vacancy rates, US Bureau of Labor Statistics; Jobs Openings and Labor Turnover Survey, and Conference Board and Barnichon (2010). Reproduced from Yellen (2012).

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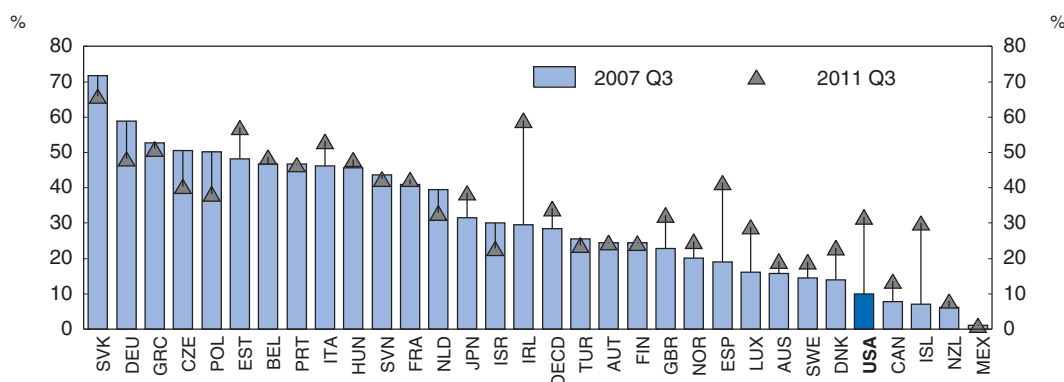
shift in the curve. As the economy recovered and the job vacancy rate began to increase, the unemployment rate failed to decline as fast as one would expect if the underlying relationship between vacancies and the unemployment rate had remained stable. However, a comparison with the severe economic downturns in 1973 and 1979 points to a similar experience: The Beveridge curve shifted outward, but the move proved to be temporary, as the curve eventually shifted back inward during the subsequent recoveries. Thus, historical experience suggests that roughly the same pattern will evolve in the current cycle.

If long-term unemployment persists, it risks becoming structural

A direct consequence of the severe labour market contraction is that the incidence of long-term unemployment in the United States has surged, from a pre-crisis level well below that observed in most OECD countries, to a level that is close to that in many European countries and Japan (Figure 1.7). A number of other OECD countries have recorded large increases in long-term unemployment in recent decades, and their experience shows that long-term joblessness can become entrenched and create very large costs both for the affected workers and for the society as a whole (Box 1.1). Although the current weakness in the US labour market is mostly cyclical in nature, there is nevertheless a significant risk that long-term unemployment could evolve into chronic problems that

Figure 1.7. **US long-duration unemployment has surged and is now close to the level in many OECD countries**

Persons unemployed 12 months and longer as a percentage of total unemployment,¹ 2007 Q3-2011 Q3



1. Data are not seasonally adjusted. OECD is the weighted average of 32 OECD countries excluding Chile and Korea. The results for Japan exclude three prefectures (Iwate, Miyagi and Fukushima) struck by the Great East Japan Earthquake, where the survey operation is suspended since March 2011.

Source: OECD calculations based on quarterly national Labour Force Surveys.

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Box 1.1. The costs of unemployment

Research has shown that periods of unemployment can have large and long-lasting negative effects on job losers. For example, recent research by Davis and von Wachter (2011) examined male workers age 50 or younger with at least three years of tenure who lost their jobs in mass layoffs (defined as employment decreases of at least 30% over two years at their place of employment) between 1980 and 2005. The authors found that that job displacement led to a loss of 1.7 years of earnings, on average, accumulated over 20 years. Moreover, the earnings losses varied depending on when the job loss occurred; job displacement led to an average accumulated earnings loss of 2.8 years if the job was lost when the unemployment rate was above 8%, but the earnings loss was only half as large – 1.4 years – if the job was lost when the unemployment rate was below 6%.

Long spells of unemployment can also permanently reduce employment prospects because workers' skills and work motivation tend to degrade over time, and employers often prefer to hire candidates with recent work experience (Blanchard and Diamond, 1994).

Other studies have demonstrated that periods of unemployment have detrimental effects on the physical or mental health and sense of well-being of individuals (e.g., Krueger and Mueller, 2011; Sullivan and von Wachter, 2009). Marriage rates, labour mobility, and rates of household formation are all lower when unemployment is high.

Finally, unemployment imposes significant social costs because some job losers will drift into permanent benefit dependency, for example by moving onto disability benefits after they have exhausted their entitlement to UI benefits (Autor, 2011).

persist long after the shortfall in aggregate demand has been eliminated. To avoid this outcome, policy makers should place a high priority on supporting the recovery in the short term and reversing the rise in long-term unemployment.

Recent policy initiatives

Unemployment benefits should be combined with a more “active” set of re-employment services

During the latest recession, the federal government moved decisively to expand the income support available to the long-term unemployed via the unemployment insurance (UI) system. Existing law had provided for up to 26 weeks of benefits, plus up to 20 additional weeks of extended benefits in states with relatively high unemployment rates. Beginning with the American Recovery and Reinvestment Act (ARRA) in 2009, federal support was strengthened by increasing both the benefit levels and the maximum duration of eligibility (federal benefits take effect when state aid expires). The period of eligibility for unemployment benefits was increased in steps from 26 weeks to 99 weeks. This year, the maximum period of eligibility moves down gradually to 73 weeks.

These emergency unemployment benefits were a welcome form of fiscal support as they provided a much-needed cushion for many of the most financially stressed households. In addition, from a macroeconomic perspective the UI benefits represent a relatively effective tool for stimulating aggregate demand and boosting economic activity, because benefit recipients are likely to be liquidity constrained and have a high propensity to consume (Johnson *et al.*, 2006; Parker *et al.*, 2011). For both of these reasons, policy makers should consider keeping these programmes in place until the scope of joblessness is reduced further. The most recent unemployment figures reinforce the argument that a significant portion of the US population is still in critical need of income support: Household survey data for April 2012 showed that 12.5 million individuals are unemployed and another 2.4 million are not counted in the labour force but have reported that they want a job and have looked for work in the past year. In addition, 7.7 million employed individuals are working only part-time for economic reasons, such as an inability to find full-time work.

To minimise the risk of an emergence of negative effects on labour supply, the eligibility period for UI benefits could be gradually adjusted back toward the pre-recession baseline of 26 weeks as the labour market improves. Ideally, the timing of the reductions in the eligibility period would be dependent on the progress of one or more aggregate economic indicators, such as the unemployment rate. It may also be useful to consider gradually reducing the replacement rate for individual benefit recipients as their unemployment duration progresses beyond a certain threshold. Previous OECD research suggests this type of rule can help incentivize job search and speed the return to work (OECD, 2011a).

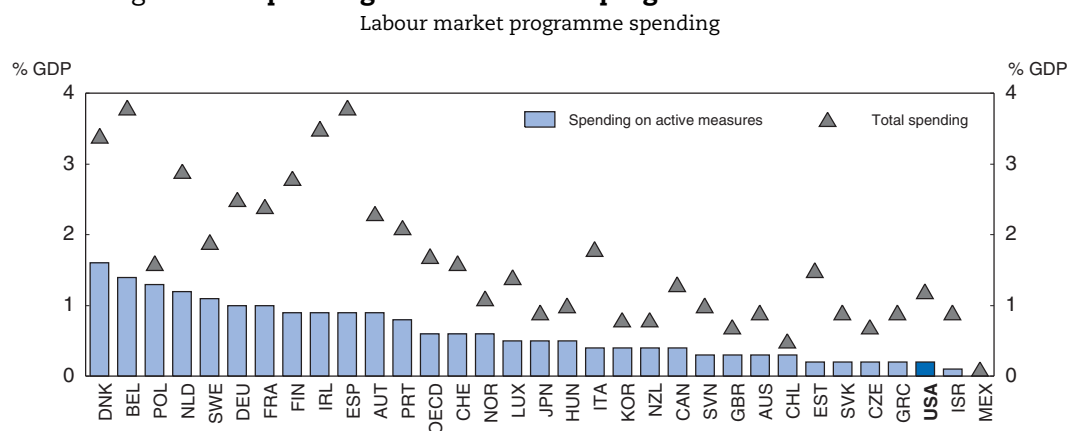
It is important, however, that the “passive” forms of unemployment assistance like cash benefits be offered in tandem with a more “active” set of re-employment services that can connect job seekers with job opportunities, facilitate job search, and guide individuals towards training and education. Job counsellors should be used to provide active case management, especially to those who appear to be at an elevated risk of becoming structurally unemployed. There is ample evidence that these types of active labour market programmes (ALMPs) can play a useful role in speeding the return to work for unemployed job seekers (OECD, 2011a). Moreover, re-employment assistance is likely to be especially important for the current pool of long-term unemployed, because job-search prospects have been shown to deteriorate as jobless spells lengthen (Krueger and Mueller, 2011).

Important insights into the effects of re-employment services can be gleaned from the experiences of other OECD countries that have used these types of programmes. During the 1990s, benefit dependency rates in many European countries tended to drift upwards (and employment rates downwards) when long-duration income support benefits were made available to working-age people without the accompaniment of ALMPs. However, many of these countries later managed to reverse some or all of those increases by reforming their benefit systems and tying them to a more effective set of ALMPs. Previous OECD research has demonstrated that while measures to trim excessively generous benefits were important in some countries, the implementation of effective activation strategies for benefit recipients played an important role in all cases (OECD, 2006). The experience of these countries also showed that successful policies need to be structured so that benefit recipients not only are offered re-employment services but also are required to participate in job search, training or employment programmes, with this requirement being enforced by “return-to-work contracts” and regular contacts between recipients and case workers.

Relative to other OECD countries, the United States spends very little on active labour market programmes (OECD, 2011a). Estimates by the OECD indicate that total US spending on ALMPs in 2007 amounted to 0.13% of GDP, far lower than the levels of up to 1% of GDP observed in many other OECD countries, including those with similar unemployment rates, and those, like Canada and the United Kingdom, with similar labour market institutions (Figure 1.8). US spending on these programmes is also low from a historical perspective; over the 20 years prior to the recession, spending on ALMPs in the United States declined from 0.24% of GDP to 0.13%. These reductions left the US system ill prepared to cope with the subsequent surge in the number of unemployed and the sharp rise in the risk that job losers fall into long-term unemployment. Low activation spending is not as important when labour market conditions are reasonably buoyant, but it needs to be ramped up again to meet the current unemployment challenge.

During the recession, the US government did reinforce the re-employment assistance available to the unemployed. The American Recovery and Reinvestment Act included additional funds for states to expand the services provided by One-Stop-Career-Centers;

Figure 1.8. **Spending on active labour programmes remains low**^{1, 2}



1. Countries are shown in descending order of active labour market spending in 2009.

2. Data for Greece exclude spending on Public Employment Services (PES).

Source: OECD Labour Market Programmes Database.

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however, the increase was quite small in relation to the sharp rise in unemployment, likely owing to intense budgetary pressures, especially at the state and local level, and to the inherent difficulty of quickly scaling up effective re-employment services. Nevertheless, significantly more resources are needed to develop an effective activation system that will address the needs of the many individuals still facing joblessness. The Administration has taken several steps in this regard. The Middle Class Tax Relief and Job Creation Act of 2012 added a requirement that all Extended Unemployment Compensation (EUC) recipients receive eligibility assessments and re-employment services, including labour market information, skills assessments and a re-employment plan. Moreover, the Act included measures that will move the unemployment compensation system in the direction of becoming a re-employment system, such as allowing the flexible use of unemployment benefits by individuals seeking to launch their own businesses or who are undergoing short-term, on-the-job training. The Administration's FY 2013 budget proposal included several other measures aimed at developing a more comprehensive activation system, and these should be implemented in full. Although funding increases may be difficult in the current fiscal environment, the investments should be considered a high policy priority that would have long-term payoff in terms of reducing the labour market marginalisation of increasing numbers of workers.

The set of services provided at these centres also needs to be broadened to address a larger set of needs. For example, while a variety of re-employment services exist to help individuals conduct a job search, there are relatively few programmes that can guide individuals toward opportunities for acquiring training or education that will result in high quality re-employment. Even workers with a well-established track record on the job may become unemployed because of changes in economic conditions in the business or industry in which they work, and for many of these individuals, it would make sense to obtain training or education for a different career with a higher market value. In addition, individuals seeking to invest in education or training need access to objective, easy-to-access information on how graduates from various programmes fare in the labour market.

Efforts to consolidate and streamline the existing programmes that provide training and employment services are also encouraged, as the current system of services is very piecemeal across many levels of government. The development of a coherent system for activation services could ensure that scarce fiscal resources can be directed toward the programmes that will generate the highest return. In addition, many states and localities already have implemented successful programmes that could be scaled up or adopted elsewhere, but additional effort is needed to gather information on the lessons learned and to implement the more successful approaches more broadly.

Marginal hiring subsidies to further support labour demand should be considered

Subsidies to employers for recruiting new employees are another effective way to raise the jobs intensity of output growth, and such measures should be considered in the short run. In 2010, the Hiring Incentives to Restore Employment (HIRE) Act offered a tax credit to employers who hired individuals who had been unemployed more than 6 months, but the take-up rates for this credit were disappointing, partly because of the modest size of the credit, and the subsidy expired before the pace of job creation had become self-sustaining.

The tax credit proposed in the American Jobs Act (AJA) appears more promising than the HIRE Act subsidy because it is targeted on net increases in payrolls, and research conducted by the OECD and others indicates that these types of marginal subsidies can

Box 1.2. Administration proposals to enhance active labour market programmes (ALMPs)

The American Recovery and Reinvestment Act (ARRA) of 2009 included additional funds for states to expand the services provided by One-Stop career centers, and the Middle Class Tax Relief and Job Creation Act of 2012 added a requirement that all Extended Unemployment Compensation (EUC) recipients receive eligibility assessments and re-employment services, including labour market information, skills assessments and a re-employment plan. In addition, the Administration has a variety of proposals to further enhance ALMPs. Details are included in the American Jobs Act (AJA) proposal, the Administration's FY 2013 budget plan, and other White House press releases (White House, 2011; White House, 2012a; White House, 2012b).

Broadly speaking, the Administration's proposals focus on two objectives: i) helping workers acquire skills needed for high-value jobs, and ii) reforming the nation's re-employment system. Many of the proposed measures would mark significant steps toward a more cohesive set of activation services, and their implementation is therefore recommended.

A major component of the Administration's plan is to create a new Universal Displaced Worker Program (UDWP) that would streamline training and employment services for dislocated workers. The programme would be designed to offer a broad set of services and provide displaced workers with job-search assistance and access to training. Various forms of financial support for displaced workers would also be administered through this programme:

- Individuals could receive up to USD 4 000 per year for up to two years to pursue technical training in the skills necessary for jobs outside their previous career field. Those enrolled in training or looking for a job would also receive a weekly stipend for child care, transportation, and other expenses for up to 78 weeks, in addition to 26 weeks of UI benefits.
- Displaced workers would receive allowances of up to USD 1 250 each for job search and relocation.
- Workers aged 50 or older who obtain new, full-time employment at wages of less than USD 50 000 would receive wage insurance for up to two years to partially offset earnings losses in new jobs that pay less than their previous jobs.

Another major proposed initiative is the creation of an American Jobs Center network, an effort to connect the vast array of employment and centers that currently exist at different levels of government into one system of resources. Online resources for job seekers would also be consolidated, with a goal of providing a single point of access for information to help people find a job, identify training programmes, and receive counseling and case management services.

indeed stimulate job creation in a depressed economy (OECD, 2011a; Neumark, 2011). The AJA tax credit could be made still more cost-effective, however, if it were limited to net increases in employment and not the wage bill, as labour supply on the employment margin is much more responsive to wages than labour supply on the hours margin. A second component of the original AJA proposal, not retained as part of the Administration's FY 2013 budget, was a separate USD 4 000 credit for hiring new employees who had previously been unemployed more than 6 months. But targeted credits

like these may transmit negative signals to employers that offset the positive effects of the credit (Dickert-Conlin and Holtz-Eakin, 2000).

Social assistance programmes need additional resources in tough economic times

The latest recession has also exposed inadequacies in the responsiveness of other social assistance programmes in the United States. In particular, as reported by the Center on Budget and Policy Priorities (CBPP) in July 2011, federal funding for the Temporary Assistance to Needy Families (TANF) programme is not designed to rise when caseloads increase in adverse economic conditions. Indeed, TANF's annual block grant funding level has been frozen since its creation 15 years ago and inflation has eroded 28% of its real value. This stands in contrast to TANF's predecessor, Aid to Families with Dependent Children (AFDC), for which federal funding rose automatically during economic downturns as state caseloads expanded, enabling states to respond to rising hardship and poverty (Pavetti and Schott, 2011). To make matters worse, many states facing budgetary pressures cut benefits to TANF recipients sharply in recent years, even as the number of individuals in need of assistance was surging. According to the CBPP, these state-level cuts affected 700 000 low-income families, including 1.3 million children.

TANF should therefore be made more responsive to economic conditions. The Supplemental Nutrition Assistance Program (SNAP, or food stamp) can provide a useful model, as this programme responded much more effectively to the downturn. SNAP benefits are fully federally funded and counter-cyclical, providing additional funding when the need for food assistance rises as it did during the recent recession. Even with these modifications, the safety net for American households would still be modest by comparison with other advanced OECD economies.

Long-term challenges

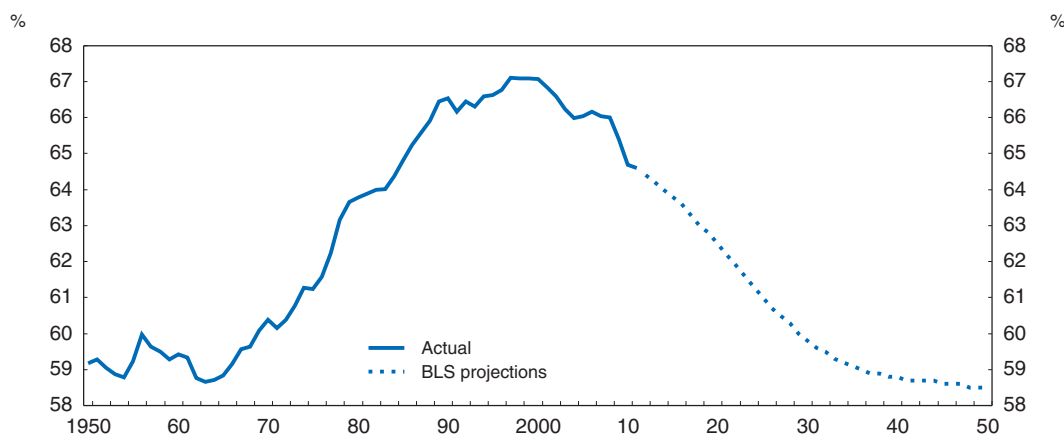
Labour force participation has declined

Several long-standing labour market issues will need to be confronted even after the economy has returned to health. The first of these is the decline in the rate of labour force participation. Demographic factors have been putting downward pressure on participation, and thus labour supply, for more than a decade (Aaronson *et al.*, 2006a; Hotchkiss, 2009). Most importantly, the ageing of baby-boom generation means that an increasing share of the population is entering its low-participation years. In addition, after rising steeply beginning in the 1970s, the labour-force participation of women has levelled off and even edged down a bit. Other sub-groups of the population, especially youth, have also recorded trend declines since the early 2000s, and these patterns were only exacerbated by the Great Recession. Indeed, nearly half of the sharp decline in youth employment over the past four years has appeared as withdrawals from the labour force rather than increases in unemployment.

