OECD Reviews of Regional Innovation

Regions and Innovation

COLLABORATING ACROSS BORDERS

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BETTER POLICIES FOR BETTER LIVES

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Foreword

Strong dynamics of innovation generation in regions are crucial for achieving national and regional growth objectives. Policy recommendations are therefore being sought by national science and technology ministries and regional development policy ministries, as well as by policy makers in the regions themselves.

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

Economic and innovation ties often span regional administrative borders, including international borders. However, policy efforts often ignore this fact, thus limiting the economic and innovation potential of many border regions. Promoting cross-border regional innovation policy is difficult given a number of barriers, including those created by policies themselves. This report provides practical guidance on the following questions regarding international collaboration:

- When does it make sense to collaborate with cross-border neighbours for innovation-driven economic development?
- What kinds of governance approaches can be used to manage such cross-border collaboration?
- What are the policy instruments that can facilitate cross-border collaboration for innovation?

Six cross-border areas participated in this study: the Bothnian Arc (Sweden-Finland); Hedmark-Dalarna (Norway-Sweden); Helsinki-Tallinn (Finland-Estonia); Ireland-Northern Ireland (United Kingdom); the Oresund Region (Denmark-Sweden); and the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (Netherlands-Belgium-Germany). Case studies are published as *OECD Regional Development Working Papers*.

In 2007, the OECD launched the series *OECD Reviews of Regional Innovation* to address the demand by national and regional governments for greater clarity on how to strengthen the innovation capacity of regions. Thematic reports in addition to this report include: *Regions and Innovation Policy*, *Competitive Regional Clusters: National Policy Approaches* and *Globalisation and Regional Economies: Can OECD Economies Compete in Global Industries?*. Reviews of specific regions conducted thus far include: the North of England (United Kingdom), Piedmont (Italy), 15 Mexican States, Catalonia (Spain), the Basque Country (Spain), Central and Southern Denmark, and Wallonia (Belgium). Several additional working papers on the topics of regions and innovation are published under the series *OECD Regional Development Working Papers*. These publications are part of a wider body of research on competitive and innovative regions under the auspices of the OECD Territorial Development Policy Committee.

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Acronyms and abbreviations

CATE	Cluster for Accelerator Technology
CEER	Center for Euroregional Studies of Galicia-North of Portugal
EC	European Commission
EGTC	European Groupings of Territorial Co-operation
EMR	Euregio Meuse-Rhine
ERDF	European Regional Development Fund
ESF	European Social Fund
ESS	European Spallation Source
ETC	European Territorial Co-operation
EU	European Union
EUR	Euro
FDI	Foreign direct investment
FP	Framework Programme (EU)
GCS	Cross-Border Cluster Stimulation Fund
GDP	Gross domestic product
GVA	Gross value added
HBAN	HALO Business Angel Network
HEI	Higher education institution
HTM	High- and medium-high-technology manufacturing
IP/IPR	Intellectual property/intellectual property rights
KIC	Knowledge and Innovation Community (EU)
KIS	Knowledge-intensive services
MNC	Multinational corporation
MVA	Medicon Valley Alliance
NGO	Non-governmental organisation
NIS	National innovation system
NMS	Nordic Mining School
NUTS	Nomenclature of territorial units for statistics (*Nomenclature d'unités territoriales statistiques*)
OECD	Organisation for Economic Co-operation and Development
OMIC	Oresund Materials Innovation Community
PBL	Problem-based learning
PCT	Patent Co-operation Treaty
PPP	Purchasing power parity

R&D/ R&D&I	Research and development/ Research and development and innovation
RIS	Regional innovation system/regional innovation strategy
RMT	Upper Rhine Trinational Metropolitan Region
RTD	Research and technological development
S&T/STI	Science and technology/science and technology and innovation
SME	Small and medium-sized enterprise
TDPC	Territorial Development Policy Committee, OECD
TL	Territorial level
TTR-ELAt	Top Technology Region/Eindhoven-Leuven-Aachen Triangle
VC	Venture capital

Executive summary

Innovation-driven growth is a major objective of the post-crisis recovery. Policy makers increasingly recognise the role that regions play in cultivating, attracting and retaining innovative people and firms. Indeed, it is cities and regions that are competing with each other in the global economy. Many regions are located along international borders, and thus working with cross-border neighbours may offer innovation-driven growth opportunities.

Place matters for innovation. Over 33% of R&D and around 25% of skilled employment occurs in the top 10% of OECD regions (large-scale regions). Patent activity is 58% in the top 10% of OECD regions (small-scale regions). Different measures of the benefits of innovation activities find that the strongest interactions take place in proximity, within a radius of approximately 200 kilometres.

The increasing globalisation of innovation is also forcing regions to think beyond their borders, but those borders do remain a barrier, even for neighbouring regions. The share of patents with a foreign co-inventor has doubled over the last three decades, from 10% to 20%. The share of scientific publications with an international co-author has tripled, from around 7% to 22%. However, data indicate that border barriers overtake proximity benefits. In North America and in Europe, the probability of citing a patent in a neighbouring foreign region is no different than citing one in any foreign region. The importance of the barrier appears to be increasing, particularly in North America.

To better fit policies to places, a first step is to define the "functional" area for cross-border regional innovation policies. Some type of data or evidence is needed to understand cross-border flows, from daily commuters to firm collaborations and university research ties. Assessments can address the innovation relationships that are, or could be, relevant as well as the other functional ties and institutional arrangements.

Key recommendations for **defining the cross-border** area include:

- Understand what the data show, but don't wait for complete data to start collaborating.
- Only pursue the cross-border element when it makes sense.
- Allow a certain degree of flexibility in the area definition to avoid creating unhelpful new borders.
- Do not under-estimate the importance of other "hard" and "soft" factors beyond innovation.

Political commitment is an important factor for kick-starting or securing long-term support for cross-border efforts. Generally, the local level has the strongest interest because it feels the costs and benefits most directly. For innovation policy, a region is typically a more appropriate scale than a locality to include the relevant range of firms, universities, workers and other innovation actors. National (and supra-national) governments can help or hinder cross-border policy collaboration, in terms of regulation and funding, in a wide set of policies that impact a cross-border area.

The real competition is global, therefore neighbouring regions may need to engage in "co-optition" (co-operation for competition). It is useful to understand the possible costs and benefits as well as the alignment, or not, of respective incentives. Favourable conditions for innovation within the region generally are likely to increase the benefits and reduce the costs. However, innovation policy is a field that does not allow for easy calculations given the upfront costs and the uncertainty associated with many innovation investments. Furthermore, complementary action can be taken over time to increase economic returns. The cost of not collaborating may actually be higher.

Collaboration that focuses on maximising economic and social benefit implies governance arrangements that require trust. It is a long-term commitment, implemented day-to-day, year after year. The arguments about *juste retour*, or getting back what one puts in, focus on the individual project and not the long-term relationship. Collaborations take the form of both formal and informal governance arrangements. Most collaborations are governed by voluntary associations and committees, with formal institutions being the exception. Some form of secretariat, even virtual, is necessary to create the public goods for cross-border governance to work. Special capacities of public authorities are also needed. If not through formal boards, the private sector, higher education institutions and in some cases citizens may be engaged in other consultation bodies or working groups.

Key recommendations on the **governance of cross-border collaborations** include:

- Give politicians a reason to care about the issue, understanding that their time horizon and motivations are generally short-term.
- Identify for national (supra-national) governments where they can help cross-border efforts.
- Understand the different costs and benefits, and the alignment of those across the border, for cultivating long-term collaboration that builds trust.
- Engage non-public actors in governance, with some form of secretariat to underpin the work of the official, even if informal, governance body.

Cross-border instruments are more likely to have impact if they contribute to a broader strategy or action plan. It helps if this strategy is supported by data, mapping exercises of relevant actors, and other forms of policy intelligence. Sometimes cross-border policy instruments are experimental: they can serve as test cases for mainstreaming whereby cross-border actors can participate in traditional innovation programmes. However, given that public funds typically stop at the border, an alternative is to align instruments across the border so that actors from respective jurisdictions can better work together. Instruments that seek to force actors to collaborate when they have disincentives to do so (due to regulations, funding, or lack of partner quality) will not be sustainable. International experience with different policy instruments highlights their respective advantages and disadvantages so that lessons learnt can inform other regions.

Key recommendations to **make cross-border instruments** work include:

- Devote more efforts to strategy development and policy intelligence.
- Mainstream the cross-border element in national and regional innovation strategies and policy instruments, or at least align programme rules.
- Make greater use of opportunities created by the border.
- Publicise success stories of cross-border instruments.

Assessment and recommendations

Introduction

Innovation is a core growth driver in knowledge-based economies, and a subject for wide-ranging policy efforts, as noted in the OECD Innovation Strategy (OECD, 2010a). National growth depends on the growth of all its regions and their innovation performance (OECD, 2012). At the supra-national level, the European Union has placed innovation at the heart of its Europe 2020 growth strategy, specifying a key role for regions. International development banks are also paying increasing attention to the role of regions in achieving national innovation goals.

Across the OECD, regional development policies increasingly focus on innovation-driven growth. Indeed, the subsidy-led approach compensating for weaknesses in lagging regions has progressively evolved towards a competitiveness-oriented approach favouring growth in all regions (OECD, 2010b). With this shift, regional development policies have included more integrated policy portfolios to promote the complementarity of policies in a given place (place-based approaches) and to leverage regional assets. European Cohesion Policy places an increasing emphasis on innovation, and expects regions to engage in "smart specialisation" strategies to support knowledge-based development (European Commission, 2010). Regions have thus been re-thinking their portfolio of innovation-related policies (OECD, 2011).

Place matters for innovation, as it is regions and cities that compete to be hubs in global networks. Over 33% of R&D and around 25% of skilled employment occurs in the top 10% of OECD regions (large-scale regions). Patent activity is 58% in the top 10% of OECD regions (small-scale regions). Different measures of the benefits of innovation activities find that the strongest interactions take place in proximity, within a radius of approximately 200 kilometres.

The increasing globalisation of innovation is also forcing regions to think beyond their borders, but those borders do remain a barrier, even for neighbouring regions. The share of patents with a foreign co-inventor has doubled over the last three decades, from 10% to 20%. The share of scientific publications with an international co-author has tripled, from around 7% to 22%. However, data indicate that border barriers overtake proximity benefits. In North America and in Europe, the probability of citing a patent in a neighbouring foreign region is no different than citing one in any foreign region. And evidence shows the border effect is increasing over time, particularly in North America.

There are three main forms of international collaboration among regions to support research, product development and innovation:

- cross-border collaboration (contiguous regions)
- transnational collaboration (macro-regions)
- inter-regional collaboration (international, non-contiguous).

This report focuses on the first, contiguous cross-border areas, that co-operate with neighbours seeking to take advantage of proximity for global reach. This form is also closest to that of a functional region, which is the most relevant for developing innovation strategies and joint policy instruments. The findings are largely based on lessons from six peer review case studies of cross-border areas that vary by: stages of development in regional innovation policy; settlement patterns and levels of innovation assets (Table 0.1). These are regions that do not correspond to traditional definitions since they extend both beyond regional administrative boundaries and over national borders.

The concept of innovation and innovation policy used is a broad one, in accordance with the OECD Innovation Strategy. Innovation goes beyond R&D and incorporates product, process, marketing and organisational innovation, as defined by the *Oslo Manual* (Box 0.1). Accordingly, the notion of innovation policy is broad too, going beyond science and technology policy, to support knowledge creation, diffusion and absorption. To innovate successfully, firms engage in a range of complementary activities. The adoption of the innovation system framework implies that policies should have a systemic character too, facilitating interactions among innovation actors. Nevertheless, this broad approach is more challenging to implement in practice, given that data and policies remain focused on the science and technology-based aspects of innovation.

This report addresses three core questions with respect to supporting innovation policy in cross-border regions:

- Why and when does it make sense to collaborate cross-border for innovation?
- How can public and private actors work together cross-border (governance)?
- What are the policy instruments for cross-border innovation collaboration?

Box 0.1. **Defining innovation**

There is growing recognition that innovation encompasses a wide range of activities in addition to R&D, such as organisational changes, training, testing, marketing and design. The latest (third) edition of the *Oslo Manual* defines innovation as 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. By definition, all innovation must contain a degree of novelty. The *Oslo Manual* distinguishes three types of novelty: an innovation can be new to the firm, new to the market or new to the world. The first concept covers the diffusion of an existing innovation to a firm – the innovation may have already been implemented by other firms. Innovations are new to the market when the firm is the first to introduce the innovation on its market. An innovation is new to the world when the firm is the first to introduce the innovation for all markets and industries. Innovation rarely occurs in isolation. It is a highly interactive process of collaboration, one that is increasingly international, across a growing and diverse network of stakeholders, institutions and users.

Source: OECD (2010), *OECD Innovation Strategy: Getting a Head Start on Tomorrow*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264083479-en.

Table 0.1. **Cross-border areas with in-depth case studies**

Cross-border area	Population Size (km²) GDP[1]	Overview
Oresund (Denmark, Sweden)	3.8 million 21 203 km² USD 118 billion	This well-known example of cross-border collaboration builds on the metropolitan area around Copenhagen and, across the sound, Southern Sweden with the cities of Malmö, Lund and Helsingborg. Cross-border integration intensified following the opening of a fixed-link bridge/tunnel in 2000 and is supported by the Oresund Committee and its members. Commuting, student flows and cross-border residency have been on the rise in this knowledge-intensive area. Cross-border cluster efforts have had varying degrees of longevity, life sciences being the most famous. After hitting an integration plateau, the region is seeking renewed inspiration for cross-border efforts.
Top Technology Region/Eindhoven-Leuven-Aachen Triangle (Netherlands, Belgium and Germany)	8.2 million 19 640 km² USD 244 billion	This densely populated network of small and medium-sized cities is located at the heart of western Europe. It spans 3 countries, 4 science and technology policy regimes and 6 sub-regions. The collaboration centres on a shared recognition of technological strengths (chemicals and advanced materials, high-tech systems and health sciences). The area seeks to better capitalise on its skilled workforce, multinational enterprises and strong research facilities. Although building on decades of cross-border activities, the area needs to overcome cumbersome governance issues to create the benefits of agglomeration with complementarity expertise so as to increase international attractiveness of the area.
Ireland-Northern Ireland (United Kingdom)	6.4 million 84 431 km² USD 205 billion	The island has an opportunity to recreate functional economic linkages across the international border. Created as an institution in response to the 1998 Belfast/Good Friday Agreement, InterTradeIreland is a rare example of a cross-border entity to promote trade and innovation co-funded by respective governments for that purpose. These efforts have led to stability in funding such programmes. The differences between the public sector-driven economy in Northern Ireland and the dual economy of Ireland (outward-looking multinationals and the local SME base) are a challenge for cross-border efforts.
Helsinki-Tallinn (Finland, Estonia)	Around 2 million Around 10 000 km² USD 76 billion	The entry of Estonia into the European Union and, since the mid 2000s, a two-hour ferry trip, have both facilitated flows of people and merchandise across the Gulf of Finland. The different levels of development between Helsinki and Tallinn result in many asymmetric flows (workers to Helsinki, tourists to Tallinn). Beyond infrastructure and labour market concerns, there are interesting opportunities for joint innovation policy efforts given their shared strengths such as in ICT, a dynamic start-up environment and technologically sophisticated public services.
Bothnian Arc (Finland-Sweden)	710 000 55 000 km² USD 31 billion	This cross-border area on the border of Finland and Sweden covers the most populated areas along the upper Bothnian Bay, spanning 800 kilometres. There is a strong commitment of the mayors of the cities of Oulu and Luleå (300 kilometres apart) to such collaboration. Despite a peripheral location in all respects, some parts of the Bothnian Arc have shown a remarkable vitality, notably Oulu (Finland), driven by an innovation ecosystem that builds on the heritage of Nokia and the contribution of Oulu University. Luleå (Sweden) has recently attracted the European Facebook data centre. The area is looking to go beyond *ad hoc* projects for a more strategic approach to collaboration to be the knowledge-intensive hub of the north.
Hedmark-Dalarna (Norway, Sweden)	469 500 Around 57 800 km² USD 22 billion	These two counties are rural, with the border remote from respective regional centres. Efforts to support collaboration at the border focus on the sector of tourism that both share, and which would be facilitated by the construction of one airport to serve both sides. Cross-border efforts for the industries at the border are not in knowledge-intensive industries. For more science and technology-based innovation collaboration, regional urban centres are perhaps better served by looking towards other regions rather than towards the border of the two counties.

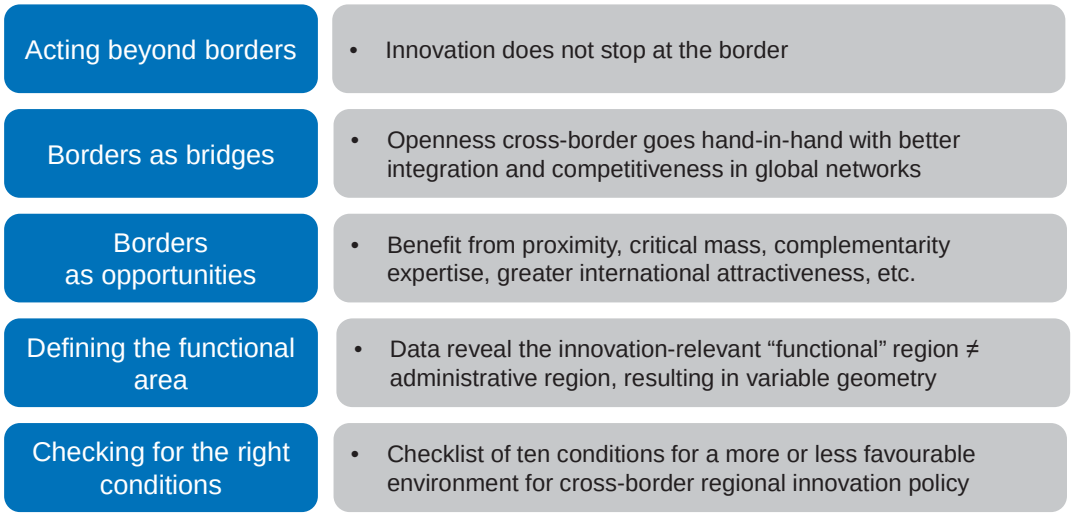
Note: GDP is expressed in constant 2005 prices.