While rising school enrolments can partly explain the lower rates of labour force participation for youth, other contributing factors, such as the increased concentration of jobs at the extreme ends of the skills distribution, are much more worrisome (Aaronson *et al.*, 2006b; Smith, 2011). Moreover, given the ongoing changes in the demographic composition of the population, Toossi (2012) and others have projected substantial further declines in the labour force participation rate in the years ahead (Figure 1.9), which will present challenges to the government in meeting its long-term fiscal objectives.

Figure 1.9. **Demographic changes will continue to push down labour force participation**

Actual and projected participation rate, age 16 and over



Source: US Bureau of Labor Statistics projections through 2050 provided by Toossi (2012).

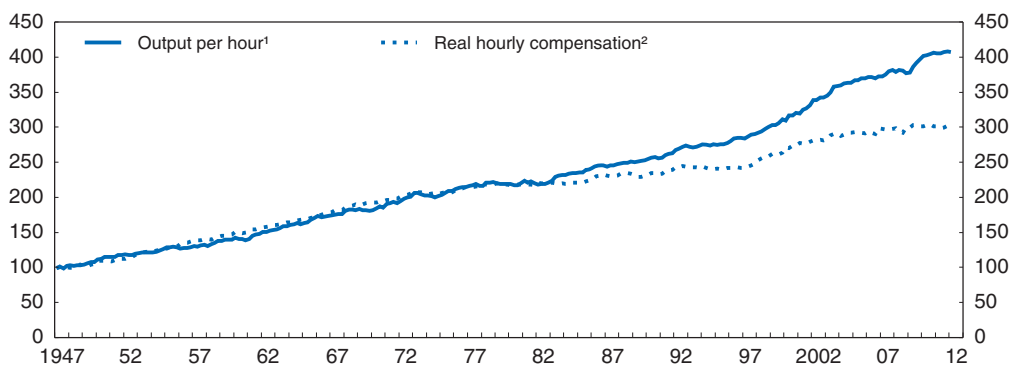
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Also of concern is the slow growth in real earnings for the much of the population

Another underlying structural issue is the slow growth in real earnings for a large portion of the population. Through the 1960s and 1970s, earnings per worker grew at a robust rate, generating increases in standards of living for most of the US population (Figure 1.10). But since the early 1980s, real compensation growth has lagged behind the gains in labour productivity, partly reflecting higher growth in consumer prices than in producer prices.

Figure 1.10. **Hourly compensation has lagged behind the gains in labour productivity**

Index base 1947 = 100



1. Output data are based on estimates of non-farm business output in constant dollars from the National Income and Product Accounts. Hours data are from the Bureau of Labor Statistics.
2. Compensation includes wages and salaries of employees plus employer's contributions for social insurance and private benefit plans, and it reflects the adjustment of hourly compensation for changes in consumer prices. The price changes for recent quarters are based on the BLS Consumer Price Index for all urban consumers (CPI-U). For earlier periods, consumer prices are based on the BLS Consumer Price Index research series (CPI-U-RS).

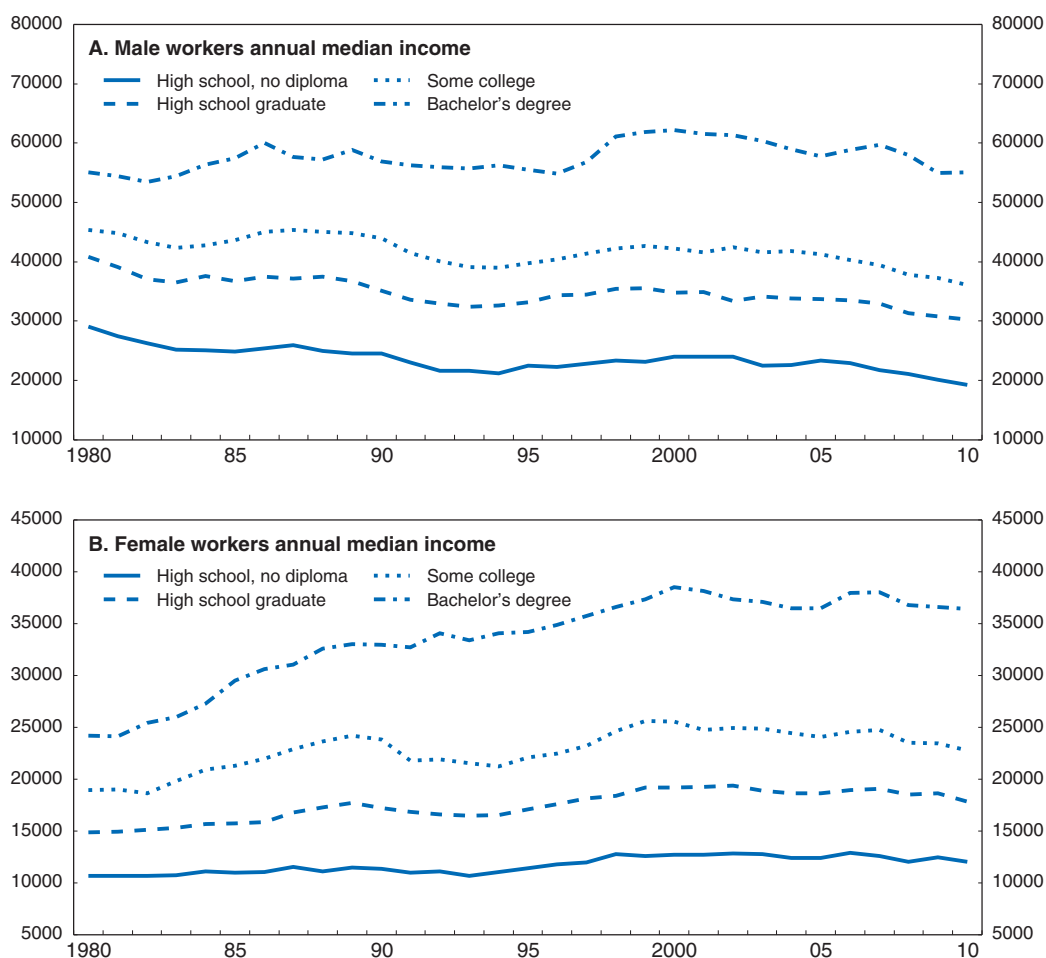
Source: US Bureau of Labor Statistics, *Productivity and Cost Database* 2012.

StatLink <http://dx.doi.org/10.1787/888932638374>


Real earnings by gender and level of education also have exhibited a pattern of lacklustre growth, particularly for the lowest education groups (Figure 1.11). Earnings of males with at least a bachelor's degree have held fairly steady, while those of the other three groups have declined. Earnings growth for females who have a college degree has far outpaced the gains for women with lower education attainment. These patterns reflect a large and increasing wage premium for college graduates: Goldin and Katz (2008) estimate that the college/high school wage premium surged from 35% in 1980 to 60% in 2005. In addition, college graduates, face much lower risk of becoming unemployed. These dynamics are not unique to the United States: Across many of the high-income countries of the OECD, demand for highly-skilled labour is rising faster than supply (*ibid*). These issues are discussed further in Chapter 2.

Figure 1.11. **Earnings data by gender and educational attainment show a similar pattern of stagnant or declining earnings for most categories**

In 2010 dollars



Source: US Census Bureau, Current Population Survey, Annual Social and Economic Supplements 2012.

StatLink  <http://dx.doi.org/10.1787/888932638393>

Progress in education attainment is critical to securing future gains in income

Progress in educational attainment and achievement is therefore critical to securing future gains in income and narrowing income inequality. Based on practices in the top-performing countries in the PISA study, a variety of secondary school education reforms are needed to upgrade US achievement towards the top levels (OECD, 2011b). As a percentage of GDP, the United States spends much more on education than most other OECD countries, yet achievement of 15-year olds in the United States is just slightly above the OECD average in reading, average in science, and slightly below average in mathematics (Table 1.1). Furthermore, socio-economic background has a much greater impact on student outcomes in the United States than it does in most other countries, resulting in much wasted talent. The United States cannot afford a school system with such mediocre outcomes if it wants to preserve its place amongst the richest knowledge-based economies.

The potential economic gains from raising education achievement are substantial. A recent study by the OECD and the Hoover Institution at Stanford University (OECD, 2010d) suggests that a boost in US PISA scores of just 25 points over the next 20 years – which corresponds to the performance gains that some countries achieved between 2000 and 2009 alone – would imply a cumulated gain of USD 41 trillion for the US economy over the lifetime of the generation born in 2010 (as evaluated at the start of the reform in terms of the present value of future improvements in GDP). Longitudinal studies have also demonstrated that student performance at school is a good indicator of subsequent successful education and labour-market pathways (OECD, 2010b).

Practices in the high-performing countries point to a strategy that entails the government making clear what standards of competencies students should achieve. Schools are given freedom in determining how to achieve these standards and are held accountable for the outcomes. Many states in the United States are well on the way to implementing common standards and competencies in the context of the Race to the Top (RTT) initiative. But to have a sustained impact on learning outcomes, further steps need to be taken to develop world-class standards for all the subjects in the core curriculum, not just language and mathematics.

The experience of high-performing countries has also demonstrated the benefits of a uniform, high-quality school curriculum. A standardized curriculum could be developed using a process that brings together the best minds in the country, engaging subject matter experts and other stakeholders to produce well designed frameworks for what should be taught and when. A coordinated programme of instruction would also allow for greater diffusion of successful practices already in place in individual schools or localities. Policies to support such a process are already in place. For example, the Investing in Innovation Fund supports projects in primary and secondary school systems education that test, validate, and scale up promising strategies and interventions that raise overall student achievement, close the achievement gap, and improve outcomes for high-need students. Further efforts to inform educators and school systems of best practices are encouraged.

In this area, Canada can provide a solid benchmark for comparison. PISA test results show that Canada has both strong average results and less dispersion related to socio-economic status than many other nations. Yet, like the United States, Canada has a large, geographically dispersed, and culturally heterogeneous population and a highly decentralized educational system. Provincial governments in Canada are responsible for

Table 1.1. Secondary school achievement in the United States lags well behind that in the best performing countries

	Quality				PISA 2009 Results, ¹ Table 1.3.3	PISA 2009 Results, ¹ Table 1.3.6	Equity PISA 2009 Results, ¹ Table 11.3.2	Coherence PISA 2009 Results, ¹ Table 11.5.1	Efficiency EAG, ² Table B1.2	Income EAG, ² Table X2.1	Equality PISA 2009 Results, ¹ Table 11.1.2
	PISA 2009 Results, ¹ Table V.2.1	PISA 2009 Results, ¹ Table V.2.1	PISA 2009 Results, ¹ Table V.2.1	Mean PISA score on the reading scale 2000							
	Score	S.E.	Score	S.E.	Score	S.E.	%	%	USD PPP	Value	Value
Mean PISA score on the reading scale 2009	Mean PISA score on the reading scale 2000	Mean PISA score on the reading scale 2009	PISA score difference in reading between 2000 and 2009	Mean PISA score on the mathematics scale 2009	Mean PISA score on the science scale 2009						
	Score	S.E.	Score	S.E.	Score	S.E.					
Brazil	412 (2.7)	396 (3.1)	16 ³ (4.9)	386 (2.4)	405 (2.4)	13 (2.4)	48	1 796 ⁴	10 770	0.57	
Canada	524 (1.5)	534 (1.6)	-10 (3.4)	527 (1.6)	529 (1.6)	9 (1.6)	22	7 609	36 397	0.30	
Shanghai (China)	556 (2.4)	m	m	600 (2.8)	575 (2.3)	12 (2.3)	38	42 064 ⁵	5 340	0.42	
Hong Kong (China)	533 (2.1)	m	m	555 (2.7)	549 (2.8)	4.5 (2.8)	42	32 896 ⁶	42 178	0.43	
Finland	536 (2.3)	546 (2.6)	-11 (4.3)	541 (2.2)	554 (2.3)	8 (2.3)	9	6 430	35 322	0.26	
Germany	497 (2.7)	484 (2.5)	13 ³ (4.5)	513 (2.9)	520 (2.8)	18 (2.8)	60	7 072	34 683	0.27	
Japan	520 (3.5)	522 (5.2)	-2 (6.8)	529 (3.4)	539 (3.4)	9 (3.4)	49	8 012 ⁴	33 635	0.34	
Singapore	526 (1.1)	m	m	562 (1.4)	542 (1.4)	15 (1.4)	35	23 699 ⁷	51 462	0.42	
Poland	500 (2.6)	479 (4.5)	21 ³ (5.8)	495 (2.8)	508 (2.4)	15 (2.4)	19	3 784	16 312	0.32	
United States	500 (3.7)	504 (7.0)	-5 (8.3)	487 (3.6)	502 (3.6)	17 (3.6)	36	9 932	46 434	0.36	
United Kingdom	494 (2.3)	m	m	492 (2.4)	514 (2.5)	14 (2.5)	29	7 032	34 957	0.34	
OECD average	494 (0.5)	497 (0.6)	-2 (2.7)	497 (0.5)	501 (0.5)	14 (0.5)	39	6 675	32 962	0.31	

Note: Values that are statistically significant are indicated in italics and underlined.

1. OECD (2010b), PISA 2009 Results, Volumes 1-V, OECD Publishing.

2. OECD (2010c), Education at a Glance 2010: OECD Indicators, OECD Publishing.

3. Statistically significant.

4. Value for core and ancillary services.

5. Cumulative expenditure per student over the theoretical duration of primary studies (PISA 2009 Results).

6. Recurrent government expenditure on education, including primary, secondary and special education and departmental support (Hong Kong Annual Digest of Statistics 2010).

7. Cumulative expenditure per student for 6 to 15-year-olds (PISA 2009 Results).

Source: OECD, PISA 2009 Database.

setting the curriculum, determining many major policies for schools, and providing most of the schools' funding. Within each of the provinces, responsibility is divided between the central provincial government and locally-elected school boards.

Part of the success of the Canadian educational system can be ascribed to the quality of its curriculum, which in turn is attributable to its development at the province level. Curriculum development is undertaken by the respective ministries of education. Through a process of extensive consultation with groups of teachers and subject matter experts, consensus is reached on what topics will be taught in what sequence through the grades. And at the national level, a Council of Ministers of Education (CMEC) exists as a forum through which the ministers of education in the respective provinces can meet for co-ordination purposes. Although its impact is somewhat limited given the country's decentralised educational structure, CMEC fulfils an important information-sharing function and enables good ideas and practices to spread across provincial lines.

Teachers also play a critical role in building a successful educational system. They need to be professionals, focused on quickly identifying students with learning difficulties and proposing pedagogical solutions for them. In high-performing countries, teachers are paid much more in relation to people with similar levels of qualifications than in the United States, and the teaching profession has high social status. As a result, these countries can recruit teachers from the top of the graduation distribution, not the bottom as in the United States. High-performing teachers interact with others in their schools to improve their teaching methods and master teachers are available to provide guidance. There are also teachers available to help bring students falling behind up to speed so that they can continue and succeed in mainstream classes. School heads also tend to be mentors in these countries rather than administrators, as in the United States.

Selecting, training and retaining excellent teachers are also necessary components to high-quality education. Additional money to pay teachers more could easily be found by reducing money spent on facilities and administrative overheads – on average, capital expenditure and overhead expenditure is a much higher share of total expenditure in US schools than in the high performing countries. Teachers could also be given more time to plan and improve their teaching by reducing their course hours and increasing class sizes, as Japan did. Class size has been shown to have a negligible effect on outcomes over a wide range of sizes.

To reduce the influence of socioeconomic background on US education outcomes, more resources need to be directed towards disadvantaged students. Currently, the United States is one of only three OECD countries (the other two are Israel and Turkey) that actually spend less per student on students from disadvantaged backgrounds than on other students. A key to redirecting resources towards students in most need would be to reform the local-property tax system of financing schools. This results in vast differences in resources per school, with schools in wealthy areas being well equipped and able to recruit the best teachers, while schools in poorer areas are in the opposite situation. This disparity reinforces the disadvantages of social segregation, which results in children in poorer schools having lower educational expectations and outcomes. Canada had similar arrangements but reformed them by moving school funding to the provincial level. In many other high-performing countries, the most able teachers work in the more socially disadvantaged schools, the opposite of what occurs in the United States.

The Administration has taken steps to promote many of these educational reforms, notably through the Race to the Top (RTT) programme. Launched in 2010, the RTT programme encourages US states to change their aspirations and organisational culture by: i) adopting internationally benchmarked state-developed standards and assessments that prepare students for success in college and the workplace; ii) recruiting, developing, rewarding, and retaining effective teachers and principals; iii) building data systems that measure student success and inform teachers and principals how they can improve their practices; and iv) turning around the country's lowest-performing schools (White House, 2012b; Office of Management and Budget, 2012). In addition, the work of the state consortia funded by RTT has generated important opportunities for the United States to make progress on adopting a consistent curriculum across school systems.

Advance the skills of high school graduates with high-quality vocational training

Every individual has different aptitudes, and many students will not go beyond a high school education. Although education should be about much more than preparation for work, the education system is a powerful tool for producing a globally competitive workforce. International evidence suggests that effective preparation for work entails success in academic courses, the acquisition of strong generic work skills – everything from showing up on time and putting in a good day's work to being an effective team member and working to meet deadlines – and technical competence in the job-specific skills needed to do the entry-level work in careers that pay well (OECD, 2011b). Countries vary widely in the degree to which they provide each of these bundles of skills and knowledge. In countries that do well on all three, youth unemployment tends to be lower, it takes less time for young people to get and keep good jobs, and economic competitiveness is higher, so there are strong reasons for a country to pay attention not just to the development of young people's academic skills and knowledge but to make sure it has a strong school-to-work transition system (*ibid*).

In this context, the strong vocational component of the German educational system can provide a useful model for improving the earnings and participation of lower-skilled workers, particularly youth. Germany's secondary education follows a "dual" system, in which the two-thirds of students who enrol in the vocational tracks alternate between a few days in school and a few days at the workplace. In the company, the apprentice receives practical training which is supplemented by theoretical instruction in the vocational school. Around 60% of all young people learn a trade within the dual system of vocational education and training in Germany (UNESCO, 2009). There are around 350 state-recognised training occupations, such as carpentry, car mechanics and roofing. The period of training is usually two to three years and is concluded by a state examination. During this time, the apprentice is financially remunerated. Access to this training is not formally linked to a specific school certificate.

The German system is notable for its success in enabling young people from widely varying social backgrounds to integrate the learning of academic skills with the mastery of job-specific skills, so that students understand the theory behind the practice as they practice their generic work skills. The generic work skills, such as motivation, persistence, effort, discipline and interpersonal skills, are without doubt highly valued by employers. And for many students, this practice-based, highly applied style of learning is far more effective than studying classroom material without obvious applications to anything they know or care about. Some students only become engaged in course material when they

see it actively put to use. Learning becomes necessary in order to solve the problems that these students find engaging. Problem-driven learning is the kind of learning most of us do when we leave school behind and enter the adult world. It is in this sense that the dual system is very much a part of the education system. Although students accept wages below the market level, they gain access to the possibility of employment with companies who might not otherwise be interested in hiring them. In short, they pay to gain important skills provided by their employers. Employers are increasingly willing to pay to send promising young people who come in through the dual system to university. In addition, OECD research suggests that workplace training facilitates recruitment of employees because potential employers and employees get the chance to get to know each other and apprentices make productive contributions such that employers benefit directly from the training (OECD, 2011b).

One might argue that the German educational system depends greatly on an industrial system that is very different from that of the United States, and thus is not easily transferable. But there is scope to provide American employers with incentives, such as payroll tax breaks or minimum wage exemptions, for offering apprenticeship programmes to youth. Pilot programmes could explore how to adapt Germany's effective school-to-work systems to the US context in ways that could produce major gains for employers, youth, and the educational system.

Community colleges are a cost-effective means of raising human capital

One particularly cost-effective approach to raising tertiary education attainment rates is to strengthen and enhance the community college system. Community colleges play an important role by providing an affordable, accessible opportunity to obtain postsecondary education. Unfortunately, many of the existing programs are under-utilised or under-resourced. Research has shown that rates of return for a community college degree are comparable to a degree from a four-year university, and yet Federal government funding for these programmes is currently modest, as most direct federal funding for higher education goes to public four-year colleges and universities (Greenstone and Looney, 2011).

Community colleges generally work with lean budgets; they are mainly funded by tuition, with some financial support provided by state and local governments. Moreover, budget pressures have greatly intensified in recent years given the sharp cutbacks in state and local government spending that were made in response to the economic downturn. The consequences of tight budgets can be quite costly for students, as capacity constraints mean that it often takes longer for students to complete the required courses. Studies have shown that the payoffs for a community college degree are greatest when studies are concentrated in more technical fields, but funding constraints mean that many community colleges cannot provide these technical degree programmes, because the development of these types of courses requires additional investments in lab or technology equipment. Most community colleges do not have the resources to provide career counselling to students or services that might help students identify a suitable field of study.

Local and regional business are a valuable and yet under-utilized resource to raise the returns to educational offerings at community colleges. Potential employers should be given more opportunities to provide input regarding their specific needs for skills and training, so that degree programmes and even individual courses can be tailored appropriately to the labour market. In addition, a combination of appropriate incentives

and regulations could establish relationships among community colleges, regional technical schools, other post-secondary institutions, and employers that could expand opportunities for workplace training in the form of internships or shorter workplacements. Efforts to encourage these types of programs have been proposed in the Administration's FY 2013 budget, which calls for USD 8 billion in funding for the Departments of Education and Labor to support state and community college partnerships.

Raise completion rates by reducing financial and other barriers

The value of post-secondary education would be increased by raising degree completion rates for tertiary education. These have gone up somewhat in recent years, but still only 58% of full-time bachelor's degree-seeking students complete their degrees within six years of starting (US Department of Education, National Center for Statistics). Completion rates are even lower for full-time students seeking certificates or associate degrees at two-year institutions – only 28% of students complete their programmes within 150% of the normal time. Completion rates for part-time students – which comprise 40% of tertiary students – are abysmal: The completion rates for bachelor's degrees (within eight years), associate degrees (within four years) and one-year certificates (within two years) are 24%, 8%, and 12%, respectively (Complete College America, 2011).

For both full-time and part-time students, shorter and more rapid pathways to graduation would increase completion rates. The longer students take, the more that life pressures from work and family crowd out studying to complete tertiary qualifications. Shorter academic terms, less time off between terms and year-round scheduling would enable students to complete their studies more quickly. Measures to counter students wasting time on credits in excess of what is required for their programmes would also help.

One promising approach to increasing completion rates for part-time students is by helping them to reconcile work and study schedules. This can be done by scheduling courses in blocks, making it easier for students to work without missing courses. The City University of New York does this in its Accelerated Study in Associate Programs and achieves graduation rates three times higher than for its students who do not participate in the programme. Similarly, the 27 Tennessee Tech Centers achieve high graduation rates by enrolling students in whole academic programmes, rather than individual courses, in blocks of time that more easily accommodate students' work schedules. Greater use of online technology to reduce the amount of time that students need to spend in class would also help students reconcile study and other obligations.

Better academic preparation for tertiary education would also improve completion rates. Fully one half of those seeking a two-year associate degree require remedial education, with this proportion falling to 21% for those seeking a bachelor's degree (Complete College America, 2011). Students requiring remedial education have much lower completion rates than other students. Complete College America (2011) makes a variety of suggestions for reforming remedial education, notably by including students requiring remedial work into mainstream courses, while also providing them with intensive help to bring them up to speed. This is the approach to educating weaker school students that has been followed in Finland (and subsequently emulated in many other countries) with much success (OECD, 2011b).

Easing financial constraints faced by students could also help to increase tertiary graduation rates. Many individuals have difficulty financing their education because they

need to support themselves and a family at the same time; furthermore, tuition has increased at an annual average real rate of 4% over the past three decades, outpacing family incomes and student loans by a considerable margin. Oliveira Martins *et al.* (2007) find that easing liquidity constraints on students could increase the US graduation rate by 1.5 percentage points, which is one of the larger increases achievable in this way among OECD countries. The Administration has taken some measures recently to help students and their families pay for college – it has increased Pell Grants and Congress extended until 2012 the American Opportunity Tax Credit – but such measures should be taken further. Students would also benefit greatly from an expansion in other types of assistance, such as child care and other family support services, which could be made available to students at reasonable cost.

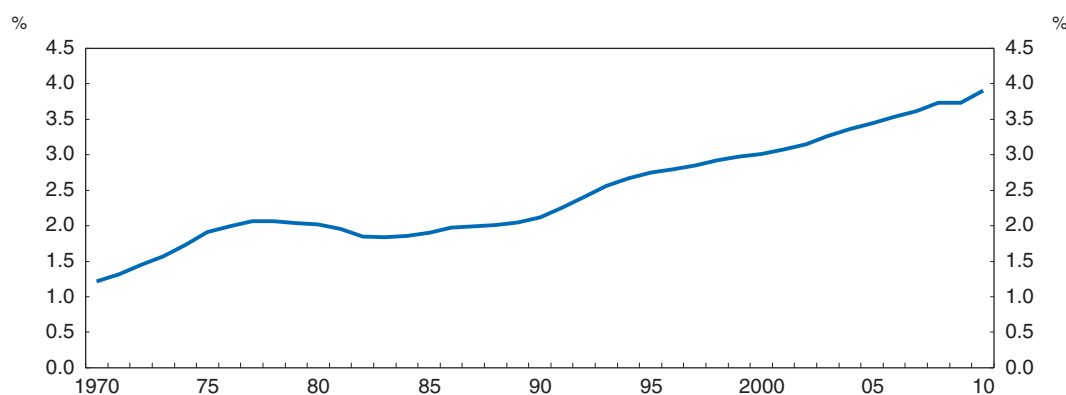
Disability programme reforms are needed to stem the tide of new enrolments

As discussed in *OECD Economic Survey of the United States* (2007) and in the *OECD Disability Study* (2011), the large and increasing number of people receiving disability benefits through the Social Security Disability Insurance (SSDI) programme holds down labour utilisation and contributes significantly to reductions in labour force participation. In particular, the share of the working-age population between the ages of 20 and 64 enrolled in SSDI rose from 3.6% in 1980 to 6.1% in 2007 and then to 6.6% in 2010. Furthermore, increases in the number of applications for disability benefits are likely to continue for some time, since there is often a considerable lag between the rise in unemployment during a recession and an upward ratchet in disability rolls.

There are several factors behind the continued rise in disability rolls. According to Autor (2011), much of the increase in recent decades reflects a relaxation of eligibility restrictions that began in 1984. New provisions made it easier for sufferers from back pain, arthritis and mental impairments to get benefits. Moreover, because these conditions tend to have early onset but low mortality, the expected duration of benefits lengthened from six years in 1983 to 14 years in 2004. Another important factor has been the increasing generosity of the programme. Disability beneficiaries receive heavily subsidised medical


Figure 1.12. **Disability rolls continue to trend up in the United States**

Share of population receiving disability benefits



Note: Disability benefits refer to Social Security Disability Insurance.

Source: OECD, *Sickness, Disability and Work*, 2010 (Administrative data); OECD Population Statistics Database, 2012.

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care, the relative value of which has increased substantially. In addition, key parameters in the formula determining benefits are indexed to average wages, which have increased faster than the wages of low-skilled workers. These factors have increased replacement rates, particularly at the bottom of the wage distribution and for workers without health insurance.

Changes in the US labour market over the past decades have also created new challenges for workers with disability. As discussed earlier, skill-biased technical change, off-shoring of low-skill activities, and other factors have reduced employment opportunities for workers at the low end of the skill distribution. These developments have affected people with disability disproportionately, since these individuals tend to have lower levels of education compared with the rest of the population. The recent deep recession and the persistent slack in the labour market have only aggravated the situation, since the evidence suggests that employment rates for workers with disability are more adversely affected during economic downturns. Burkhauser *et al.* (2001), for example, examined the relative outcomes of workers with disability over the business cycles of the 1980s and the 1990s in the United States and concluded that employment fell more for people with disability than for those without disability. As a result of these developments, disability benefits are increasingly taking on the role of a benefit of last resort for many working-age people facing labour market disadvantages and having difficulties in performing continuously at the expected high level of productivity.

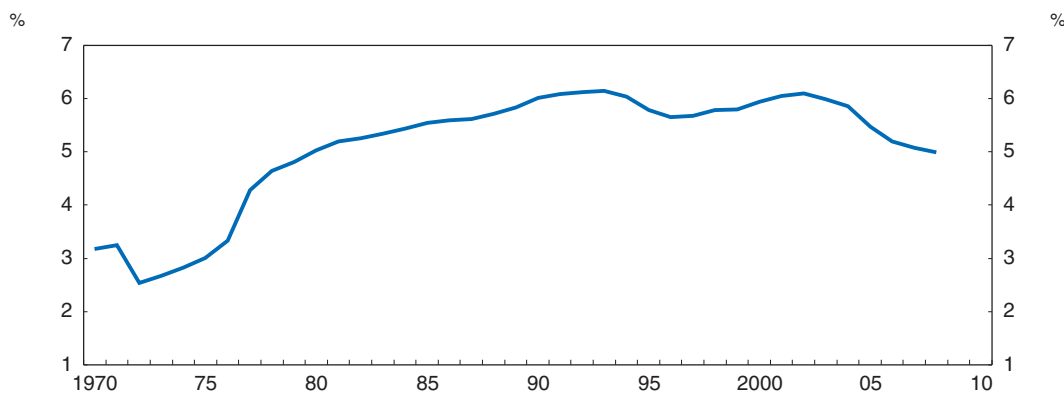
Government reforms are clearly needed to stabilise and reduce the reliance on these programmes, particularly because almost none of the individuals who qualify for benefits ever return to the workforce. Although proposals to make disability benefits less generous have obvious political and economic difficulties, there seems to be scope for improving the targeting of benefits to those genuinely incapable of work. For example, Autor and Duggan (2006) propose greater reliance on independent medical evaluations and providing legal representation of the taxpayers' interest at appeals. They argue that these reforms would raise the rejection rate of non-deserving claims without hurting those in need.

Another area where reforms could potentially bring high returns is on the employer side. Autor and Duggan (2010) propose that a variety of so-called "front-end" approaches should be used to minimize movements of workers from employment into the SSDI system. The authors' suggestions include enhancements to workplace accommodation, rehabilitation services, and partial income support, with the common goal of enabling more workers with disabilities to remain in employment. In addition, financial incentives could be offered to employers that successfully accommodate workers who become disabled.

Reforms in the Netherlands can provide a useful model on both of these fronts, and the data on enrolments since their implementation illustrate that the effects of policy reforms can be large (Figure 1.13). In the early 2000s, the Netherlands conducted a major reform of its disability insurance system with the aim of reducing annual inflows into the programme by focusing benefits more effectively on those who could not work while strengthening the work incentives of those who could. Specific measures included tightening eligibility and testing criteria, extending the period of employer-paid sickness from one to two years, and introducing a "no-risk" policy where the government covers sickness payments for recently-hired partially disabled workers and of work-capacity related disability benefits to strengthen work incentives (OECD, 2008).


Figure 1.13. **Disability enrolments in the Netherlands dropped noticeably following reforms**

Share of population receiving disability benefits



Note: Disability benefits refer to Social Security Disability Insurance

Source: OECD, *Sickness, Disability and Work*, 2010 (Administrative data); OECD Population Statistics Database, 2012.

StatLink  <http://dx.doi.org/10.1787/888932638431>

In the years immediately following the reform, both inflows into disability and the total number of claimants fell sharply. By 2008, the total stock of benefit recipients had fallen by roughly one-quarter from its 2002 peak. Estimates by Jehoel-Gijsbers (2007) suggest that the so-called “gatekeeper law” (greater employer responsibility for re-integration of sick employees) made the largest contribution to the overall fall in inflows (42%), followed by a law lengthening employer-paid sick pay from one to two years (25% to 35%). There were also significant changes attributable to the restructuring of benefits and the reassessment of existing benefit recipients. In the early stages of this process, around 40% of those reassessed lost benefits altogether or were assigned to a lower category of disability; these initial reassessments focused on younger cohorts in the disability pool and on those most likely to be reintegrated.

Box 1.3. Summary of recommendations for promoting job creation and earnings growth

Key recommendations:

- Development of enhanced “activation” programmes would facilitate the return to work for many unemployed individuals and mitigate the risk of long-term unemployment becoming structural. A variety of proposals for training and re-employment services were presented in the Administration’s FY 2013 budget, and these plans should be implemented without delay.
- Education and training are key to improving skills, reducing mismatches, and addressing the problem of slow wage growth. Programmes such as Race to the Top and measures to strengthen community colleges are steps in the right direction, but more could be done, such as reducing financial and other barriers to tertiary education and providing vocational training opportunities in secondary school.

Box 1.3. Summary of recommendations for promoting job creation and earnings growth (cont.)

Other recommendations:

- Strengthen and enhance the community college system, especially in technical fields and through collaboration with local employers.
- Offer high-quality vocational education in secondary schools with a substantial work-experience component, organised jointly with local employers.
- Reduce reliance on disability benefits by making eligibility requirements more stringent, and by enhancing workplace accommodations, rehabilitation services and partial income supports.
- Make social assistance programmes more responsive to economic conditions, so that more resources are allocated in tough economic times.

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Chapter 2

Strengthening innovation

The US innovation system has many strengths, including world class research universities and firms that thrive in innovation-intensive sectors. However, fissures have begun to appear, notably in the areas of human capital development, the patent system and manufacturing activity, while public investments in R&D and research universities are at risk of being curtailed by budget cuts. Revitalizing the dynamism of innovation has become a priority for US policymakers. To this end, it is important that federal and state governments sustain financial support for knowledge creation. The US workforce's skills will need to be upgraded, especially in STEM fields, and measures taken to provide more favourable framework conditions for developing advanced manufacturing in the United States. While the recent patent reform is a big step in the right direction, patent reform needs to be taken further by ensuring that the legal standards for granting injunctive relief and damages awards for patent infringement reflect realistic business practices and the relative contributions of patented components of complex technologies.

The US innovation system has many strengths, led by world-class research universities and world-leading businesses in various innovation-intensive sectors such as ICT, biotechnology, energy and agriculture. In addition, it has competitive product markets and flexible labour markets, facilitating the reallocation of resources triggered by innovation to more efficient products and processes. However there is continued weakness in K-12 education performance, especially in science, technology, engineering and mathematics (STEM); emerging countries are increasingly attracting research centres with high-skilled personnel; the patent system needs adjustment to ensure that it drives innovation in all sectors to which it applies; and there has been a reduction in entrepreneurial activity. In addition, government support for R&D will be reduced if the funding cuts in the Budget Control Act of 2011 are implemented.

This chapter discusses measures to foster innovation by US firms. After briefly reviewing innovation performance, the chapter discusses the importance for innovation and economic growth of limiting reductions in the federal R&D budget as far as possible. The next section discusses reforms to patent protection to increase the likelihood that it promotes innovation in all sectors to which it applies. Reforms to strengthen innovation in the manufacturing sector, which has a disproportionate impact on national innovation performance, are discussed in the following section. This is followed by a discussion of reforms to the education system to equip workers with the analytical skills they need to adapt to technological change, especially through having better skills in Science, Technology, Engineering and Mathematics (STEM). Policies to counter the decline in entrepreneurship and new firm creation in recent decades are discussed in the next section. The chapter concludes with a call to establish a national innovation agency to sustain an evidence-based focus on innovation policy and strategy.

Innovation performance is high but showing signs of faltering

Innovation is the “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations” (OECD and Eurostat, 2005). While business enterprises or government agencies implement these improvements, they build on the flow of new knowledge from universities and research laboratories, most of which is funded by the Federal government. The intensity with which firms innovate depends on the incentives they face, which in turn are influenced by framework conditions such as competitiveness of product markets, flexibility of labour markets, protection of intellectual (and other) property rights, development of financial markets, supply of skilled labour and strength of public research capabilities that are subject to public policy influence. Some of these factors also influence the intensity with which government agencies innovate. Framework conditions are generally strong in the United States although, as noted in Chapter 1, there are concerns about the supply of skilled labour.