Why and when does it make sense to collaborate cross-border for innovation?

Acknowledging the potential of the cross-border dimension for innovation adds an opportunity-driven approach to traditional cross-border co-operation practices. Rather than being focused on the sometimes disadvantageous position of border regions and border barriers, this new approach considers the potential of these regions for innovation-driven growth. There must be both compelling reasons to work cross-border and a favourable environment that facilitates collaboration. The costs need to be weighed against expected benefits from cross-border collaboration. A cross-border area therefore needs to ask itself if the conditions and opportunities for working together make sense.

The relevant functional region for innovation will depend on both analysis of the general conditions of the cross-border area as well as innovation-specific assets and current or potential linkages. The relevant area may not map neatly to administrative borders on either side of the border, so some trade-offs may be required in deciding on the general area for intervention.

Figure 0.1. **Innovating beyond borders: Why and when to collaborate**



Innovation partnerships do not stop at administrative borders, and can benefit from proximity. Innovation is an interactive process, involving collaboration and partnerships amongst firms, between firms and other actors such as educational and research organisations, and with user communities. This interaction takes place both at a distance, and in proximity. The importance of this closeness for face-to-face interaction to support innovation is well-documented in academic studies of clusters, agglomeration economies and knowledge spillovers. Valuable partners may be located nearby, but simply on the other side of a national border where they are less likely to know each other, and they are more likely to experience additional obstacles to working together.

Working cross-border can be a bridge that complements other global interactions. Innovating with a cross-border partner requires a degree of openness, which can be a first step towards internationalisation. This is especially relevant for many SMEs that often lack capacity for engaging in innovation and knowledge sourcing activities on a global scale. *For example, commercial ties among SMEs across the border between Ireland and Northern Ireland (United Kingdom) were used as a stepping stone for wider export strategies*. But it is also valid for larger companies and universities, which can use the cross-border partnership as a stepping stone for building multinational partnerships. Developing cross-border partnerships for innovation in proximity, on the one hand, and wider partnerships in the international environment, on the other hand, are not mutually exclusive options. They go hand-in-hand and reinforce each other. There can be, however, some specific policy considerations associated with collaborations in proximity that are different from broader international networks.

There are many reasons why it may make sense for public authorities to collaborate with a cross-border neighbour to better compete. Some regions seek to address the positive or negative externalities that cross the border, be that the benefits of a science facility for industry in the other region or tax arrangements to compensate for service use

due to cross-border commuting. Another set of rationales reinforces regional efforts to overcome peripherality. Cross-border regions seek to be more visible to national policy makers as well as globally competitive for firms and talent. Several drivers for cross-border collaboration for innovation policy support these goals (Table 0.2). Of course, there are costs to such collaboration, but also benefits. *The Helsinki-Tallinn cross-border area recognises its business and cultural differences as an asset for developing value through joint action.* In this context, borders are seen as opportunities for innovation, rather than barriers to flows of people, goods and knowledge.

Table 0.2. **Rationales for cross-border collaboration for innovation policy**

Economic concept	Driver	Explanation
Economies of scale	Critical mass	Larger labour markets or access to wider business and knowledge networks to increase critical mass, characteristics associated with agglomeration economies
	Political power	Increase the recognition of areas of strength (or special needs) in regions that are far from capitals to better compete for resources from higher levels of government
	Specialised services	Innovation support services can be more specialised and thus of higher quality
Economies of scope	Complementarities	Build on a diversity of assets in terms of research, technology and economic base, known also as "related variety", as well as supply chain linkages; in some cases, complementarity may also be due to differences in price levels, cost structures or functions
Public and club goods	Regional identity	Increase internal recognition of the cross-border area for greater integration and social capital (including knowledge of the partners on the other side of the border)
	Regional branding	Attractiveness and recognition of the area to firms and skilled labour both within the cross-border area and beyond
	Specialised infrastructure	Shared science and technology facilities reduce financial costs and risks for the regions or countries involved, and allow access to a greater number of researchers
Externalities	Border challenges	Address the day-to-day issues associated with flows of people, goods and services (including public services) across the border for both positive and negative spillovers

Cross-border efforts should target "functional" regions for innovation, but we cannot easily "see" what that region should be. Data are often lacking to make that determination. Regions typically need to rely on national statistics offices for data and/or harmonisation with neighbouring country definitions, yet this subject is not a top priority for national agencies with increasingly tight budgets. Functional regions have traditionally been defined according to labour market criteria. The definition of a functional cross-border area for innovation can be different from that of a local labour market. Indicators measuring innovation-related flows of people, goods, services, capital and knowledge, in addition to those that measure integration more generally, help to assess the relevant geographic scale. Measures of innovation in a broad sense are particularly difficult in any region, let alone one that is cross-border.

Definitions of a cross-border area may imply a variable geometry and should avoid the creation of new rigid borders. Different definitions of the cross-border area co-exist in many places, in some cases serving complementary purposes and in some cases competing. Definitions can change over time, or simply depend on different specialisations within which innovation interaction takes place. *Studies in the TTR-ELAt have shown that the sub-regions have different strengths within the priority sectors of the*

cross-border area. Broadly speaking, the wider international space is more relevant for collaborations involving a lot of codified knowledge, innovations directly linked to science, or the sharing of top-level scientific infrastructure. *This is the case of the European Spallation Source being constructed in the Oresund, which will have benefits for the cross-border area but also involve researchers from around the world.* The local area is more relevant for co-operation in innovative products and processes based on unique local assets or that rely on learning-by-doing procedures that require frequent interaction.

An assessment of ten different factors related to the cross-border area can provide evidence as to whether there is strong potential for cross-border action (Table 0.3). Some of those factors are framework conditions, similar to the ones that define functional cross-border areas in a traditional manner, such as geographic accessibility. Other measures consider a range of different "proximities", beyond geography, that provide more or less favourable conditions for collaboration. Innovation-specific conditions include the existence of relatively balanced potential on the various sides of the border (to create a condition of mutually beneficial partnerships) and "related variety" in knowledge infrastructure and industrial specialisation (to nurture conditions for cross-fertilisation based on useful differences).

Table 0.3. **Ten conditions for assessing the cross-border environment**

Framework conditions	
1. Geographic accessibility	Internal and external accessibility of the cross-border area/integration
2. Socio-cultural proximity	Similarities in language, culture, practices and values as well as a sense of shared identity
3. Institutional context conditions	Level and degree of similarity in regional competences for economic development and in laws, regulations, tax systems, etc.
4. Cross-border integration	Flows of workers, goods (market and supplier links), FDI, etc. across the area as well as harmonisation of price levels, production costs
Innovation system conditions	
5. Economic specialisation	Proximity and complementarity both in industrial structures and knowledge bases (also known as "related variety" and "proximate diversity")
6. Business innovation model	Innovation-based business strategies with open innovation practices, as opposed to low-cost competition strategies
7. Knowledge infrastructure	Quality of research and educational organisations and their engagement with the regional economy
8. Innovation system interactions	High density and balanced cross-border interactions across innovation system actors
Governance and policy context	
9. Governance	Degree, longevity and institutionalisation of political and financial commitment to cross-border collaboration
10. Policy mix	Orientation of innovation policy as well as the cross-border policy instruments

Note: See Annex I.1 for a diagnostic guide with questions to help assess how functional the region is (or could be) for innovation.

Source: Inspired and expanded from Trippl, M. (2010), "Developing cross-border regional innovation systems: Key factors and challenges", *Tijdschrift voor Economische en Sociale Geografie*, Vol. 101, No. 2, pp. 150-160.