One longstanding approach to measuring innovation performance is to infer it from Multifactor Productivity (MFP) growth (see for example US Department of Commerce, 2012; White House, 2012). MFP is a residual that contains many things, but innovation is thought to be the primary source of long-run increases in MFP (Grossman and Helpman, 1991); another source is improvements in infrastructure, as occurred, for example, in the late 19th century when the railway network was developed and in the post World War II years when the national highway network was built (Box 2.1). If so, the decline in MFP growth rates in business cycles (tough-to-trough, as identified by the National Bureau of Economic Research (NBER)) since the 1970s suggests that there has been some long-run deterioration in innovation performance (Figure 2.1). Based on unofficial estimates of MFP growth before 1947, it is the period since 1970s that is unusual, not the post World War II years before the 1970s (Field, 2003, 2007 and 2009). While MFP growth picked up in the late 1990s and early 2000s as the diffusion of ICT pushed up productivity growth, especially in the distribution sector, these high rates have not been sustained. Kahn and Rich (2007 and 2012) estimate that there is a high probability that productivity growth has fallen back to the lower rate recorded over most of the period since the 1970s. Although MFP growth may have slowed, it still compares favourably with that in many other

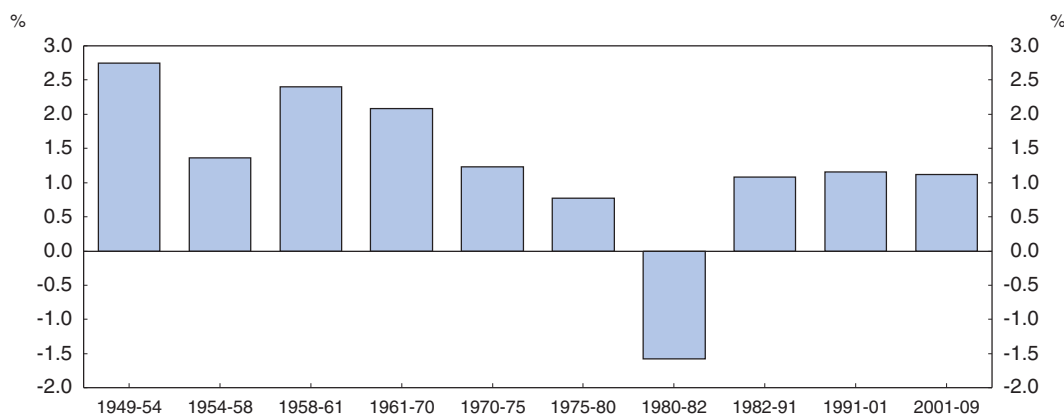
Box 2.1. The economic benefits of transportation infrastructure investment*

Investments in transportation infrastructure can significantly improve an economy's long-run economic performance, with the investments in the rail in the 19th century and the national highway system in the 20th century being outstanding examples (Field 2003, 2007, and 2009). Investments that create, maintain, or expand transportation networks are likely to enhance efficiency, productivity and economic activity (Department of Treasury and Council of Economic Advisers, 2010; and Gramlich, 1993). Despite high expected returns from such investments, the United States has been under investing for many years. Infrastructure investments have been running at around 2% of GDP in the United States compared with 5% in Europe. The American Society of Civil Engineers estimates that the United States needs to spend approximately USD 2.2 trillion on infrastructure over the next five years, with around half of this amount needed to make up for deferred maintenance.

Against this background, the Administration has proposed USD 50 billion in immediate investments in transportation infrastructure as part of the American Jobs Act. The proposal includes investments: to make highways safer and more efficient; to repair and modernize public transit systems; to improve intercity passenger rail service and develop high-speed rail corridors; to improve airports and modernize the air traffic system; and to support innovative multi-modal transportation programmes. The Administration is also championing a USD 10 billion proposal to capitalize an independent National Infrastructure Bank, which would both increase investment in infrastructure by attracting private capital to co-invest in specific projects and help to improve the efficiency of infrastructure investment by relying on a merit-based selection process for projects.

Expected returns from such projects at this time are likely to be unusually high owing to high levels of economic slack: competing demands for capital from the private sector are currently low and unemployment is high, notably amongst former construction workers.

* This Box draws heavily on White House (2011).

Figure 2.1. **Multifactor productivity growth has slowed since the 1970s¹**

1. Non-farm business sector. Annual average growth rate. Periods correspond to business cycles (trough to trough) identified by the National Bureau of Economic Research (NBER).

Source: US Bureau of Labor Statistics and OECD calculations.

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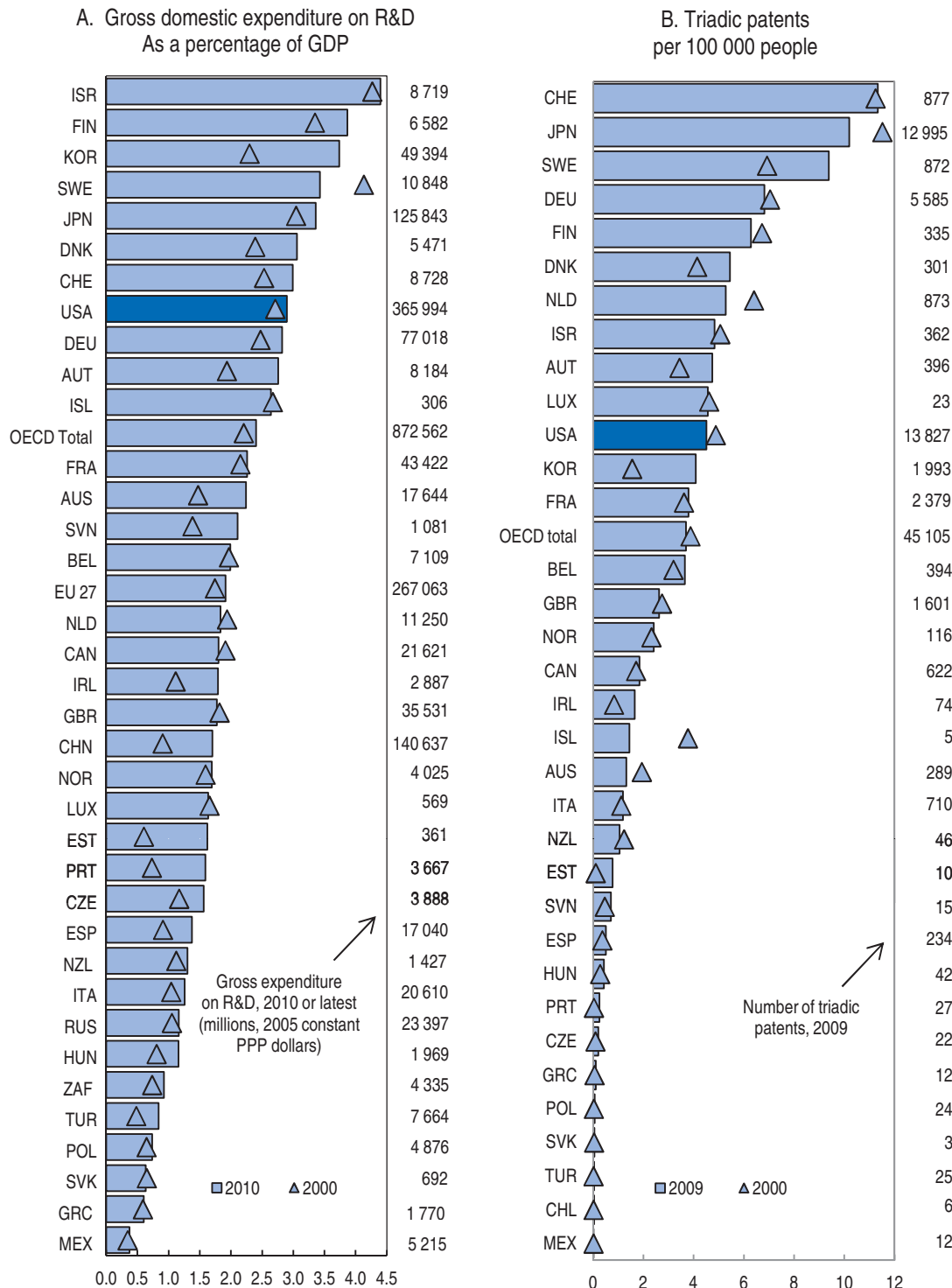
OECD countries, suggesting that the United States still has some advantages, most likely in the effective use of information technology to support changes in business practices (Brynjolfsson and Saunders, 2010).

This long-run decline in performance may well reflect the increasing difficulty of achieving transformational innovation now that the “low-hanging fruit have been picked” (Cowen, 2010). A related explanation is that the number of researchers and education attainment – factors that can explain most long-run MFP growth (Jones, 2002) – are no longer growing off a low base. In these circumstances, greater innovation investments than in the past would be required to counter the long-run decline in performance.

A more direct approach to measuring innovation performance is to conduct surveys of innovation outputs. For the time being, such data are quite limited in the United States, precluding comparisons over time and making them difficult across countries. The most important source of such information in the United States is the National Science Foundation’s (NSF’s) 2008 Business R&D and Innovation Survey (BRDIS), which has recently been modified to collect such data. For manufacturing firms, it shows that 22% introduced a new or significantly improved product during 2006-08 and the same proportion introduced a new or significantly improved process (NSF, 2010). For non-manufacturing firms, these proportions fall to 8%. Allowing for differences in design and coverage (notably non-manufacturing in BRDIS but services in the European Community Innovation Survey (CIS)), these rates may be around the OECD average (rates for other countries are available in OECD (2011a)). Improving these data sources should be a priority for the US authorities as this would allow policymakers to make better informed innovation-policy decisions.

The other main approach to measuring innovation performance is the proxy method, where indicators such as patents or R&D spending are tracked as a proxy for the level or rate of change of innovation, although these measures too are necessarily imperfect (US Department of Commerce, 2012; White House, 2012). Innovation surveys show that firms that make R&D investments are much more likely to innovate, such as by introducing a new product or process, than are other firms (NSF, 2010; OECD, 2011a). R&D spending as a share of GDP and per capita applications for triadic patents¹ (Figure 2.2) by US residents

Figure 2.2. **R&D spending and patent activity are slipping in global rankings but remain high**¹



1. In panel A, 2001 and 2010 for Sweden, Denmark and Norway, 2000 and 2009 for Japan, USA, China and OECD Total, 2000 and 2008 for Australia, Iceland and Switzerland, 2001 and 2007 for Greece, 2000 and 2007 for Mexico and 2001 and 2008 for South Africa.

Source: OECD, Main Science and Technology Indicators Database.

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are relatively high by international comparison but are rising less quickly than in some other countries, with the result that the United States is slowly slipping down the global rankings. Similarly, composite indicators such as INSEAD's Global Innovation Index (Dutta, 2011), which combines these and many other indicators considered to be relevant for innovation activity, suggest that US innovation performance is relatively good but not exceptional. The United States is ranked seventh out of 125 countries and fifth among OECD countries in 2011. This assessment concords with the findings in *The Atlantic Century* (Atkinson and Andes, 2011), which further finds that the US score stagnated over the past decade, resulting in its ranking slipping from first to fourth.

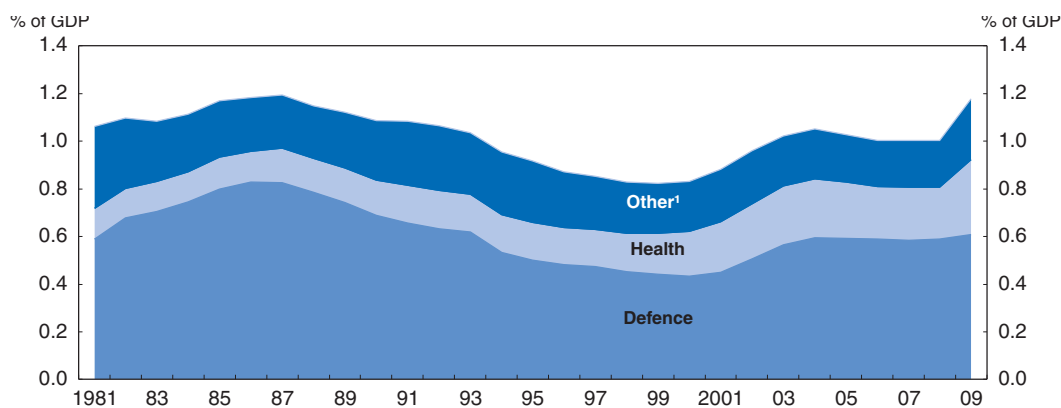
Strengthening government support for R&D investments

The government plans to increase federally-funded R&D

R&D investments are an important input to innovation. As noted above, firms that make R&D investments are much more likely to innovate. Yet firms under-invest in R&D because they are unable to capture fully the social returns on their investments owing to the public-good nature of knowledge. Much of the social return on R&D investments accrues to competing firms, downstream firms that purchase the innovating firms' products or consumers (Griliches, 1992). Empirical evidence suggests that social rates of return to R&D are substantially higher than private rates of return (Griliches, 1992), an indication that R&D investment is too low. In the absence of government involvement, the shortfall in fundamental research, which aims to expand scientific knowledge and thus does not have immediate commercial applications, is even greater as firms do not invest in such research. Yet it is an important foundation for private R&D investments. To increase R&D investments closer to the socially optimal level, the government finances most fundamental research and provides financial support to business R&D.

Federally-funded R&D budget allocations have fluctuated over the past three decades (Figure 2.3). The fluctuations have mainly occurred in defence, which declined with the

Figure 2.3. **US government budget allocations for R&D have fluctuated in recent decades**



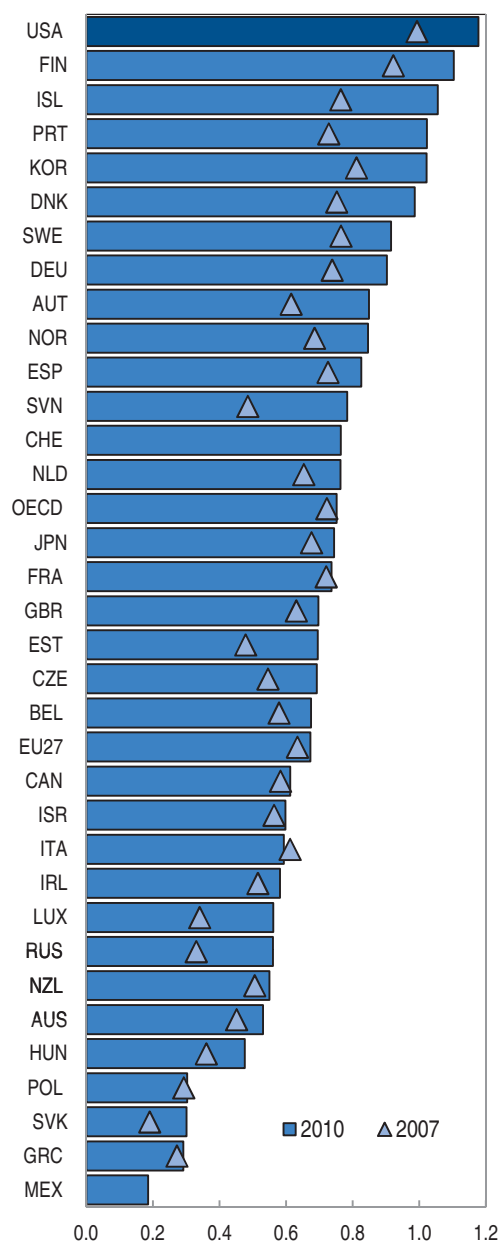
1. The category 'Other' includes: Exploration and exploitation of space and earth; Transport, telecommunications and other infrastructure; Industrial production and technology; Agriculture; Energy; and General advancement of knowledge (R&D financed from other sources than general university funding (GUF)).

Source: OECD – Research and Development Statistics – Government Budget Appropriations or Outlays for R&D (GBAORD) Database 2011.

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end of cold war but rose again following the 2001 terrorist attacks. Federal R&D spending received a sharp boost from the Recovery Act of 2009, temporarily pushing up such spending to 1.2% of GDP, the highest in the OECD (Figure 2.4). This increase was part of the

Figure 2.4. **US government R&D spending is high by international comparison**^{1, 2, 3}
As a percentage of GDP



1. For Mexico, the latest data available are from 2006. For Switzerland, France, EU27, Canada, New Zealand, Poland and Greece, the latest data available are from 2008. For the USA, Israel, Sweden, Spain, Slovenia, the United Kingdom, Estonia and Russia, the latest available data are from 2009.
2. In the United States, general support for universities is the responsibility of state governments; therefore general university funds (GUF) is not included in total Government Budget Appropriations or Outlays for R&D (GBAORD).
3. For Israel, defence is excluded.

Source: OECD, *Main Science and Technology Indicators Database*, June 2011.

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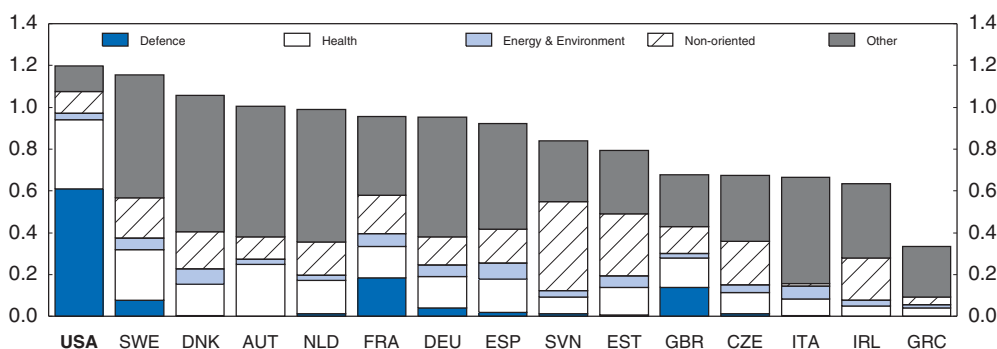
Administration's effort to reach the goal that the President set in April 2009 of devoting more than 3% of GDP to R&D, both public and private.

However, federal R&D spending will fall sharply if the expenditure reductions required by the Budget Control Act of 2011 are implemented. In view of the high social rates of return on R&D and the need for stable funding for R&D to be most productive, reductions in the federal R&D budget should be as limited as possible. It would be preferable to cut non-R&D expenditures (including tax expenditures) for legacy or incumbent sectors as this would facilitate the flow of resources to more productive uses. Ideally, Congress would go further by appropriating the funds approved in the 2007 America COMPETES Act, which called for doubling the funding of three key basic research agencies – the National Science Foundation (NSF), the Office of Science in the Department of Energy, and the National Institute of Standards and Technology (NIST) – within a decade. To date, Congress has only appropriated the first instalment towards realising this goal.

Policy makers need to be better informed about expected outcomes of R&D budget allocations


It may be possible to improve the allocation of the federal R&D budget by providing policymakers with better information about expected outcomes. The NSF's Science of Science and Innovation Policy (SciSIP) programme, which funds "... research that develops, improves and expands models, analytical tools, data and metrics that can be applied in the science policy decision making process", will contribute to making such information available. The results could be helpful to the President and Congress in determining R&D budget allocations, which are currently heavily weighted towards defence (mostly weapons development rather than research) and health in comparison with other countries (Figure 2.5), although judgements of experts in the various fields of science and technology are likely to remain important for such decisions. As regards non-defence, non-health government R&D budget allocations, the United States comes in lower than other OECD comparator countries.