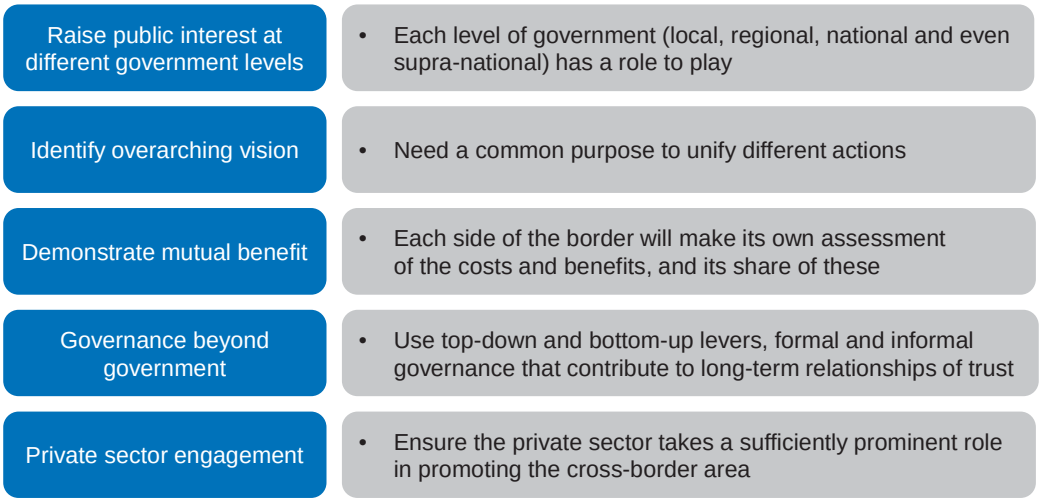
Key recommendations for defining the cross-border area include:

- **Understand what the data show, but don't wait for complete data to start collaborating.** Despite a long history of cross-border flows in some areas, there is a notable lack of data to support decision making about the utility and progress of cross-border collaboration. Launching some form of collaboration should not wait for a three-year study, but some basic indicators can draw attention to the need for collaboration. Three forms of data analysis can be important. First is internal data on the flows and level of integration. A second set of data benchmarking international performance is helpful for supporting a strategic vision for the cross-border area. A third set of useful data involves micro-analyses, which highlight the possible failures in the innovation system, and how policy, or other efforts, can help remedy them.
- **Only pursue the cross-border element when it makes sense.** In some cases, geographic proximity is important for a particular innovation partner or project. In others, accessing the best global partner is the priority. One test for the relevance of the collaboration is whether the workers, firms and research-intensive actors in the region see a benefit to cross-border interactions, because if they do not, publicly co-funded innovation projects may only last as long as public money is available. The public sector can stimulate demand by innovation actors by raising awareness of cross-border opportunities.
- **Allow a certain degree of flexibility in the area definition to avoid creating unhelpful new borders.** It is not in the interest of developing the cross-border area to artificially create a barrier to connections outside the border through funding streams. Area definitions are subject to political realities of administrative borders, and thus funding sources. While the perimeter will be set somewhere, some flexibility in funding opportunities to outside actors helps overcome the rigidities of new definitions.
- **Do not under-estimate the importance of other "hard" and "soft" factors beyond innovation.** Innovation policy instruments are generally part of economic, industrial or research policy. However, the functionality of the region for innovation also depends on some basic transport infrastructure to improve internal accessibility, which proved "game-changing" in certain case study regions. Other soft factors help build contacts and interest in the other side of the border, including language and culture, which were reported to also be important.

How can public and private actors work together cross-border (governance)?

Governance to support the cross-border area is particularly difficult for a number of reasons. The multiple jurisdictions and likely different languages, cultures, and regulatory and institutional environments are barriers to working together. Another challenge is the ability to assess the benefits and costs of the collaboration, which is vital for garnering support from the public sector, politicians, private actors and residents for cross-border action. In some cross-border areas, a formal entity, even if not a government *per se*, does exist or could be created to support cross-border policies. In other cases, the complexity of the cross-border area may render formal institutions too cumbersome, requiring other forms of day-to-day working groups and interactions to guide the work. Finally, while in some cases the private sector is ahead of the public sector, in other cases the public sector lead needs to be further complemented by private sector leadership.

Figure 0.2. **Governing cross-border collaboration: Public and private engagement**



Public action may be required at local, regional, national and in some cases supra-national levels of government. Political commitment on both sides is an important factor for kick-starting or securing long-term funding for cross-border efforts. The functional cross-border area is at the intersection of different administrative jurisdictions. Local authorities are those that experience the benefits and costs of the cross-border area most directly and are often very engaged in cross-border issues. For innovation policy, a wider region is generally the more appropriate scale to include the relevant range of firms, universities, workers and other innovation actors. The share of the innovation policy toolkit managed by the regional level depends on the country context. Many of the innovation policy instruments, as well as the framework conditions such as taxes and labour force policies, are nevertheless typically set at national level. In some instances, such as through the Nordic Council of Ministers or the European Commission, actions can be taken at supra-national level to facilitate cross-border interaction by addressing bottlenecks that are not region-specific or developing compensation mechanisms for "internalising externalities" that cross national borders.

Identification of joint goals and a common vision underpins strategic cross-border collaboration. Those goals are often defined by three considerations: *i*) joint problems; *ii*) joint opportunities; and/or *iii)* complementary assets, the last two being most relevant for innovation-driven strategies. Those goals may also help to define the identity of the cross-border area and, where it makes sense, to co-operate locally to be competitive globally. *For example, the Bothnian Arc collaboration is centred on its goal of being the high-tech hub of the north. Hedmark-Dalarna seeks to be marketed as a healthy and green sports tourism destination*. This general vision should be sufficiently generic to sustain lasting interest from key stakeholders, but also sufficiently specific to be meaningful, relying on unique assets of the cross-border area. A strong vision and identity are necessary to ensure continuity over policy cycles, and political changes which are more frequent in cross-border areas where multiple governments are active. Alignment with regional and national economic objectives is also important for longevity. *This is the case for InterTradeIreland, where three-year strategic plans deliver against shared government economic priorities*.

Collaboration that focuses on maximising economic and social benefit implies governance arrangements that require trust. It is a long-term commitment, implemented day-to-day, year after year. Collaboration, if deemed relevant, depends on a clear

understanding of the possible costs and benefits as well as the alignment, or not, of the incentives for both sides of the border. Favourable conditions within the cross-border region for innovation generally are likely to increase the benefits and reduce the costs of collaboration for innovation policy. However, it is a policy field that does not allow for an easy calculation of inputs and outputs given the high degree of uncertainty associated with many innovation investments.

Ensuring mutual benefits across the border can be an ongoing challenge. A "zero-sum" approach to policy is unlikely to work in cross-border innovation policy, as any gain on one side of the border is viewed as a loss to the other side. This creates a climate where policies are developed within a *juste retour* framework (i.e. you get out what you put in). This principle is almost impossible to follow in practice for innovation policy, characterised by long-term returns, uncertainty and difficulty to assign innovation outcomes to policy actions. Partners need to focus on positive sum games, where joint action leads to benefits for all, generated by higher value-added rather than by redistribution. The opportunities for value creation are not always known upfront, they are revealed over time as collaboration increases the knowledge of opportunities.

A functional region is subject to governance beyond government, requiring both top-down and bottom-up approaches. In cases where the interest in developing cross-border co-operation originates from political authorities (top-down), stakeholder involvement is necessary to ground it in reality so as to create the mutual benefits and economic value-added. Even if a functional region for innovation becomes integrated from the point of view of the joint innovation system, it remains politically fragmented. Often private entities are the first to see the potential for cross-border collaborations, driven by market opportunities that do not stop at administrative boundaries. In cases where the cross-border partnerships are initiated by actors from the field (companies, research institutions, etc.), political endorsement leading to an adaptation of institutions and policies may be needed to facilitate collaboration.

Cross-border areas may implement formal or informal governance arrangements, or both. Most cross-regional partnerships are governed by associations and committees established under voluntary agreements, with formal institutions being the exception. *Examples of effective "bridging" institutions for governance of cross-border areas include the Oresund Committee and InterTradeIreland (under the North/South Ministerial Council).* Some form of secretariat, whether through in-kind contributions of regions or a separate entity, can help create the public goods for cross-border area governance to work. Special capacities of public authorities are needed for cross-border regional innovation efforts.

Innovation is a process led by the private sector; therefore it should play a key role in informing and implementing cross-border collaboration. Innovation takes place within a system of actors. This involves public authorities, companies, research and education organisations, and other members of the society (non-governmental organisations, citizens' representatives, etc.). These four categories of actors have been referred to in the innovation literature as the "quadruple helix". Different mechanisms may be required to solicit their input and leadership in cross-border action.

Key recommendations on the governance of cross-border collaborations include:

- **Give politicians a reason to care about the issue, understanding that their time horizon and motivations are generally short-term.** Sometimes they need a flagship project (tunnel/bridge/science infrastructure, etc.) to motivate that

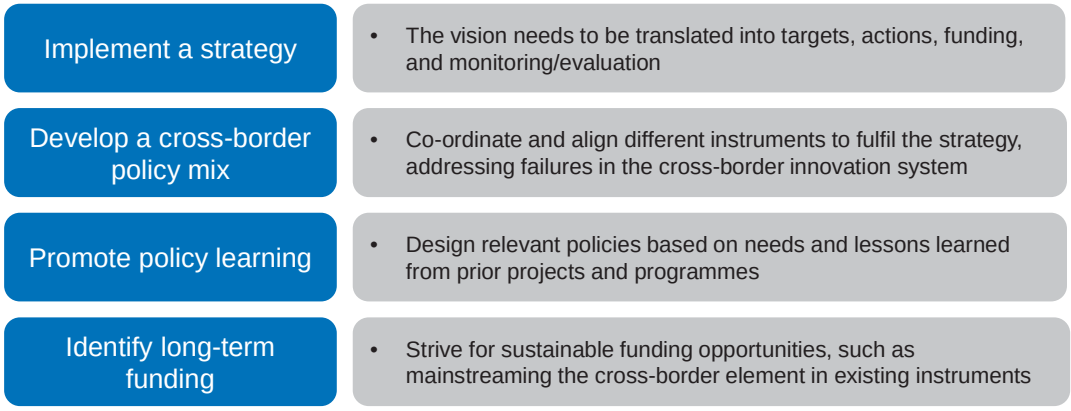
support, but there is a risk that this one project leads to disappointment. The pressing realities of the cross-border area may be enough to raise awareness. Large firms and other actors often seek cross-border opportunities, helping to show why it is relevant. The more citizens identify with the area, the easier it is for politicians to make such commitments. Nevertheless, the degree of political turnover in a cross-border area with multiple jurisdictions, as well as the short-term time horizon, means that there will also be a need to show how the cross-border actions fit with their agendas on an on-going basis.

- **Identify for national (supra-national) governments where they can help cross-border efforts.** While the local, sub-regional or regional level may be able to develop the strategy and the lines for collaboration, removing some of the particularly binding constraints may lie in the hands of national policy makers. Those constraints can be in the innovation policy field specifically, but may also involve regulations in other fields such as taxation or labour policy.
- **Understand the different costs and benefits, and the alignment of those across the border, for cultivating long-term collaboration that builds trust.** While some initial experiments may be needed to test possibilities for collaboration, ultimately a focus on each project detracts from relationship building with a focus on increasing economic and social benefits. These opportunities may change over time and require supplementary action to get the most impact. Given the competition among jurisdictions within the cross-border area, a first step is to focus on location-specific attractiveness where all jurisdictions see the direct benefit.
- **Engage non-public actors in governance, with some form of secretariat to underpin the work of the official, even if informal, governance body.** All the relevant stakeholders from the public, private, academic/research and civil society spheres are generally not on governance bodies. However, they may be mobilised in consultation bodies or working groups to define the vision and strategy, including through their participation in stakeholder networks (such as a cross-border association of universities or firms). These stakeholders may also support cross-border efforts because they see how the programmes do serve their needs, or they have participated in research that helps define the programmes in the first place. A co-funded secretariat may be centralised in one organisation or virtual through in-kind contributions of participating jurisdictions, but somebody needs to make cross-border efforts a priority.

What are the policy instruments for cross-border innovation collaboration?

There are many possible policy instruments that can be used to facilitate cross-border collaboration, but ultimately they need to contribute to strategic action. Sometimes there are experiments to test the potential for cross-border policy prior to a formal strategic engagement. In other cases, there are broad visions but not a clear action plan for implementing a strategy. As a newer policy area, it will inevitably involve trial and error, which requires considerable policy learning to progressively get it right. If the funding is only for temporary projects that do not last beyond a public funding cycle, the impacts of public action are likely to be lower than if there is an opportunity for funding continuity, particularly from private sector sources.

Figure 0.3. **Making cross-border instruments work: Learning from international examples**



The success of making the cross-border instruments work is likely to be greater when they contribute to a broader strategy. Data, mapping exercises of relevant actors, and other forms of policy intelligence underpin a relevant strategy. The policy mix should address failures in the cross-border innovation system that justify a public intervention. Some failures can only be addressed at national level (e.g. regulatory issues, differences in labour market or fiscal rules), others can only marginally be addressed by policy (e.g. deep cultural differences). Some interventions only generate impacts in the long term, and others are most conducive to policy interventions at regional level (e.g. low levels of business co-operation due to lack of awareness of resources over the border).

Strategies also require translation into an action plan that implies accountability and policy learning. Outcome-oriented policies are needed to demonstrate the value-added of cross-border policies over policies that are restricted to national/regional boundaries. Rarely does the cross-border entity promoting the strategy have the mandate and/or resources to achieve it. The plan therefore involves the commitment of the myriad of agencies and implementers to make it happen. Monitoring actions to evaluate progress can then feed into strategy revision. The individual instruments – and the targets attached to them – need to be defined according to their contribution to these overall goals and targets.

Pilot actions are useful strategy components, both for accountability and for stakeholder engagement. These experiments can serve as test cases for determining whether cross-border actors can participate in traditional innovation programmes (mainstreaming). Many experiments have been tried but they do not always work. Understanding why these did not work, so as to revise for the future, is critical in a field that is fraught with uncertainty and special challenges working cross-border. Instruments that seek to force actors to collaborate when they have disincentives to do so, such as regulations or insufficient quality of an innovation partner, will simply not be sustainable.

Policy instruments have shown different degrees of success in international examples (Table 0.4). Instruments that worked in several examples include those supporting linkages between firms and knowledge institutions across the border, cluster-related efforts in common areas, and shared access to scientific infrastructure. Innovation vouchers and joint research were also received well in several regions. Innovation projects in highly regulated sectors (including related to health systems or energy provision) as well as common branding efforts, which raise political sensibilities, were generally more difficult to implement. Mixed results were observed for broad university

collaborations; however, arrangements that focus on specific areas of complementary expertise or cross-border study programmes were easier to implement. Other cross-border instruments have been tried, such as financing and innovation awards.

Table 0.4. **Overview of cross-border innovation policy instruments**

Instruments	
Strategy and policy development	R&D support
Analytical exercises and mappings (mapping of clusters or value chains, technology foresight exercises)	Joint public research programmes
Benchmarking and policy learning	Joint research infrastructure, shared access to research facilities
Joint branding of the cross-border area	Cross-border private R&D funding programmes (generic and thematic)
Technology transfer and innovation support	Educated and skilled workers
Cross-border innovation advisory services (vouchers, intermediaries)	Scholarships/student exchanges
Advisory services to spin-off and knowledge-intensive start-ups	Joint university or other higher education programmes
Other technology transfer centres and extension programmes	Talent attraction and retention or mobility schemes
	Cross-border labour market measures
Science and technology parks and innovation networks	Other instruments
Cross-border science and technology parks	Financing (venture capital funds or angel networks)
Cluster or network initiatives	Public procurement/ border as a source of innovation/ innovation awards

Note: See Annex 3A.1 for a summary of the advantages and barriers found in practice for each of these innovation instruments applied on a cross-border basis.

There are different options for trying to ensure longer term funding for cross-border activities, such as through alignment. In some cases, the cross-border instruments are created by aligning existing policies on both sides of the border, thus ensuring a smooth implementation of different policies without developing joint programmes. In other words, public funding is in the form of a "virtual common pot": each authority keeps its own budget and funding rules ensuring co-ordination in implementation and adding an important criterion on the cross-border dimension. *The Innovation Voucher programme has been jointly managed by the respective Ireland and Northern Ireland (UK) business development agencies, Invest Northern Ireland and Enterprise Ireland.*

Another option is to mainstream the cross-border dimension in specific regional/national programmes. Actors from one jurisdiction are thus eligible to receive funds from the other jurisdiction where the innovation partner is located. There are few experiences with joint instruments involving "real common pots" whereby the design and implementation procedures (including selection, etc.) all operate across borders. The possibility for such fully joint programmes could be explored on the basis of successful cases of aligned policies. *The Top Technology Clusters and Cluster Stimulation Fund (GCS) are examples of "real common pot" instruments used in the TTR-ELAt cross-border area.*

Finally, the private sector needs to see value to continue the financing. There are many cases of unsustainable cross-border initiatives due to a project logic or a design insufficiently adapted to participant needs. Public funding should be catalytic, based on bottom-up agendas. *The MIDAS project in Ireland-Northern Ireland (UK), a cluster of creative industries, was initially publicly funded, and then companies continued the cluster with their own funding.*

Key recommendations to make cross-border instruments work include:

- **Devote more efforts to strategy development and policy intelligence.** Case studies reveal that greater attention is needed to identify opportunities where collaboration would create a true and significant value added, as well as opportunities for complementarities across different fields of expertise. The incentive structures for different actors to collaborate should also be taken into account. Developing a common understanding of why certain previous cross-border initiatives did not succeed can serve to avoid repeating similar mistakes. Benchmarking with other cross-border areas may help define more efficient cross-border initiatives or instruments.
- **Mainstream the cross-border element in innovation instruments, align programme rules or allow for greater programme flexibility.** Allowing cross-border actors to participate in programmes in the neighbouring country, subject to the demonstration of co-operation benefits, is a powerful means to stimulate and support cross-border collaboration. An alternative is to align programmes on the various sides of the border, so that actors can benefit from simultaneous and co-ordinated support from their respective jurisdictions. Such alignment can achieve impact without an increase of budgets dedicated towards cross-border activities. It allows the creation of "virtual common pots" for joint efforts whereby funds may still stop at the border, but meet funds on the other side.
- **Make greater use of opportunities created by the border.** While in many areas the border is a burden, there are cases where it can be an opportunity. Working across the border may allow firms to then gain easier access to another national market, including the public sector of a neighbouring country. The neighbouring country can serve as a test bed for products before wider international marketing. There are several examples of problems that are created by the border that can be the source of inspiration for a solution marketable elsewhere.
- **Publicise success stories of cross-border instruments.** Given the challenge of trying to convince politicians and cross-border residents that such efforts are worthwhile, some concrete and successful projects can inspire. The examples can serve to engender greater willingness on behalf of constituent jurisdictions to support cross-border collaboration. Such success stories should focus on the unique contribution of the cross-border dimension.