Figure 2.5. **The shares of defence and health in government R&D budget allocations are high in the United States, 2010**
As a percentage of GDP



1. Health includes direct health government budget appropriations or outlays for R&D (GBAORD), advancement of knowledge (medical sciences) plus other funding.
2. Data for Greece refer to 2007. Data for France and the United Kingdom refer to 2008. Data for the Czech Republic, Estonia, Sweden, Spain, Slovenia, Ireland and the USA refer to 2009.

Source: OECD, Research and Development Statistics Database.

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Reforms to increase the impact on business R&D

Most governments support business R&D with the aim of correcting or alleviating two main market failures: difficulties of firms to fully appropriate the returns on their R&D investments, as discussed above; and difficulties in finding external finance, particularly for small innovation-based start-up firms. These market failures are manifest in a large gap between social and private returns on business R&D investment (Table 2.1). Government support is intended to raise business R&D closer to the socially optimal level.

Table 2.1. **Social rates of return on business R&D are far higher than private rates of return**

Researcher	Private	Social
Mansfield <i>et al.</i> , (1977)	25	56
Sveikauskas (1981)	7-25	50
Scherer (1982, 1984)	29-43	64-147
Bernstein-Nadiri (1991)	15-28	20-110

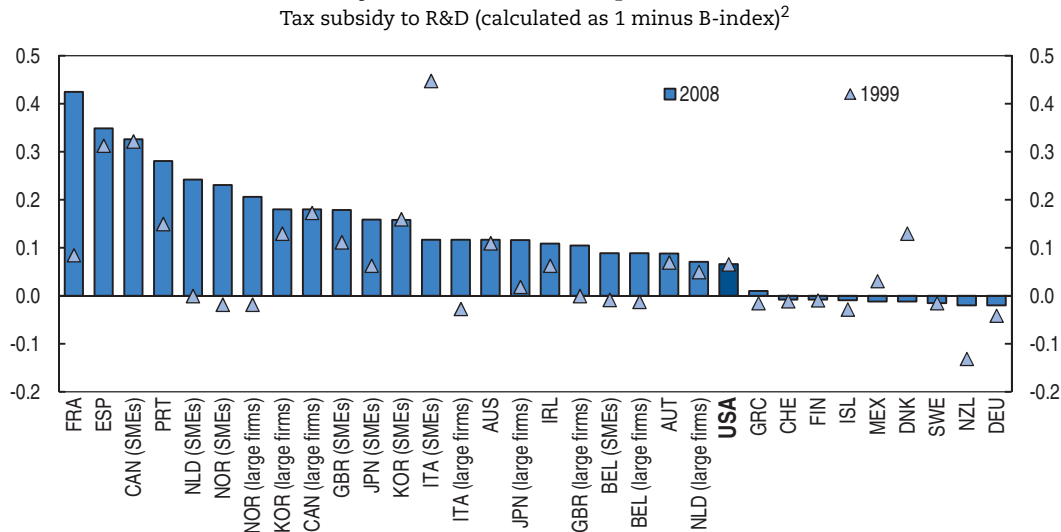
Source: Center for Strategic and International Studies, "Global Innovation/National Competitiveness", Washington, DC: CSIS, 1996.

Such support typically takes the form of subsidies or tax incentives. In the United States, subsidies are provided to businesses for early-stage exploration of new technical concepts, to assist small businesses in doing R&D, for certain high-potential sectors such as nanotechnology, and to help create new technology-based industrial clusters. Subsidies are often considered to have the advantage that they can be directed to high-impact areas. This can, however, be a disadvantage if policymakers are not able to identify such areas. In this case, tax incentives are preferable as they are a market-based tool that aims at reducing the marginal cost to firms of R&D activities in a neutral way, leaving firms to decide on which R&D projects to fund. A disadvantage of tax incentives, however, is that unless carefully constructed, they reward companies for doing R&D that they would have done anyway. To minimize this kind of wasteful subsidy, the US Research and Experimentation (R&E) tax credit is made available only for increases in R&D spending over a base amount.

Government also contracts with businesses to carry out R&D to help accomplish specific government missions such as national and homeland security, environmental protection and public health. In the United States, most government budget outlays to finance R&D in the business sector are in pursuit of such public missions, while a relatively small part is intended to offset the market failures noted above. Moreover, the tax subsidy for business R&D is relatively low in the United States by international comparison (Figure 2.6). Consequently, the combined support of business R&D through subsidies and tax incentives is relatively low in the United States by international comparison.

The Small Business Innovation Research Program (SBIR), which is worth over USD 2 billion annually is aimed at encouraging innovation-based start-ups. SBIR funds are designed as a first step on the procurement ladder. Awards are linked to public sector customer requirements and the details of the topic, the recipient and the agency making the award are published. The programme requires government agencies with a certain level of external R&D budget (mainly Department of Defence, National Institute of Health,


Figure 2.6. **The tax subsidy for business R&D is low in the United States by international comparison¹**



1. 2009 for Mexico.

2. The B ratio shows the minimum benefit to cost ratio at which a R&D investment becomes profitable given a jurisdiction's income tax treatment for firms performing R&D. The difference between unity (when the benefits and cost of R&D are the same) and the B ratio is the tax-subsidy ratio. For example, in France, 1 unit of R&D expenditure results in 0.425 unit of tax relief, making R&D investment profitable at a B ratio of 0.575.

Source: OECD, *OECD Science, Technology and Industry Outlook 2010*.

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NASA, National Science Foundation and Department of Energy) to set aside 2.6% of their funds for the programme, which offers competition-based awards in three phases:

- Phase 1 (6 months), up to USD 100 000 for a feasibility study allowing small firms to test the scientific and technical value of their R&D effort and its feasibility;
- Phase 2 (2 years), up to USD 750 000 for a full R&D effort;
- Phase 3, the firm pursues – with non-SBIR funds – the commercialisation objectives resulting from Phases 1 and 2. Phase 3 follow-on projects can benefit from US government R&D funding; awards are then funded from mainstream budget lines.

Evaluation of the SBIR programme, however, has been mixed. Data showed that SBIR awards did not lead to an increase in employment in firms and appeared to crowd out private money that companies previously spent on R&D (Wallsten, 2000). Analysis also pointed to an inherent incoherence in the selection process of award-winners: SBIR managers aim at selecting firms with a likelihood of commercial success (pick winners) as they are looking for success stories. Research has shown that SBIR project performance is highest for those projects in industrial segments which themselves receive the highest level of venture capital financing (Gans and Stern, 2003). This means that if the programme administrators are given a strong incentive to identify projects with the highest performance, SBIR funding may precisely focus on those segments which least need financial support. Instead, SBIR managers should fund proposals that are not likely to receive funds from private sources (Wallsten, 1998 and 2000) but that might yield great social returns. On the other hand, some evaluations of the SBIR programme show that awards have caused the creation of new firms, with positive benefits in employment and growth for the local economy (NRC, 2000). Quantitative analysis has stressed that award

recipients grew significantly faster in terms of employment and growth (over a ten years period) and were more likely to attract venture financing than comparable firms (Lerner, 1999).

All of these studies concur on the need for a continuous effort to carefully evaluate the SBIR programme to assess its real economic impact, to improve programme performance and spread best practice. They point to the fact that the efficiency of the programme could be increased through a regular internal/external assessment to inform agency management about programme outcomes (*e.g.* tangible results from firms' previous R&D awards should be examined more closely). Improved project management, notably by examining the track record of the firms receiving awards in order to help better identify multiple unproductive award-winners (NRC, 2008), would also raise the programme's impact.

Federal R&D support programmes should recognize the changing nature of innovation and adapt accordingly

Four important changes in the nature of industrial innovation should be taken into account in the design, implementation and funding of federal R&D programmes: i) open innovation; ii) service sector innovation; iii) globalization of innovation; and iv) basing innovation on the integration of technology with design, cultures, and business practices. These are each reviewed in turn.

Open innovation

Over the past two decades, many businesses have made radical changes in their innovation strategies. Whereas large firms once sought to invent and commercialize new technologies using their own resources, they now turn to external sources for ideas and technologies, including customers, suppliers, competitors, universities, government laboratories, and even the general public. This shift has reinforced the importance of collaboration in R&D, both among competitors and along supply chains, and it has made it imperative that all of the institutions are adequately supported and rewarded and that the interfaces between institutions operate as smoothly as possible. Policies that support R&D collaboration, that encourage technology transfer, and that take advantage of the virtues of clustering of capabilities are all steps in the right direction.

Service sector innovation

Innovation in the service sector has assumed substantially greater importance. The fact that the service sector now accounts for 80% of US economic activity means that continued growth in productivity and improvement in living standards depend heavily on service sector innovation. In the early 1960s, when much of present-day R&D policy was developed and programmes implemented, the service sector accounted for only a very small share of business R&D. Today, it accounts for 30%. With the exception of software, however, federal R&D programmes place relatively little emphasis on R&D in services. The National Science Foundation (NSF) and other agencies should aggressively explore opportunities to support fundamental research that is of value to the service sector, in part by encouraging researchers to acquire the background and skills needed to make contributions in the service industries.

Globalisation of innovation

Both R&D and innovation are increasingly conducted by global networks of complementary expertise and enterprises. Publications with co-authors from two or more countries are fast becoming the norm in science. Companies are increasingly engaged in developing new technologies along supply chains that span the globe and a rapidly increasing share of research and related publications are being carried out in countries other than the United States. Both academics and companies face barriers to more effective participation in global R&D. For example, academics find it difficult to use federal R&D funds to participate aggressively in global R&D networks owing to rigid rules governing the use of US funds to support research partners elsewhere. Federal programmes that encourage industrial R&D and technology commercialization often incorporate rules limiting the location of application of the results of such activities to the United States. These barriers made some limited sense when the United States was the unequivocal leader in R&D and innovation world-wide. Now, however, they are widely seen as problems for effective participation of US entities in global R&D and innovation networks. Federal policymakers should re-examine them with an eye to reform.

Integrating technology

It is widely recognized that a significant proportion of contemporary industrial innovation is based, not just on exploitation of new technologies resulting from advances in basic science, but on the integration of new technologies with new business practices, on the careful integration of technologies with design, and on the development of technologies that mirror and challenge contemporary cultures. This new world of innovation has been called the “Post-Scientific Society” (Hill, 2007). Firms operating successfully in the Post-Scientific Society need engineers, designers and marketing professionals who individually integrate understandings across the several disciplines mentioned above. However, little in the university curriculums in these disciplines or in the programmes of support to research and innovation recognizes these new realities.

One interesting educational model is Aalto University in Finland, which integrates three pre-existing institutions devoted to engineering, business, and the arts. Some have called for the extension of the STEM concept discussed below to embrace the “STEAM” framework (Science, Technology, Engineering, the Arts and Mathematics) as a way to move this topic to the current agenda of educational reform (see for example Rhode Island School of Design [2011]). Attention should be paid in both federal research and educational programmes to broadening the agendas of inquiry and pedagogy to develop a more systematic basis of fundamental understanding of how best to integrate technology, design, business and culture and to develop new curricula that prepare graduates for success in this new world.

States should shield their research universities from budget cuts

State universities are the backbone of the US network of research universities, which are among the best in the world (Figure 2.7). Public universities and colleges account for 68% of university and college R&D in the United States (NSF NCSES website). They represent a key strategic advantage for innovation.

However, states have recently sharply reduced university budgets in the context of fiscal consolidation (College Board Advocacy and Policy Center, 2011). These actions follow

declines in state support for universities in recent decades in the face of competing demands on state budgets from health-care costs and the costs of incarceration. As a consequence, universities have had to cut back on faculty salaries (or at least on their growth) and have no longer been able to afford “start up packages”² that new STEM faculty staff expect. Non-faculty staff have been cut and building maintenance and repairs have been deferred. The other main source of budget pressure is from the cap on the administrative share of indirect costs of federal research funds (the main source of public universities’ research funds). This cap, which has been held at 26% for some years, is widely considered to be too low (United States Government Accountability Office, 2010; Association of American Universities, 2010). Universities have to make up the shortfall in funds for indirect costs of research from appropriated or other unrestricted funds. Consequently, when states cut back funding and students resist tuition hikes (and states put pressure on universities to hold down tuition fees) public universities have to cut costs everywhere they can, including in support of research. The resources invested in research have also been reduced by universities asking faculty to teach more courses with more students in each when state funds are cut. In view of the importance of these universities to state innovation systems, states would do well to shield them from budget pressures.

Taking patent reform further

One of the main ways in which government aims to encourage R&D investments is patent protection. Patents give time- and scope-limited exclusive rights over the use of a new product or process, rewarding the patent holder and helping to address a possible market failure in the supply of technology and knowledge. However, concerns have been voiced about the functioning of the US patent system, most notably in thirty days of hearings held by the Federal Trade Commission (FTC) and the Department of Justice in 2002. These hearings were followed by a report with recommendations from the FTC (2003) and a study by a specially constituted committee under the National Academy of Sciences (National Research Council, 2004). Reform legislation was introduced in Congress in 2005, although passage was achieved only with the America Invents Act of 2011. Several academic books critical of the US patent system also appeared during this time: see Adam Jaffe and Josh Lerner, *Innovation and Its Discontents*, 2004 (institutional critique); James Bessen and Michael Meurer, *Patent Failure*, 2008 (problem of indeterminate boundaries and poor notice; showing extreme variation in benefits and costs across industries); and Dan Burk and Mark Lemley, *The Patent Crisis and How the Courts Can Solve It*, 2009 (emphasizing industry differences and the judicial tools available for addressing differences).

A principal target of criticism was the Court of Appeals for the Federal Circuit, which was established in 1982 to hear all appeals from the district courts and the United States Patent and Trademark Office (USPTO). By 1999, the Federal Circuit had reshaped patent law to make patents more widely available and more difficult to invalidate, including opening up the United States to software and business method patents. Contemporaneous with the introduction of reform legislation, the US Supreme Court, which had previously deferred to the Federal Circuit on patent matters, began accepting major cases for review. In *KSR International v. Teleflex*, 550 US 398 (2007), the Court raised the threshold of inventiveness demanded of patent applicants by striking down the Federal Circuit’s standard for obviousness. In *eBay v. MercExchange*, 547 US 388 (2006), the Court abolished the Federal Circuit’s rule of automatic injunctive relief for infringement, a rule that gave patent owners

powerful leverage over complex products. However, these landmark decisions do not appear to have had a discernible impact on the high volume of applications. Nor has the KSR decision reduced the number of patents issued. In fact, issuances have jumped significantly in the last two years.

Passed in 2011, the America Invents Act aims to increase patent quality by providing for new procedures for challenging patent validity, analogous to opposition proceedings in other systems, that may allow patent disputes to be resolved more quickly and at lower cost. It also allows the USPTO to prioritize certain applications, gives it some freedom to set fees and some assurance that fee income will not be diverted to other government purposes, and increases resources to reduce the backlog of patent applications and improve the quality of patent awards. The Act also replaces the first-to-invent rule, which had become a US anomaly, by a first-to-file rule with prior user rights in line with international practice. This eliminates costly interference proceedings that were sometimes needed to determine who had reduced the invention to practice first. At the same time, unlike many other jurisdictions, US law retains a 12-month grace period that gives patent priority to the first inventor to publish within a year to filing. This grace period may promote earlier disclosure of new scientific knowledge, helping to foster a more rapid rate of cumulative innovation.

Efforts to reform the calculation of damages to reflect the relative contribution of the patented technology met with resistance outside of the ICT sector and were abandoned. In line with the FTC's recent analysis (Federal Trade Commission, 2011), damages awarded for patent infringement should reflect the relative contribution of the patented function relative to the product as a whole based on what a willing licensee would have paid had they known about the patent ahead of time. While there is evidence that courts appear to be embracing a more disciplined approach to awarding "reasonable royalties" (*e.g.*, *Uniloc v. Microsoft*, Fed. Cir. 2011, 632 F.3d 1292), there remains a long way to go to get a consistent standard.

The division between complex and discrete technology perspectives was also evident in controversy over the timing of the various administrative invalidation procedures, especially the new post-grant review proceeding, which was limited to the nine-month period following issuance of the patent. The ICT sector wanted an alternative for contesting patents when litigation was threatened since the high volume of ICT patenting makes it impractically costly to monitor and evaluate patents as they issue, especially since most patents will never be asserted.³ Evaluating patents is extremely expensive; the 2011 American Intellectual Property Law Association Report of the Economic Survey shows an average cost of USD 13 712 for an opinion on patent validity.

While the Supreme Court's *eBay* decision reduced awards of injunctive relief by about one-quarter, patent owners have taken to filing before the International Trade Commission, which still provides virtually automatic exclusionary orders for imported products that are found to infringe.⁴ Since most information technology is imported, the remedy is very potent and can essentially bar an entire product line from the US market, regardless of the relative significance of the infringed patent. However, in recent high-profile cases the Commission has allowed defendants a period of time to design around or remove the patented function.

Nevertheless, non-producing patent assertion entities retain considerable ability to hold up producing companies, while at the same time having no exposure to the patents

that producing companies have in their arsenals. This has recently led large producing companies to spin off portions of their portfolios to patent assertion entities that can maximise payoffs from the patents and raise rivals' costs – a practice known as “privateering”. The net effect is to impose growing costs and risks on companies engaged in innovation. To counter these effects, patent reform needs to be taken further by ensuring that the legal standards for granting injunctive relief and damages awards for patent infringement reflect realistic business practices and the relative contributions of patented components of complex products.

Although the Act allows the USPTO to tailor patent fee schedules to better recover its costs, it only allows recovering the costs of its internal operations. This limits the extent to which the USPTO can set patent fees at levels that would account for the potential externalities of patenting activity, such as the search burden imposed on other innovators who wish to avoid infringing (Menell and Meurer, 2012). Again, this is a burden that may be insignificant for discrete products where notice is effective and competitors are naturally aware of each other's patents, but overwhelming for complex products where innovation is cumulative and patents are voluminous. In short, some sectors observe patents and others ignore them (Lemley, 2008).

The USPTO's recently proposed fee structure provides for more sharply rising maintenance (renewal) fees consistent with the principle that information about technology value emerges over time and with the desirability of reducing clutter from patents of marginal value (de Saint-Georges and Van Pottelsberghe, 2011). However, despite legislatively mandated reduced fees for small and “micro” entities as an explicit subsidy, the fee structure continues a front-end subsidy on the grounds that more patents are better.⁵ Clearly, there are industry and professional differences about this. While China clearly embraces this view, albeit in a different manner, the European Patent Office (EPO) has taken a more conservative approach. An implicit subsidy for marginal patents will inevitably lower average patent quality and increase information asymmetries and strategic behaviour in the patent marketplace. Moreover, under-pricing the front-end fees provides patent offices with an incentive to grant patents, since they receive nothing for applications denied, and the repercussions of wrongly issued patents are experienced only indirectly at some future time. This is especially likely in times of chronic budget shortfalls (Frakes and Wasserman, forthcoming 2013). While the United States is not alone in subsidizing applications and examination, patent quality is generally considered to be more problematic for the USPTO than the EPO and the Japanese Patent Office, the other two “trilateral” offices (European Patent Office (2011); Quillen and Webster (2006); de Saint-Georges and Van Pottelsberghe [2011]).