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Part I

Engaging in regional cross-border collaboration for innovation

Chapter 1

Innovating beyond borders

To be globally competitive, regions need to take into account the dual phenomena of increasing international linkages and the persisting importance of geographic proximity. However, even when innovation actors are in proximity, the presence of an international border is a barrier for collaboration, one that is increasing in recent years. For many regions, there are a number of reasons why collaborating with an international neighbour makes sense for both sides. For innovation purposes, the definition of the "functional" area for cross-border policy requires some assessment of both the innovation relationships that are (or could be) relevant, as well as the other functional ties and institutional arrangements. The definition should seek to avoid simply creating rigid new borders.

While international collaboration is increasingly part of the innovation process for firms, there nevertheless remains an important place-based dimension. Cross-border areas bring together firms, people and knowledge generation institutions that are in geographic proximity, albeit with an international border in between. While fitting policy to place can result in better economic outcomes, the definition of that place can be complicated. Even within the same country, collaboration across regions to support innovation-driven economic development is challenging. Regions compete to attract skilled workers and firms. Furthermore, it is much more difficult to illustrate the value of inter-regional collaboration for innovation policy, or the costs of non-collaboration, relative to other policy fields such as transport. When the complication of an international border is added, that inter-regional collaboration can be unwieldy to initiate and implement. This chapter considers:

- what innovation and globalisation trends make cross-border collaboration for regional innovation increasingly relevant
- for what reasons, and under what conditions, does it makes sense to collaborate with cross-border neighbours
- how can the cross-border area for innovation policy support be defined.

Acknowledge globalisation and innovation trends

Innovation collaboration is increasingly global, for several reasons

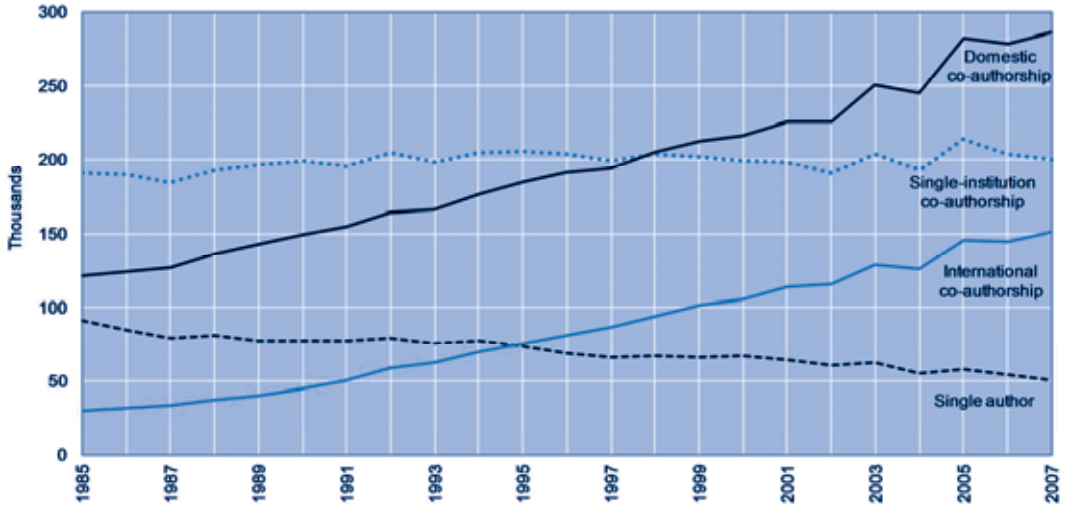
The increasing globalisation of knowledge production and innovation activities requires all regions to think beyond their borders. Companies are extending their value chains and markets, recruitment areas and range of innovation partners towards farther reaching locations. While the share of foreign innovation collaborations may be larger in smaller and highly open economies, firms in countries with large domestic markets still seek global partners. There is an increasing share of scientific co-publications with international partners. The share of all publications with an international co-author has tripled from around 7% in 1985 to around 22% in 2007 (Figure 1.1). In terms of patenting, the share of co-patents with inventors in a foreign country has doubled over the last three decades, increasing from 10% in 1980 to 20% in 2008.

Innovation is increasingly multi and inter-disciplinary. Data from “science maps” show the convergence of different scientific fields, such as nanoscience that grew out of the interaction of physics and chemistry. Environmental research is an example of a multidisciplinary field (OECD, 2010b). Innovation is increasingly at the intersection of different technologies and sectors, thus requiring opportunities for such new combinations to arise. For example, many innovations are at the intersection of nanotechnology and biotechnology. Economies of scope can enhance innovation as wider partnerships can create value from diversity, by combining complementary expertise available internationally.

There is a need for greater critical mass in certain fields to compete globally. Knowledge production is characterised by economies of scale, generally requiring international investments and talent. Small regions are often less visible on an international scale. Joining efforts and resources with nearby regions across borders may be necessary to increase the size of the local labour market and the access to innovation resources. Such joint efforts can help the respective regions gain the effective critical mass necessary to become visible internationally, thus attracting foreign firms,

investments and personnel. Technology parks and similar initiatives with an international outlook benefit from a wider pool of clients and the cross-border scope also serves international branding efforts. Joint investments and the sharing of resources are increasingly necessary to reach the scale for international excellence. Venture capital (VC) funds work more efficiently when there is a sufficient base of firms in proximity.

Figure 1.1. **Scientific publications increasingly involve international collaboration**



Source: OECD (2010), *Measuring Innovation: A New Perspective*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264059474-en.

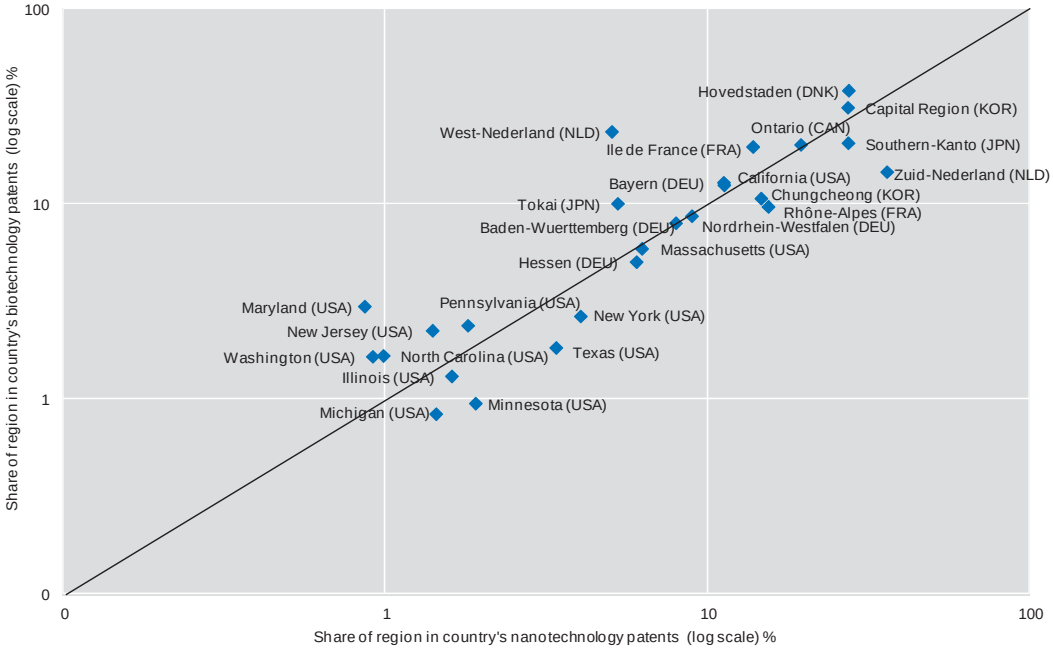
There is a growing need for specialised knowledge as well as both cost and risk-sharing. Firms in regions need to access world-class knowledge and be connected to a wide range of innovation actors. The size of many regions prevents them from offering a full innovation support infrastructure responding to all the specialised needs of regional stakeholders. Innovation advisory services need a degree of specialisation to reach a high level of professionalisation. Moreover, this knowledge specialisation makes innovation processes more risky. Building high-end and targeted research centres, or providing particular S&T equipment, is expensive. Sharing the costs and the risks of such facilities is a way to support future innovations. Accessibility through physical proximity can be an advantage for such joint efforts.