The interplay between patent administration and market behaviour is beyond the scope of this report. However, there is growing concern in OECD economies over the implications of the activities of patent assertion entities and aggregators.⁶ There is renewed concern about strategic behaviour (“privateering”) by some large producing companies, which now collaborate with patent assertion entities in ways that raise costs for rivals and consumers without contributing meaningfully to innovation (Ewing and Feldman, 2012; Ewing, 2012).

To date, only the FTC has been active in analysing patent markets. Following the lead of the European Patent Office in 2004, the USPTO hired a chief economist in 2010, but an effort is needed to understand the dynamics of patent practice beyond the walls of the

USPTO. This should lead to better understanding of patent practice, more informed patent policy, and better integration with US innovation policy. However, it is clear that given the state-created nature of patent rights and the growing strategic state intervention in patent markets, the functioning of patent markets must be addressed from an international perspective. Given the historic prominence of the US system and the US origins of emerging and controversial practices, the USPTO and the FTC should play a leading role in international analysis and debate.

Government action to increase green innovation⁷

Innovation can help to make economic growth “green” by contributing to decoupling it from depletion of the natural resources and environmental services. Firms under-invest in green innovation because they are unable to capture the full social returns on their investments owing to the public-good nature of knowledge, as for other forms of innovation. In addition, the presence of dominant designs, technologies and systems in key sectors such as energy and transport can create entry barriers for new technologies and competitors owing to, for example, the high fixed costs of developing new infrastructures.

The starting point for increasing green innovation is to price environmental externalities in a clear and stable way. This increases households’ and firms’ incentives to develop and adopt green technologies, leading to the establishment of markets for green innovation. The United States has had a very favourable experience with pricing sulphur dioxide (SO₂) emissions (which cause acid rain) in the electric power sector, but Congress failed to pass legislation in 2010 to price Greenhouse Gas (GHG) emissions. Given the Supreme Court ruling that GHG emissions are a form of pollution and that consequently the US Environmental Protection Agency (EPA) is obliged to limit them, the EPA has recently proposed to introduce regulations to limit carbon dioxide (CO₂) emissions from new power stations, which would effectively render new coal-fired power stations uneconomic. This is an important sector because it accounts for a large share of US CO₂ emissions; indeed, this is one of the two sectors – the other is transportation – that account for such high per capita emissions in the United States relative to European countries (Carey, 2010).

In the area of transportation, the EPA and the Department of Transportation (DOT) have issued new joint regulations to reduce GHG emissions and increase fuel economy of new passenger cars and light trucks sold in model years 2012 through 2016. The EPA projects that CO₂ emissions per mile of the average new light-duty vehicle will be 23% lower by 2016 than in 2011 and that fuel savings associated with the more efficient GHG technologies will far outweigh the higher initial vehicle costs by 2020 (US Environmental Protection Agency, 2010). EPA and DOT have also issued a joint proposal – due to be finalized this summer – extending this programme to reduce further GHG emissions and improve fuel economy for model years 2017 through 2025. It is projected by EPA to save approximately 4 billion barrels of oil and 2 billion metric tons of GHG emissions over the lifetimes of those light duty vehicles sold in model years 2017-25. In addition, the Administration has finalized the first-ever national fuel efficiency and GHG emission standards for heavy-duty trucks, vans and buses spanning model years 2014-18. Given that greater fuel economy is likely to encourage more vehicle use, these measures should be complemented by an increase in gasoline taxes, which are exceptionally low by international comparison (Carey, 2010), until GHG emissions are priced.

Increased government investment in basic- and long-term research is also required. Such investment, which is not undertaken by private firms as it has no immediate commercial applications, helps address fundamental scientific challenges and fosters technologies that are considered to be too risky, uncertain or long-gestating for the private sector. Such research should increasingly be based on multi-disciplinary and interdisciplinary approaches and should target generic technologies as opposed to highly specific technologies (*e.g.*, target energy storage devices instead of lithium-ion batteries), as innovations may emerge from a wide range of fields. As noted above, the American Recovery and Reinvestment Act (ARRA) of 2009 gave a large temporary boost to federal R&D expenditures. The ARRA included USD 400 million of funding for the Department of Energy's (DOE's) Advanced Research Projects Agency – Energy (ARPA – E), which promotes and funds work on advanced energy technologies that might not otherwise occur because of a high risk of failure. The doubling of the research budgets for three key scientific agencies discussed above would be very helpful in boosting fundamental research.

While these budget increases go in the right direction, still larger increases are likely to be required to enable backstop technologies to emerge and hence substantially reduce GHG abatement costs. Assuming a world carbon price scenario that targets a GHG concentration of 550 ppm, OECD (2009a) estimates that global energy R&D investments would need to rise approximately six-fold initially, to 0.12% of global GDP, to enable backstop technologies to emerge.⁸ By 2050, abatement costs and GDP costs could be one half of the levels without such technologies; these results accord with those in other studies (Edmonds *et al.*, 2007; Manne and Richels, 1992; and Clarke *et al.*, 2006).

This greater research effort would also benefit from enhanced international cooperation to share the costs of public investment, improve access to knowledge and foster the transfer of technologies across countries. In this regard, the United States cooperates with other members of the Major Economies Forum on Energy and Climate (MEF) to promote innovation, deployment and information sharing in low GHG-emissions technologies, as well as through the Clean Energy Ministerial (CEM). The CEM, announced by MEF leaders in 2009, is a high-level global forum that promotes policies and programmes to advance clean energy technology, share lessons learned and best practices, and encourage the transition to a global clean energy economy. Action plans have been developed in the technologies considered to be the most important for reducing emissions. The United States is leading the action plans on energy efficiency in the buildings sector and industrial sector.⁹ The US government has also substantially increased its assistance to developing countries to help them with abatement and adaptation measures (Carey, 2010).

To overcome specific market failures associated with green innovation, support for private investment in innovation, notably R&D, and for the commercialisation of green innovations is needed. Such support may be required because green innovation faces additional barriers in some markets, such as barriers to entry in the electricity sector. The ARRA included a considerable boost to funding to improve the electric grid so that it is better adapted to receiving and managing renewable energy and an additional USD 6.0 billion of loan guarantees offered through the Innovative Technology Loan Guarantee Program. These measures complement those taken by twenty-five states and the District of Columbia to establish renewable (energy) portfolio standards (RPS) (IEA, 2008). Unfortunately, these standards use different design principles and goals, increasing the cost by limiting cross-border trade in renewable energy. The federal government should

establish a federal electricity RPS, covering those parts of the country in which cross-border trade in electricity is feasible, to overcome these problems.

The Renewable Fuels Standard (RFS), which mandates a progressive increase in the bio-fuel content of gasoline sold in the United States, highlights the dangers of favouring specific technologies and of lobbies shaping the programme to their advantage. In its initial incarnation in *The Energy Policy Act of 2005*, the OECD (2008) estimated that abatement costs under the RFS were high (at least USD 1 000 per tonne of CO₂). Moreover, the programme had also taken land out of production of food, pushing up prices. The revisions to the RFS in *The Energy Independence and Security Act of 2007 (EISA)* give increased weight to bio-fuels that are more effective in reducing GHG emissions, allowing for direct emissions and significant indirect emissions (such as from indirect land use changes), represent a substantial improvement. The cost effectiveness of the programme increased further when the import tariff on sugarcane-based ethanol and subsidies for corn-based ethanol expired at the end of 2011.

One possible approach to overcoming market failures more prevalent in green- than other technologies while avoiding the problems arising from targeted support for specific innovations is to support sustainable infrastructure (such as the smart electric grid discussed above) or basic conditions for a wide range of alternative technologies, *e.g.*, as noted above, energy storage technologies that are needed for a wide range of technologies, or general purpose technologies such as ICT that have a wide range of applications. This approach is widely followed in the federal R&D budget. In addition to support for research in ICT, the budget also provides considerable support to research in industrial biotechnology and nanotechnology, areas that are likely to be important for green innovation.

Measures to strengthen innovation in manufacturing

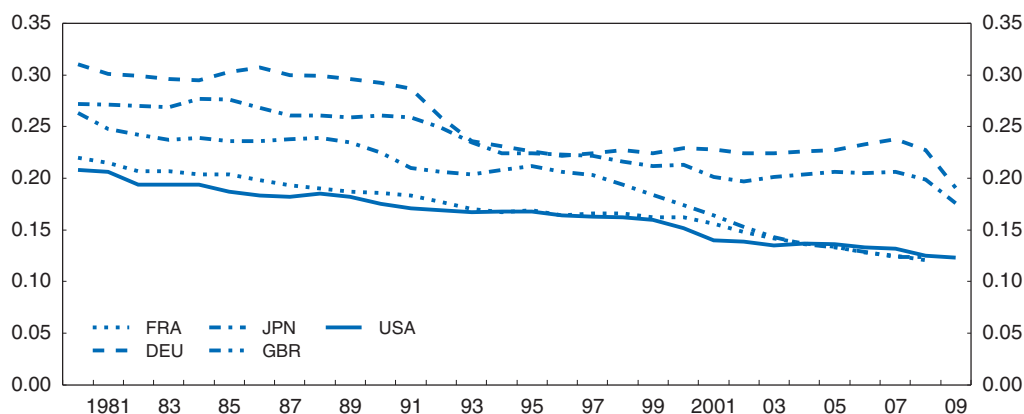
Manufacturing firms play a key role in innovation. They perform 70% of all privately-funded business R&D¹⁰ and a significant proportion of industrial R&D performed in non-manufacturing sectors is done in close collaboration with or in direct service of manufacturing. This preponderant role in R&D makes them important players in innovation because, as noted above, firms that invest in R&D are much more likely to innovate (by introducing a new product or process) than are other firms (NSF, 2010; OECD, 2011a). In addition, important service sectors, such as information and health care, depend directly on manufacturing firms for the continued flow of new products that they embed or use in their services, such as network servers and routers for the information services industry and pharmaceuticals, instrumentation and medical devices for the health services industries. Because minimizing the time to market is important to the competitive success of leading service sector firms, it is to their advantage to be located close to associated R&D and early-stage manufacturing centres for the new devices they depend on.

Small firms – especially new, technology-based firms – are particularly important to innovation in advanced manufacturing sectors such as pharmaceuticals (Kaitin, 2010) and optical materials (St John and Pouder, 2007). Sustained innovation by established small and medium sized manufacturing firms is also critical to enabling innovation in the larger firms that are their customers for new materials, parts, components and subassemblies that become part of higher level system innovations made by the larger firms. Put another

way, manufacturing innovation increasingly takes place, not in single large firms, but along supply chains and supply networks of firms of diverse sizes that collaborate to produce complex and innovative new systems (Dyer, 2000; Paasi *et al.*, 2010).

As in most other economically advanced countries, the share of manufacturing in total value added declined steadily in the United States over the last decades of the 20th century before falling sharply over the past decade (Figure 2.8). The employment share of manufacturing has declined even more, reflecting relatively high productivity growth in this sector. This has been underpinned by the applications of more efficient technologies in manufacturing, the continuing closure of large numbers of older, less efficient manufacturing facilities, and the shift to production of higher-valued goods.¹¹ Manufacturing productivity has also been boosted by firms focusing on their core competencies, where productivity is generally high, while outsourcing labour-intensive functions such as financial and accounting services, logistics services, maintenance, legal services, medical services, and food services, where productivity is often lower, to service sector companies.

Figure 2.8. **The share of manufacturing in total value added has been declining in the United States and other OECD countries**



Note: For Germany, data from 1980 to 1991 refer to West Germany.

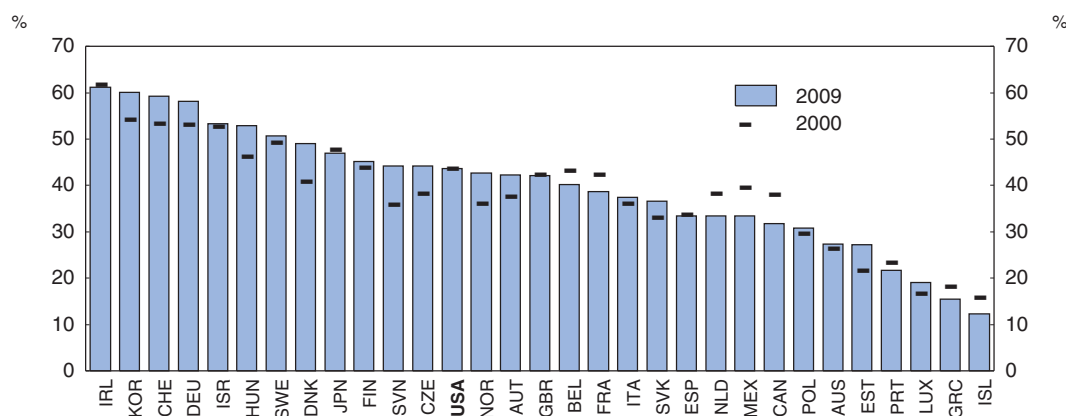
Source: OECD, STAN Database.

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Value added in high- and medium-high tech manufacturing, which is particularly innovation-intensive, has only grown at the same rate as manufacturing value added in the United States over the past decade, in contrast to some other OECD countries such as Germany and Switzerland (Figure 2.9). The US share of such manufacturing in the total is middle ranking among OECD countries. The increasingly negative US balance of trade in advanced technology products may also be an indication of competitiveness problems for US manufacturers in technology-intensive product categories (Figure 2.10).

Only a few of the large, integrated flagship industrial R&D laboratories that were established by major manufacturers in the decades before and after World War II have survived, leaving serious questions about where the capabilities reside to create the next generations of radical and transformative manufacturing innovations like those of the past such as the transistor, the semiconductor chip, optical fibres, carbon-fibre reinforced plastics, jet engines, and the like. In addition, US-based multinational firms have

Figure 2.9. **The share of high- and medium-to-high tech manufacturing in total manufacturing value added in the United States ranks around the middle of OECD countries' shares**



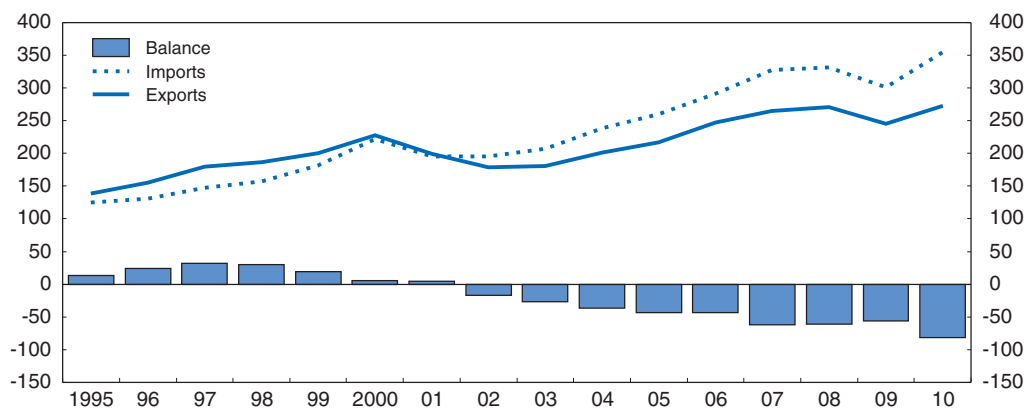
Note: Data for Germany, Switzerland, Israel and France refer to 2008. Data for Norway, the United Kingdom and Poland refer to 2007. Data for Portugal refer to 2006. Data for Australia refer to 2005.

Source: OECD, STAN Database.

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Figure 2.10. **The US trade balance in advanced technology products has deteriorated over the past decade**

USD (billions)



Source: National Science Board, *Science and Engineering Indicators* 2012.

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increasingly located important elements of their R&D and innovative activities in other countries, responding to market opportunities there, as well as to the apparently greater availability of appropriately skilled and priced workforces, and to the demands of some host countries. The share of US-based multinational corporations' R&D performed overseas increased from 12% in 1999 to 16% in 2008 (National Science Board, 2012). US firms have also reduced their commitment to funding basic research (National Science Board, 2008). Small, entrepreneurial, technology-based firms have emerged to pick up some of the slack; and federal laboratories and universities have been enlisted in the past three decades to assist industry in its innovation work, enabled by the 1980 Bayh-Dole Act and the Stevenson-Wydler Technology Innovation Act of 1980 as amended by the Federal

Technology Transfer Act of 1986 and other amendments. These acts created both the authorities and the means by which universities and government laboratories could work with industry and transfer technology to industry with appropriate intellectual property protections in place. Innovation clusters, made up of several firms in similar lines of business, academic institutions, and suppliers of critical inputs and services, are increasingly seen as important mechanisms for aggregating the resources of people, knowledge, experience, and capabilities needed to make major new advances in focused areas of technology (Porter, 1998).

Economic studies show that there are agglomeration- (Greenstone, Hornbeck and Moretti, 2008) and knowledge (Keller, 2010; Branstetter, 2001) spillover benefits from manufacturing activity that benefit locations that have such activity. In light of these spillovers, measures to promote innovation in manufacturing are warranted. To this end (and/or to encourage US firms to conduct more of their manufacturing activities in the United States), the Administration has recently taken a number of steps to better focus existing resources on assisting manufacturers and it has proposed additional actions that would require congressional action for their realization. For example, in June 2011 the President announced the Advanced Manufacturing Partnership to focus approximately USD 500 million of existing programme funds on improving manufacturing performance for national security needs, reducing the time to develop and deploy advanced materials, develop next generation robotics and develop new energy-efficient manufacturing processes, as well as other activities. In December 2011, new co-chairs of the White House Office of Manufacturing Policy were appointed to coordinate “the execution of manufacturing programmes and the development of manufacturing policy”. In January 2012, the President proposed that Congress consider changes in the federal tax code to encourage manufacturers to produce in the United States.

The President has also proposed warranted reforms to the US international tax system that address the current distortion that favours outward FDI over domestic investment. These reforms would make shifting profits offshore less attractive by: imposing minimum tax on foreign income of foreign subsidiaries located in no or low tax jurisdictions; taxing on a current basis excess profits associated with shifting intangibles to low-tax jurisdictions; and requiring that deductions for interest expense attributable to outward FDI be delayed until the related income is taxed in the United States.

To strengthen manufacturing innovation in the United States, especially in large firms, the existing Research and Experimentation (R&E) tax credit also should be reformed. Consideration should be given to increasing the tax credit, which is relatively low by international comparison (see Figure 2.6), as it is likely to be effective at increasing business R&D (OECD, 2011b). In addition, the R&E tax credit should be made permanent, as proposed in the President’s FY 2013 budget, to strengthen its impact on R&D investments (Guellec and van Pottelsberge de la Potterie, 1997). The proposal in the President’s FY 2013 budget to simplify the tax credit, which has become increasingly complex, also should be implemented to facilitate use of the credit.