Geographic proximity remains important for the innovation process

The phenomena of agglomeration and clustering (firms, research facilities, skilled workers, etc.) illustrate the persisting relevance of geographic proximity. A broad stream of academic literature has studied the benefits of agglomeration economies in terms of productivity gains.[1] According to Rosenthal and Strange (2004), a doubling of the size of urban agglomerations increases productivity between 3% and 8%. Productivity advantages of agglomeration economies have been related to several aspects: *i)* labour market pooling that gives workers a range of potential employers and the firms access to specialised skills, thus facilitating better labour market matching; *ii)* variety and specialisation by providers of intermediate goods and services; and *iii)* knowledge spillovers whereby firms benefit from being near each other because there are areas of special knowledge.[2]

Innovation activities are highly concentrated in a limited number of regional knowledge hubs. Over 33% of R&D takes place in the top 10% of large OECD regions,[3] and 58% of patents are applied for in the top 10% of small OECD regions (OECD, 2013).[4] Around one fourth of skilled employment is concentrated in the top 10% of OECD regions.[5] The top OECD regions in terms of patenting volume are often responsible for a large share of the national patents, notably in biotechnology and nanotechnology (Figure 1.2).

Figure 1.2. **Top patenting regions strong in several technologies**



Source: OECD (2010) *Measuring Innovation: A New Perspective*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264059474-en.

The return on innovation-related investments declines with distance. There are many studies that document the phenomenon of the spatial decay of knowledge spillovers (Box 1.1). For example, if R&D investments are made in a particular location, the impact on growth is generally observed to be limited to a certain radius around that investment. The same finding is observed with patent citations, whereby the frequency of citing a given patent does fade with distance. One recent analysis shows that the change in the probability of citing a patent in the same region (metropolitan area) is generally twice as high as citing a domestic patent more generally in Europe and three times higher in North America. Citation probability decays after around 200-250 kilometres in Europe, and a shorter 150 kilometres in North America, after which point distance no long plays a role (Thoma, forthcoming). Therefore, even for codified knowledge, such as a patent, proximity still matters. Some form of tacit knowledge, which comes from inter-personal interaction, is clearly still important to transfer knowledge.[6]

Box 1.1. **Place still matters for innovation: Knowledge spillovers and spatial decay**

Several scholars have debated the geographic dimension of knowledge spillovers, as measured by different innovation-related variables: *i)* sectoral concentration of firms; *ii)* human capital characteristics; *iii)* R&D activities; *iv)* patents and patent citations. All of these studies claim that the geography matters for innovation activities and that the concentration is beneficial for regional development and economic growth (see, for example, Carlino et al. [2012] and Ejermo [2009] for a more detailed discussion on this topic).

Studies have shown the importance of proximity as evidenced by the concentration of jobs and firms. Ellison and Glaser (1997) proposed a dartboard approach across industries and regions and a scoring index to demonstrate that firms and employment are spatially concentrated at a higher degree than a random distribution. This index has been subsequently improved and extended by Ellison and Glaser (1999) and Duranton and Overman (2008). Rosenthal and Strange (2005) analyse the impact of agglomeration of human capital on productivity, finding that proximity matters and that the positive effects of knowledge spillovers driven by the spatial concentration of educated workers decline as distance increases. In the same vein, Arzaghi and Henderson (2008) study the networking effects of the advertising agency industry in Manhattan and they find that those spillovers have a very rapid decay with distance (approximately 750 meters).

The productivity gains of joint R&D projects among G-5 countries in the OECD area have been shown to be geographically bounded, as the productivity gains decline with the distance between R&D partners (Keller, 2002). Orlando (2004) finds that both geographic and technological R&D spillovers are significant and important. Buzard and Carlino (2009) look at the concentration patterns of R&D labs in the United States, finding that geographic clustering of labs is significantly different from random spatial patterns. In addition, they also find a strong positive correlation between geographic clustering of R&D labs and knowledge spillovers as proxied by patent citations.

Jaffe et al. (1993) proposed for the first time to consider patent citations as a paper trail for the existence of geographical knowledge spillovers. They find that patent citations are geographically localised even when controlling for a pre-existing concentration of technologically related activities. Thompson (2006) illustrates that patent citations are geographically concentrated both between and within a country. In Agrawal et al. (2008), patent citation and co-ethnicity data are used to study the impact of spatial and social proximity on knowledge flows. The authors find that both geographical and social proximity have an impact and, in particular, that knowledge flows between inventors fade with distance.

More recently, Lychagin et al. (2010) compare different kinds of R&D spillovers depending on geographic, technology and product-market proximity. They find that local spillovers are significant, showing a gradual decay over space. Kerr and Kominers (2010) use patent citations to measure spillovers in geographical areas and relate them to clusters and shapes of firms. Murata et al. (2011) use micro-level and geolocalised data on patent inventors to analyse knowledge spillovers in different technologies. They find that spillovers are localised for most technologies (95%) and diminish with distance. Carlino et al. (2012) detect patterns of local concentration of R&D clusters and find that patent citations occurring in those clusters are significantly more geographically concentrated than patent citations on average. In addition, they show that R&D labs are most significantly clustered at small spatial scales (a quarter of a mile) and that the significance decays rapidly with distance.

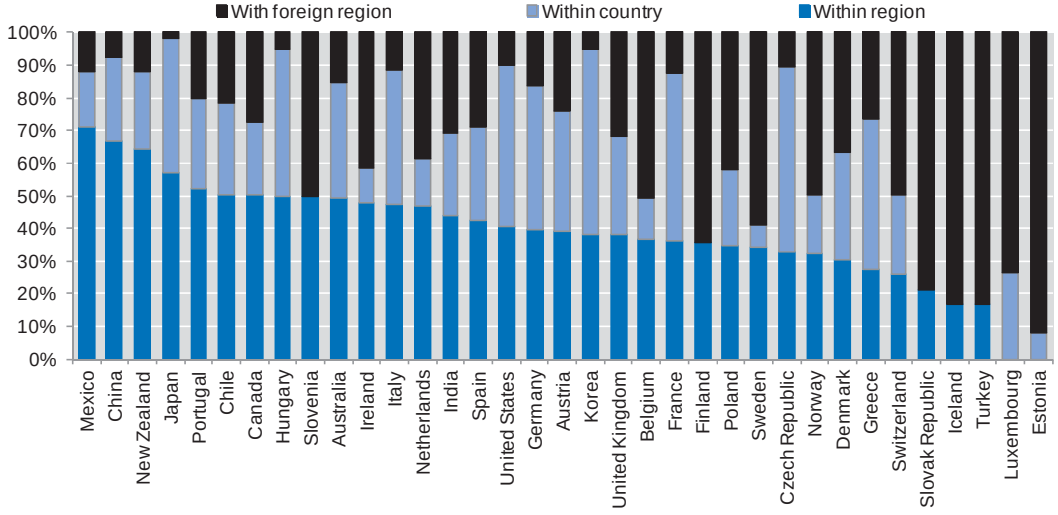
In an econometric study covering all regions in 25 EU countries, Rodríguez-Pose and Crescenzi (2006) try to discriminate between the influence of internal factors and external knowledge and institutional flows on regional economic growth. The empirical results highlight neighbourhood effects: not only is R&D investment within the region important for growth, but R&D investment in nearby regions has impacts on a region's growth. They also indicate the importance of proximity for the transmission of economically productive knowledge, as spillovers show strong distance decay effects. In the EU-25 context, the study found that only the innovative efforts pursued within a three-hour travel radius have a positive and significant impact on regional growth performance.

Source: Agrawal et al. (2008); Arzaghi and Henderson (2008); Buzard and Carlino (2009); Carlino et al. (2012); Duranton and Overman (2008); Ejermo (2009); Ellison and Glaeser (1999); Ellison and Glaeser (1997); Jaffe et al. (1993); Keller (2002); Kerr and Kominers (2010); Lychagin et al. (2010); Murata et al. (2011); Orlando (2004); Rodríguez-Pose and Crescenzi (2006); Rosenthal and Strange (2005); Thompson (2006).

Evidence on collaborative activities for patenting highlights the importance of geographic proximity, as well as other forms of proximity. For example, collaboration for invention activities is almost 50% in the same region (OECD, 2013). When looking specifically at co-inventions between public and private co-applications, around 40% of those collaborations take place within the same region, even in countries with other strong regions and international collaboration networks, such as Germany and the United States (Figure 1.3). Policies that shape collaboration between the public and private sector are more likely to favour same country collaboration. However, it is likely that other forms of proximity are relevant as well (Box 1.2).