Strengthening innovation in small- and medium-sized US manufacturing firms will require a broader and more sustained investment in regionally-based programmes of direct technological and operational assistance, organized around clusters of manufacturing firms in similar sectors where appropriate. The *Fraunhofer* Institutes in Germany¹² provide an interesting model for what could be done in the United States,

although some adjustments to the *Fraunhofer* model would be needed for them to fit US circumstances. The much greater size of the United States along with greater dispersion of industrial activity in specific sectors suggests that duplication of *Fraunhofer*-type centres would be appropriate. In addition, experience with programmes like the Manufacturing Extension Partnership at the National Institute of Standards and Technology (NIST) suggests that the scope of centre activity might effectively incorporate assistance to firms on business practices and in employee training. The Administration's new National Network for Manufacturing Innovation (NNMI) is to be structured very much along these lines (www.whitehouse.gov/the-press-office/2012/03/09/president-obama-announce-new-efforts-support-manufacturing-innovation-en). The NNMI will be funded initially from existing programmes in the Departments of Defence, Commerce and Energy and NSF on an interagency basis. In his FY 2013 budget proposal, the President has asked Congress to appropriate USD 1 billion to NIST to set up the national network.

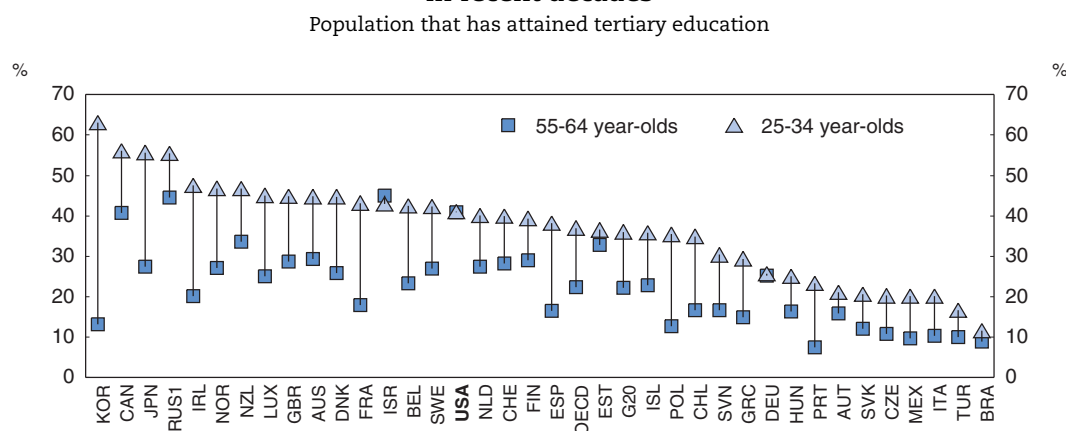
Further investments in upgrading American workers' skills

Increasing tertiary education attainment rates

Human capital policies influence the extent to which workers acquire the analytical skills required to adapt to technological change. The greater these skills, the more easily resources can flow to their most productive uses, thereby promoting investments in intangible assets (such as R&D) and innovation.

A major concern in this regard is that tertiary attainment rates in the United States have not been increasing in recent decades, in contrast to most other OECD countries, and for the younger generation, are now exceeded in many other countries (Figure 2.11). The lead that the United States had throughout the post-World War II period in the share of its workforce with tertiary education attainment rates is gradually being eroded as the younger cohorts replace the older ones in the labour force.

Figure 2.11. **US tertiary education attainment rates have stagnated in recent decades**



Note: Countries are ranked in descending order of the percentage of the 25-34 year-olds who have attained tertiary education.

1. Year of reference 2002.

Source: OECD, *Education at a Glance* 2011.

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At the same time, there has been a very large increase in the college wage premium since 1980, from which it can be inferred that the relative demand for college educated workers grew more rapidly than the relative supply over this period (Box 2.2). Indeed, the increase in the college wage premium since 1980 reversed the decline that had occurred since 1915, restoring the college wage premium to approximately its 1915 level (Figure 2.12). Goldin and Katz (2008) estimate that the college wage premium has increased by 24 percentage points since 1980 to 60% in 2005.

Box 2.2. Growth in the relative supply of college graduates was lower than growth in the relative demand over 1980-2005, fully reversing the declines in the college wage premium that had occurred since 1915

Growth in the demand for skills can be derived from growth in their supply and in skill earnings premiums. Goldin and Katz (2008) estimate that the average annual growth rate in the relative supply of college-equivalent educated workers (college graduates plus half of those with some college) to high-school equivalent workers (those with 12 years or fewer of schooling plus half of those with some college) was only a little more than half as much over 1980-2005 as over 1960-80 (Table 2.2). The college/high school wage premium, on the other hand grew markedly over 1980-2005 after having stagnated over 1960-80. Assuming an elasticity of substitution between skilled and unskilled workers of 1.64, Goldin and Katz estimate that the annual average growth rate in the relative demand for college educated workers slowed slightly in 1980-2005 from 1960-80; assuming other plausible values for the elasticity of substitution between the two groups of workers does not materially alter this conclusion. Thus, the increase in the college wage premium over 1980-2005 reflects a slowing in the growth of the relative supply of college graduates, not an acceleration in the growth in relative demand for college skills. These authors estimate that growth in the relative demand for college-educated workers has been steady over most of the 20th century. During 1915-60, the relative supply of college-educated workers grew more quickly than demand, driving down the college wage premium. For the period 1915-2005, growth in the relative supply and demand for college educated workers was in balance, leaving the college premium the same at the end of the period as at the beginning.

The “relative wage” shown in Table 2.2 is the log (college/high school) wage differential, which is the college wage premium. The relative supply and demand measures are for college equivalents (college graduates plus half of those with some college) relative to high school equivalents (those with 12 or fewer years of schooling and half of those with some college). The log relative supply measure is given by the log relative wage bill share of college equivalents minus the log relative wage series:

$$\log \left(\frac{S}{U} \right) = \log \left(\frac{w_s S}{w_u U} \right) - \log \left(\frac{w_s}{w_u} \right)$$

where S is efficiency units of employed skilled labour (college equivalents), U is efficiency units of employed unskilled labour (high school equivalents), and w_s and w_u are the (composition-adjusted) wages of skilled and unskilled labour. The log relative wage bill is based on the series for the wage bill share of college equivalents in Appendix Table D.1. of Goldin and Katz (2008). The relative demand measure $\log(D_{su})$ depends on σ_{su} and follows from equation (3) in the text:

$$\log (D_{su}) = \log \left(\frac{S}{U} \right) + \sigma_{su} \log \left(\frac{w_s}{w_u} \right)$$

Box 2.2. Growth in the relative supply of college graduates was lower than growth in the relative demand over 1980-2005, fully reversing the declines in the college wage premium that had occurred since 1915 (cont.)

To maximize data consistency across samples in the measurement of education, changes from 1980 to 1990 use the Current Population Survey (CPS), changes from 1990 to 2000 use the census, and changes from 2000 to 2005 use the CPS. The changes for 1915 to 1940 are for Iowa. See Autor, Katz and Kreuger (1998) for details on the methodology for measuring relative skill supply and demand changes.

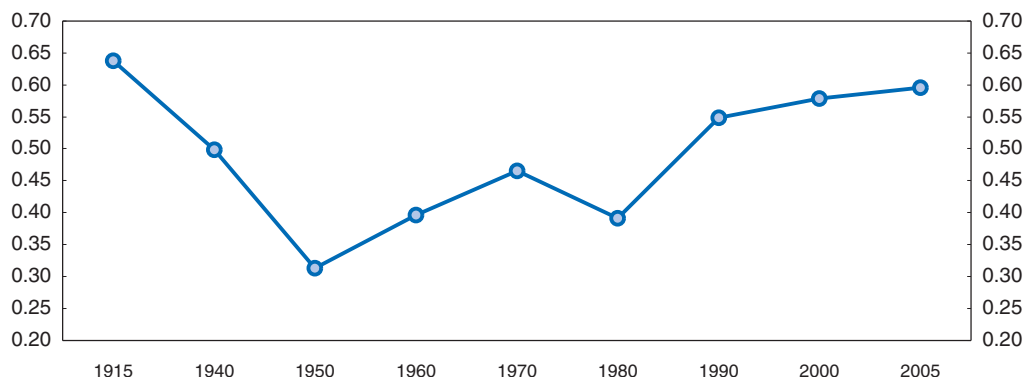
Table 2.2. Changes in the college wage premium and the supply and demand for college educated workers: 1915 to 2005 (100 * Annual log changes)

	Relative Wage	Relative Supply	Relative Demand ($\sigma_{SU} = 1.4$)	Relative Demand ($\sigma_{SU} = 1.64$)	Relative Demand ($\sigma_{SU} = 1.84$)
1915-40	-0.56	3.19	2.41	2.27	2.16
1940-50	-1.86	2.35	-0.25	-0.69	-1.06
1950-60	0.83	2.91	4.08	4.28	4.45
1960-70	0.69	2.55	3.52	3.69	3.83
1970-80	-0.74	4.99	3.95	3.77	3.62
1980-90	1.51	2.53	4.65	5.01	5.32
1990-2000	0.58	2.03	2.84	2.98	3.09
1990-2005	0.50	1.65	2.34	2.46	2.56
1940-60	-0.51	2.63	1.92	1.79	1.69
1960-80	-0.02	3.77	3.74	3.73	3.73
1980-2005	0.90	2.00	3.27	3.48	3.66
1915-2005	-0.02	2.87	2.83	2.83	2.82

Goldin and Katz (2009), Table 8.1.

Figure 2.12. The college/high school wage premium has increased sharply since 1980, reversing earlier declines¹

College graduate wage premium (log wage differential, college/high school)



1. 1915 Iowa State Census; 1940 to 2000 US Census IPUMS; 1980, 1990, 2000, and 2005 CPS MORG samples; and February 1990 CPS.

Source: Goldin, C. and L.F. Katz, *The Race Between Education and Technology*, The Belknap Press of Harvard University Press (2008).

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An important route for increasing tertiary attainment rates is to increase degree completion rates, which are relatively low. Measures such as those discussed in Chapter 1 to increase completion rates should be implemented. These include making pathways to graduation shorter and more rapid, helping part-time students to reconcile work and study schedules, alleviating liquidity pressures on students and their families, and improving secondary education so that more students are college ready.

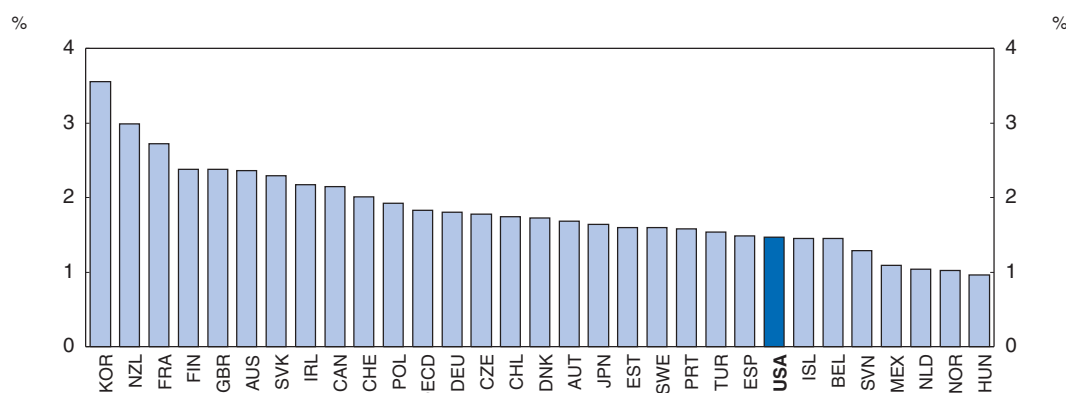
Reducing barriers to graduating in STEM disciplines¹³

STEM graduates are a key input into innovation. However, they represent a relatively low share of persons aged 25-34 years in employment in the United States (Figure 2.13). Moreover, the share of STEM in total graduations has not increased over the past decade except at the PhD level (Table 2.3), despite wage data pointing to persistent and, at lower qualification levels, worsening shortages of STEM workers (Figure 2.14). Langdon *et al.* (2011) estimate that the STEM-earnings premium increased from 18% in 1994 to 26% in 2010. They further estimate that all STEM degree holders receive an earnings premium relative to other college graduates, whether or not they work in a STEM job, although the premium is greater if they do.

Many students enter college intending to major in a STEM field but fewer than 40% of them complete a STEM degree (President's Council of Advisors on Science and Technology, 2012). A major problem is that many students are not well prepared for STEM tertiary studies (OECD, 2009b). The Administration has launched a variety of initiatives to improve secondary-school student achievement in STEM fields. They focus on improving science and mathematics teachers' subject knowledge, pedagogical skills and compensation as well as their evaluation and professional development. Efforts should also be made to increase female achievement, which lags further behind male achievement in these subjects than in most other countries, and achievement of other under-represented groups

Figure 2.13. The number of STEM graduates in relation to total employment of persons aged 25-34 is relatively low in the United States (2009)¹

Number of graduates (science and engineering) divided by the total number of 25-34 year-olds in employment, per cent



Note: Science-related fields include life sciences; physical sciences, mathematics and statistics, computing; engineering and engineering trades, manufacturing and processing, architecture and building.

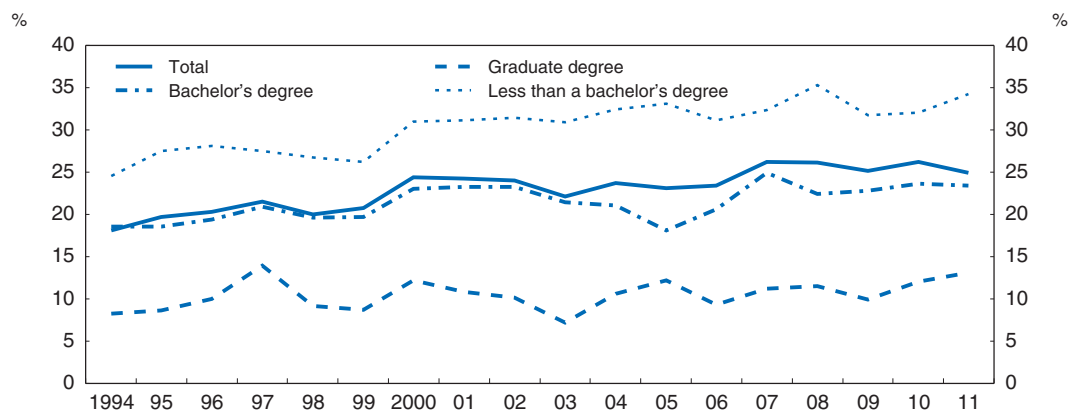
1. Data for Australia and Canada refer to 2008.

Source: OECD, *Education at a Glance* 2011.

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Figure 2.14. **STEM workers receive a significant earnings premium over other workers with the same level of education**¹

Private wage and salary, workers aged 25 and over



1. Regression-based hourly earnings premiums for STEM workers over non-STEM workers with the same level of education 1994-2010. These earnings regressions (log earnings is the dependent variable) control for age (up to a fourth degree polynomial of age), gender, marital status, race and Hispanic origin, nativity and citizenship, educational attainment, metropolitan area, region, union representation, major industry, STEM occupation, time, and STEM occupation interacted with time (Langdon et al., 2011). The regressions use Current Population Survey public use micro-data files of annual merged outgoing rotation groups from the National Bureau of Economic Research for 1994-2010.

Source: Langdon et al. (2011).

StatLink  <http://dx.doi.org/10.1787/888932638697>

Table 2.3. **STEM degrees have grown more slowly than non-STEM degrees, except at the doctoral level**

2000-09
Per cent

	Annual average growth rate		STEM share of all degrees	
	STEM ¹	non-STEM	2000	2009
Doctoral				
All citizenships	5.7	1.5	62.0	66.6
Males	3.5	0.5	67.9	71.3
Females	9.5	2.5	54.5	62.0
US citizen/permanent resident	5.9	1.2	56.9	61.6
Males	3.1	-0.1	61.5	64.3
Females	9.9	1.9	52.0	59.5
Master's				
All	3.0	4.0	21.0	20.0
Males	3.4	3.6	28.3	27.9
Females	3.4	4.7	15.6	15.2
Bachelor's				
All	2.0	3.1	31.8	31.2
Males	2.2	3.1	36.9	36.3
Females	1.8	3.0	28.0	27.5
Associate's²				
All	2.9	3.8	5.4	5.0
Males	5.3	2.8	7.8	9.5
Female	-1.5	4.3	3.8	2.3

1. Excludes social scientists.

2. Associate's degrees are the degrees earned from two-year programmes offered by community colleges.

Source: National Science Foundation (2012), *Science and Engineering Indicators*; OECD Secretariat calculations.

(Cook and Kongcharoen, 2010). In the 2009 PISA study, girls' mean score in mathematics lagged that for boys by 20 points, compared with an OECD average of 12 points. In science the mean score was 12 points lower for girls than for boys compared with no gender difference on average across OECD countries (OECD, 2009b). Improving achievement of females and other under-represented groups in mathematics and science would help to narrow gender- and minority gaps in STEM graduation rates and hence, increase the supply of STEM graduates. There may also be a role for public information campaigns to encourage girls and minorities to consider STEM career opportunities.

State governments should also encourage tertiary institutions to take measures to increase STEM completion rates. They should take greater responsibility for bringing first-year students up to the required level. To this end, remedial programmes need to be made more effective (Complete College America, 2011). For engineering, where some 50% of freshmen do not complete the programme, universities should consider introducing an intermediate year so that only students likely to be able to cope are accepted into engineering school. Moreover, engineering programmes should include more applied content and team work in the early years as this has been shown to increase completion rates.

Expanding professional STEM master's programmes may also help to relieve pressure in the market for personnel with advanced STEM qualifications. Many employers claim that graduates of such programmes are better suited to their requirements than PhD graduates and returns on investing in such programmes appear to be high (Science magazine, 30 March 2012, http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2012_03_30/caredit.a1200036).

Enhancing opportunities for STEM qualified personnel from overseas to remain in the United States after graduation

Another challenge facing the United States is to ensure an adequate supply of STEM graduates at the PhD level going forward. At the PhD level, one third of STEM graduates are not US citizens or permanent residents (rising to almost 60% in engineering) (National Science Foundation, 2012). There is a risk that fewer such students will in the future come to the United States and that more of those that do will choose not to remain after graduating as universities and economic opportunities improve in their home countries.

In addition to the measures discussed above to increase STEM graduation rates, action is needed on visas to make it easier for graduates of US PhD STEM programmes to gain permanent residence. Most of these students currently plan to stay in the United States after graduating (NSF, 2012). Yet, they often encounter considerable difficulties as few visas per capita are available for citizens of large countries – only 20% of US visas are employment based and there is a cap of 7% on the share of such visas that may be allocated to citizens of any one country (i.e., the limit is the same for a big country as for a small country). Consequently, there are very few visas available to students from China and India who comprise a large share of STEM PhD graduates relative to demand. The share of US visas that are employment based should be increased and the limits per country should be removed.

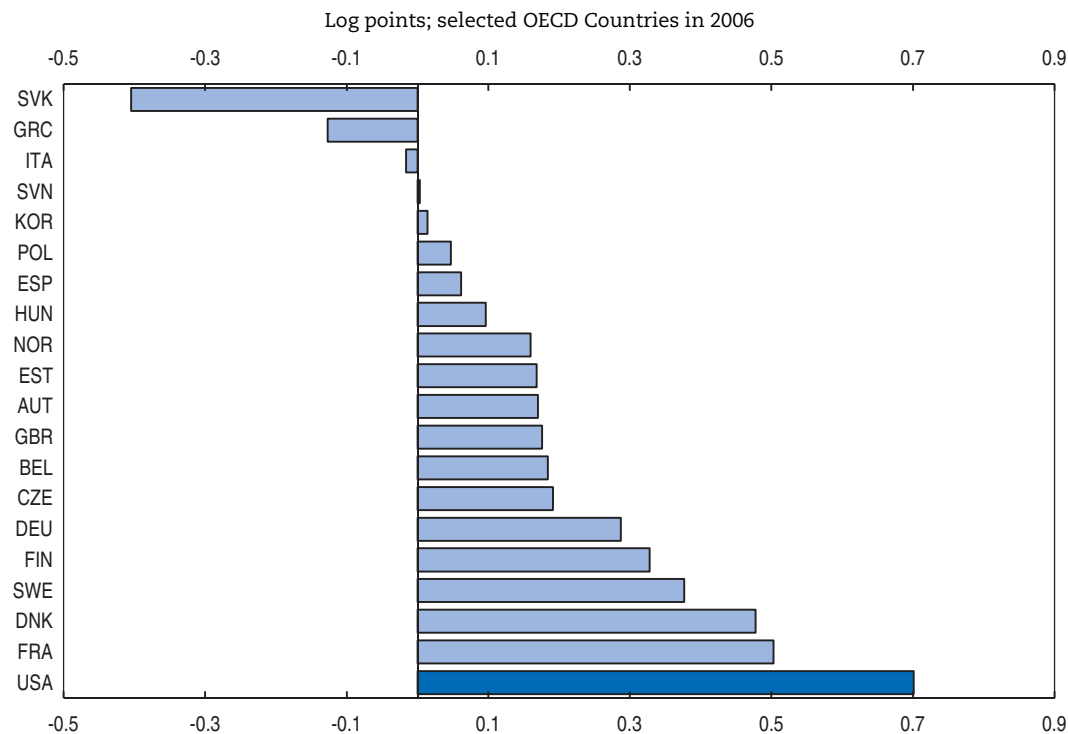
Encouraging entrepreneurship and firm start-ups

For innovations to increase productivity, resources must be transferred to new, more efficient products and processes from less efficient ones. The more easily that resources

can be transferred, the greater will be productivity growth and incentives to innovate, leading to still more resource reallocation and productivity growth. An indicator of the degree to which resources are allocated to their most efficient uses is the extent to which *ceteris paribus* the most productive firms hold the largest market shares (Olley and Pakes, 1996). Estimates using a similar metric indicate that the United States is the world leader in allocating resources to their most efficient uses – firms with higher than average labour productivity have a higher share of employment than in any other OECD country (Figure 2.15).

Nevertheless, business start-up employment as a share of total employment has declined in the past decade, raising concerns about the rate at which would-be entrepreneurs are turning new ideas into new businesses (Figure 2.16). One factor that may have contributed to this decline is that access to the high-risk capital on which innovation-based entrepreneurial firms depend has diminished (Figure 2.17). Following the “dot-com”

Figure 2.15. The contribution of the allocation of employment across firms to aggregate labour productivity is higher in the United States than in other OECD countries



Notes: The estimates show the extent to which the firms with higher than average labour productivity have larger employment shares, based on the Olley and Pakes (1996) decomposition of the log level of labour productivity. In most countries, the covariance between productivity and employment shares is positive, suggesting that the actual allocation of employment boosts aggregate labour productivity, compared to a situation where resources were allocated randomly across firms (this metric would equal zero if labour was allocated randomly). Labour is allocated relatively efficiently in the United States and some large Continental and Northern European countries – e.g. aggregate productivity in the United States is boosted by over 50% due to the rational allocation of resources – while there is considerable scope to improve resource allocation in most southern and eastern European countries. The sample excludes firms with one employee as well as firms in the top and bottom 1% of the productivity distribution. To enhance representativeness, re-sampling weights based on the OECD Structural and Demographic Business Statistics are applied.

Source: Andrews and De Serres (forthcoming 2012).


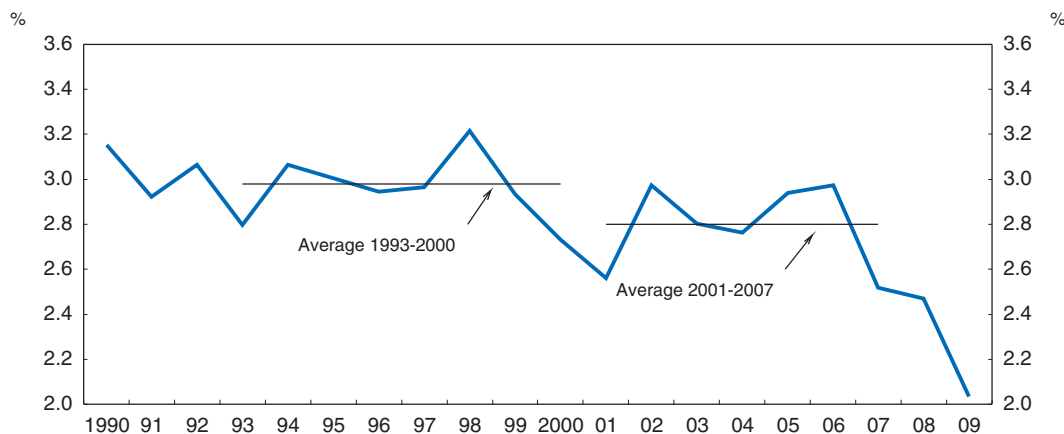
StatLink  <http://dx.doi.org/10.1787/888932638716>

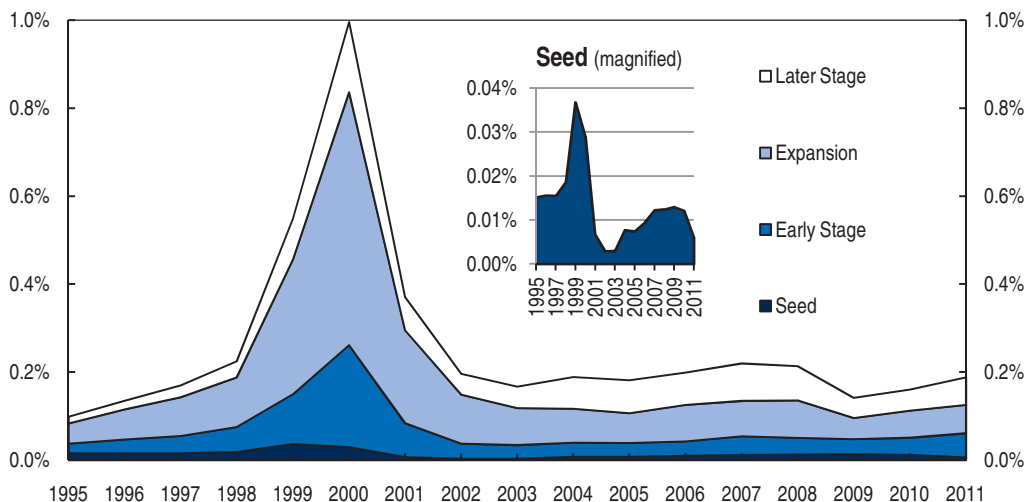
Figure 2.16. **Start-up employment has declined as a share of total employment**
Start-up job creation out of total business employment, in percentage



Source: US Census Bureau, Business Dynamics Statistics, *Longitudinal Business Database*.

StatLink <http://dx.doi.org/10.1787/888932638735>

Figure 2.17. **Seed/start-up financing has diminished**
Per cent of GDP



Note: Seed/Start-up stage: the initial stage. The company has a concept or product under development, but is probably not fully operational. Usually in existence less than 18 months. Early stage: The company has a product or service in testing or pilot production. In some cases, the product may be commercially available. May or may not be generating revenues. Usually in business less than three years. Expansion stage: Product or service is in production and commercially available. The company demonstrates significant revenue growth, but may or may not be showing a profit. Usually in business more than three years. Later stage: Product or service is widely available. Company is generating on-going revenue; probably positive cash flow. More likely to be, but not necessarily profitable. May include spin-offs of operating divisions of existing private companies and established private companies.

Source: PricewaterhouseCoopers/National Venture Capital Association MoneyTree™ Report, Data: Thomson Reuters.

StatLink <http://dx.doi.org/10.1787/888932638754>

bust of a decade ago, and reinforced by the economic downturn of the past three years, a greater share of high-risk capital is invested in later stage of development innovative firms, which tend to be less risky than start-ups, than before.

A variety of approaches to alleviate these pressures are being publicly discussed and, in some cases, experimented. These include: federal R&D agencies to finance very early-

stage companies through add-ons to existing grants to support taking spin-offs to market; creation of a new federal programme to provide competitive funding to support proof-of-concept research at universities (the NSF is experimenting with this kind of funding programme through its Innovation Corp programme); “crowd funding”, under which entrepreneurs with ideas seeking financing use the Internet to advertise their ideas and seek investments in small amounts from many small investors, as authorized in the Jumpstart Our Business Startups Act (JOBS Act); and providing matching funds and various forms of non-financial assistance to entrepreneurs with good ideas that are worthy of financing but are at too early a stage, and therefore, too risky to attract private capital. Following careful analysis and evaluation, the federal government should implement the most promising of these approaches.

These proposals fall within the scope of the Startup America initiative launched by the Administration in 2011 to improve the environment for high-growth entrepreneurship. They could usefully be complemented by the other main aspects of this initiative: creating mentorship and educational opportunities for entrepreneurs; reducing regulatory barriers; and driving a nationwide effort to engage potential new opportunities in industries like healthcare, clean energy, and learning technologies (US Department of Commerce, 2012). The federal government also runs a number of programmes to promote high-growth potential entrepreneurship at the regional level, including through the development of innovation clusters.

Entrepreneurial activity could be further enhanced by limiting clauses in employment contracts that expressly prohibit individuals from competing with their former employers (known as non-compete covenants). It has been found that stricter enforcement of such contracts is associated with lower rates of entrepreneurial start-ups, innovation and employment growth (Samila and Sorenson, 2011; Marx *et al.*, 2010).

Building a better social safety net would also encourage firm start-ups by reducing the potential costs of failure for entrepreneurs and their families. The Health Care Act of 2010 makes an important contribution to improving the safety net for entrepreneurs and making small firms more attractive to work for by reducing the costs of individual or small group policies. Similarly, the reforms proposed in the FY 2013 budget to encourage small firms to offer for the first time qualified employee retirement plans will help to make working for small firms more attractive.

Establish a national innovation agency to enhance coherence, continuity and coordination in innovation policy development and implementation

In contrast to other advanced economies, the United States does not have an agency responsible for national innovation policy. Instead, innovation policy (or strategy) is developed by the White House (usually by the National Economic Council and the Office of Science and Technology Policy) with help from the Secretary of Commerce and various agencies within the Department of Commerce (notably USPTO, NIST and the Economics and Statistics Administration [ESA]). While there have been efforts to provide line agency support for technology policy, such as the former Office of Technology Policy, they have lacked the scale and stature needed to sustain a disciplined evidence-based focus on innovation policy and strategy from one administration to the next. To address this problem, a line agency should be given responsibility and capacity for sustaining policy analysis and development across the government and serving as a point of coordination for other agencies’ activities. The agency could be housed conspicuously within National

Institute of Standards and Technology, along with the proposed National Network for Manufacturing Innovation. This would fit with the remit of the Under Secretary for Standards and Technology and the fact that there is a programme office in the NIST director's office that is already well-regarded for its analytic work on technology policy. Alternatively, if the President's proposal to reorganize federal trade-related and small-business agencies is adopted, the agency could provide a high-level focus on the innovation agenda within the Department of Commerce, drawing on the Economic Development Administration, the Patent and Trademark Office, ESA, NIST and other innovation-related elements of the Department of Commerce. Either way, the resource would provide permanent capacity to address the changing technological, market, and geopolitical environment, i.e., expertise and institutional memory that carries forward across administrations and congresses, strengthen collaboration, analysis and implementation across the government and serve as a regular interface with experts in industry, state and local governments, think-tanks, academia, and other national governments.

Box 2.3. Recommendations for strengthening innovation

Key recommendations:

- Given the importance of R&D for innovation and economic growth, reductions in the federal R&D budget should be as limited as possible. Ideally, funds would be appropriated to continue on the path approved in the 2007 America COMPETES Act of doubling the budgets for three key science agencies within a decade.
- Patent reform (America Invents Act) needs to be taken further by ensuring that the legal standards for granting injunctive relief and damages awards for patent infringement reflect realistic business practices and the relative contributions of patented components of complex products.
- Tertiary education attainment in STEM fields needs to be increased. An important step in doing so is improving access to quality secondary education so that students are better prepared for STEM tertiary studies.

Other recommendations:

- Complement an increase in funding for basic and long-term research that can reduce pollution abatement costs by pricing environmental externalities. Until Greenhouse Gas (GHG) emissions are priced, impose higher gasoline taxes.
- Implement the measures proposed by the Administration to strengthen manufacturing competitiveness, including lowering corporate tax rates and discouraging corporations from shifting profits offshore, making the R&E tax credit permanent and less complicated, investing in transport infrastructure, creating a fund for community colleges to partner with businesses to train workers for advanced manufacturing, increasing support for basic research and creating a network of manufacturing institutes to facilitate the transfer of new technology from invention to product development to manufacturing at scale.
- Raise tertiary graduation rates by taking measures to increase degree completion rates, including by improving secondary achievement so that students are more college ready. In STEM disciplines, state governments should encourage universities to take measures

Box 2.3. Recommendations for strengthening innovation (cont.)

to increase completion rates by improving remedial programmes and mentoring especially women and other under-represented groups and, in engineering, also by including more applied and team work in the early years.

- To increase the retention rate of foreign STEM PhD graduates, the share of visas that are employment based should be increased and the restrictions on country of origin should be removed.
- Encourage innovation-based entrepreneurship by increasing access to capital that supports young firms and by limiting non-compete covenants in employment contracts.
- Establish a national innovation office to increase coherence, continuity and coordination in innovation policy development and implementation.

Notes

1. Triadic patent families are defined as those patents applied for at the European Patent Office (EPO), the Japan Patent Office (JPO) and the US Patent and Trademark Office (USPTO) to protect a same invention. Triadic patents are typically of higher value and eliminate biases arising from home advantage and the influence of geographical location (OECD, 2011a).
2. A “start-up package” is the collection of benefits, other than direct compensation and personal benefits like health insurance, that is offered to prospective new faculty members to entice them to accept a job offer. For science, engineering and medical faculty members start-up packages might include things like:
 - a budget for purchase of experimental equipment and for its operation and maintenance;
 - a budget for the salary of specialized technicians if they are needed to operate especially sophisticated equipment;
 - a budget to pay the salary and associated running costs for one or more graduate assistants and/or post-doctoral associates;
 - a budget to pay for travel to professional meetings;
 - guaranteed access to be able to use equipment already purchased for other faculty members on a shared basis; and
 - less commonly, an opportunity to serve, for pay, on the board of a company that is supportive of the university or to be a consultant to such a company. Usually, funds in support of these packages are intended to be spent in the first two to five years of a faculty member’s appointment to help establish him or her more or less immediately as an active researcher. Universities compete for top talent based in part on the size of these packages.
3. Lawsuits by non-producing patent-assertion entities (popularly known as “trolls”) are only filed on average eight years after the patent has been issued (Bessen *et al.*, 2012).
4. The “domestic industry” requirement for filing before the ITC has been interpreted liberally to include any domestic company with a patent licensing programme. In many cases, patent holders sue in district court as well, since the ITC cannot award damages.
5. “Lower front-end fees encourage innovation, publication of new ideas, and knowledge sharing. This is good for the economy by encouraging research and development and promoting competition” (USPTO, 2012).
6. While aggregators may assert patents, they are distinguished from assertion specialists by virtue of acquiring substantial portfolios that are licensed on a nonexclusive basis to investors, members, or other insiders. The patents held by aggregators may be sold for use in counter assertions, perhaps with buyback arrangements. Or they may be asserted against outsiders, either directly, through shells, or simply through sales to assertion specialists.
7. This section draws heavily on OECD (2011c).

8. This estimate comes from the WITCH-model, which incorporates a detailed representation of the energy sector into an inter-temporal growth model of the economy and, in contrast to most of the literature, does not assume that backstop technologies emerge without dedicated investments. The way in which the impacts of R&D (and learning-by-doing) on the costs of these “backstop” technologies are incorporated into the model relies partly on past experience with solar, wind and nuclear power.
9. The other action plans are: advanced vehicles (led by Canada); bio-energy (led by Brazil and Italy); carbon capture, use and storage (led by Australia and the United Kingdom); high-efficiency-low-emissions coal (led by India and Japan); marine energy (led by France); smart grids (led by Italy and Korea); solar energy (led by Germany and Spain); and wind energy (led by Germany, Spain, and Denmark).
10. OECD calculations based on data in Table 1 of Raymond M. Wolfe, *Business R&D Performed in the United States Cost USD 291 billion in 2008 and USD 282 billion in 2009*, US National Science Foundation, NSF 12-309, March 2012. On line at: <http://nsf.gov/statistics/infbrief/nsf12309/>.
11. Growth in real output and labour productivity in manufacturing, however, may have been overstated during the past two decades owing to errors in the way that growth in imported inputs to manufacturing has been allocated to prices (overestimated) and volumes (underestimated) (Houseman et al., 2011; Mandel, 2011).
12. Homepage Fraunhofer-Gesellschaft : www.fraunhofer.de/en.html. The Fraunhofer is a network of some 80 applied research institutes in Germany. It also supports institutes in other countries, including eight in the United States. The individual institutes carry out research of interest to industry, with each institute focused on a particular technical area. About 70% of the Fraunhofer budget comes from industrial contracts and 30% from public authorities in Germany.
13. While standard practice in the United States is to include the social and behavioral sciences in the “STEM” disciplines, in this report, we systematically exclude those fields from the STEM totals.

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