Figure 1.3. **Public-private co-patenting collaboration often occurs in the same region**

Co-patenting with at least one business and one public applicant over total co-patenting, by location of applicants, 2005-07



Note: A public applicant is a public research organisation or higher education institution.

Source: OECD (2011), *OECD Regions at a Glance*, OECD Publishing, Paris, http://dx.doi.org/10.1787/reg_glance-2011-en.

International borders remain important obstacles for the flow of knowledge and other forms of innovation collaboration. Evidence shows that even when regions are physically close and share common areas of technological expertise, there is an additional barrier given the presence of an international border (Box 1.3). In fact, in both North America and Europe, the probability of citing a patent in a neighbouring foreign region is no different than citing one in any foreign region, regardless of distance, showing that the border effects dominate over proximity benefits. Language differences are also significant for patent citations. This implies that there must be a range of associated costs with cross-border collaboration by innovation actors. Therefore efforts to promote regional innovation policy taking into account a cross-border area will need to seek to minimise the costs of the international boundary to better reap the benefits of working together.

Box 1.2. **What is meant by the term "proximity" for innovation collaboration?**

Geographic proximity is only one of several kinds of proximity that can be relevant for collaboration in innovation. Boschma (2005) has identified five forms of proximity:

- **Cognitive proximity:** Actors need cognitive proximity in terms of a shared knowledge base in order to communicate, understand, absorb and process new information successfully. Too little cognitive distance means a lack of sources of novelty. It increases the risk of lock-in or undesirable spillovers to competitors. Too much cognitive distance hampers communication and leads to misunderstanding and limited potentials for interactive learning.
- **Organisational proximity:** A certain degree of organisational proximity is needed to control uncertainty and opportunism in knowledge creation within and between organisations. Too little organisational proximity goes along with a lack of control, increasing the danger of opportunism. Too much organisational proximity may be detrimental to interactive learning due to lock-in and a lack of flexibility.
- **Social proximity:** Social proximity may stimulate interactive learning due to trust and commitment. Too little social proximity may be harmful for interactive learning and innovation due to a lack of trust and commitment. Too much social proximity may also be detrimental to interactive learning due to lock-in and an underestimated risk of opportunism.
- **Institutional proximity:** Institutional proximity is an enabling factor, providing stable conditions for interactive learning to take place effectively. Too much institutional proximity is unfavourable for new ideas and innovations due to institutional lock-in (obstructing awareness of new possibilities) and inertia (impeding the required institutional readjustments). Too little institutional proximity is detrimental to collective action and innovation due to weak formal institutions and a lack of social cohesion and common values.
- **Geographic proximity:** This is the spatial or physical distance between economic actors, both in its absolute and relative meaning. Short distances literally bring people together, favour information contacts and facilitate the exchange of tacit knowledge. The larger the distance between agents, the less the intensity of these positive externalities, and the more difficult it becomes to transfer tacit knowledge. This may even be true for the use of, and spread of, codified knowledge. There can also be disadvantages to too much geographic proximity as it can lead to lock-in.

Applying a proximity level analysis, others have documented challenges for creating an integrated cross-border system. Lundquist and Trippl (2013) note three broad concepts of proximity as important for the success of cross-border co-operation among innovation-related actors: physical (geographic), functional and relational proximity. In a study of the cross-border area of Baden (Germany) and Alsace (France), it was a lack of relational proximity (non-tangible dimensions based on degrees of similarity and affinity), and not geographical proximity (accessibility issues) that was the challenge for collaboration (Koschatzky, 2000). According to Maggioni and Uberti (2007), functional distance defined as strong asymmetries in innovation potential and performance limit cross-border knowledge flows between places.

Sources: Boschma, R. (2005), "Proximity and innovation: A critical assessment", *Regional Studies*, No. 39, pp. 61-74; Maggioni, M. and E. Uberti (2007), "Inter-regional knowledge flows in Europe: An econometric analysis", in Frenken, K. (ed.) (2007), *Applied Evolutionary Economics and Economic Geography*, pp. 230-255, Edward Elgar, Cheltenham; Lundquist, K.-J. and M. Trippl (2013), "Distance, proximity and types of cross-border innovation systems: A conceptual analysis", *Regional Studies*, Vol. 47, No. 3, pp. 450-460; Koschatzky, K. (2000), "A river is a river – cross-border networking between Baden and Alsace", *European Planning Studies*, Vol. 8, No. 4.

Box 1.3. **Quantifying border barriers for innovation: Evidence from the academic literature**

The academic literature includes different attempts to quantify the costs and the barriers with respect to innovation and knowledge spillovers associated with the presence of an international border. These studies make use of different indicators (generally patents and patent citations, scientific publications and R&D expenditures) to statistically assess the importance of the border. They generally consistently find that the border has an impact in terms of a faster spatial decay of science and research spillovers.

Okubo and Zitt (2004) study the intra-European S&T co-authorship collaborative network. They also focus on frontier areas and find that EU regions bordering foreign countries are more open towards academic co-authorship with cross-border regions than their national average. However, they also find that the level of preference for other regions within the same country is higher. This phenomenon is accentuated in large European countries. This shows both the importance of geographical proximity (since cross-border regions tends to have more privileged collaboration than other regions with the neighbouring country) but also the great importance of national borders.

Peri (2005) uses patent and patent citation data to estimate knowledge flows across the borders of 147 sub-national regions over the period 1975-96. The author finds that, on average, only 20% of the knowledge spillovers flow over the regional borders and only 9% flow across national borders.

LeSage et al. (2007) try to understand whether knowledge, measured by patent citations, flows more easily within countries than across international borders and to what extent physical distance between inventors is affecting knowledge flows. The authors control for technological proximity between regions and use an econometric model assessing that, overall, knowledge tends to flow more easily within, rather than between, regions across countries. The analysis also shows that language barriers have an even bigger impact than borders.

Greunz (2003) builds a model relying on a knowledge production function measured per R&D expenditure data in order to investigate inter-regional knowledge spillovers across 153 European sub-national regions. The analysis shows that, even when controlling for geographical and technological distance, inter-regional R&D spillovers take place, but to a lesser extent between cross-border regions.

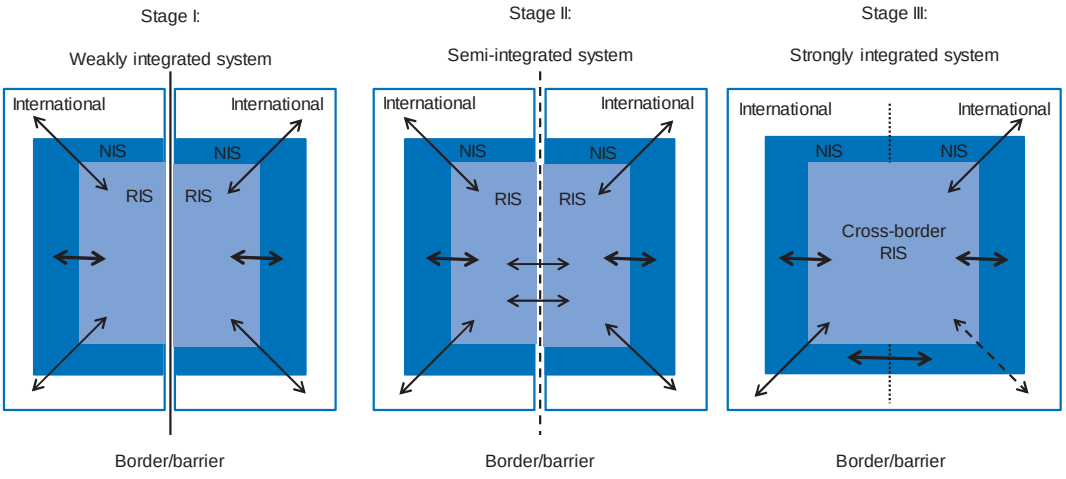
Thoma (forthcoming) finds that in both North America and Europe, the probability of citing a patent in a neighbouring foreign region is no different than citing one in any foreign region, regardless of distance, showing that the border effects dominate over proximity benefits. There is evidence of an increase of the border effect in Europe from early 1990s to 2004, above and beyond distance and language use. The increase of the border effect in North America from the early 1990s to 2002 appears to be even stronger; however, it cannot be compared to Europe, because the evolution of border effect depends also on number of patents invented domestically in each nation.

Sources: Peri, G. (2005), "Determinants of knowledge flows and their effect on innovation", *The Review of Economics and Statistics*, Vol. 87, No. 2, pp. 308-322; LeSage, J., M.M. Fischer and T. Scherngell (2007), "Knowledge spillovers across Europe: Evidence from a Poisson spatial interaction model with special effects", *Papers in Regional Science*, Vol. 86, No. 3, pp. 393-421; Greunz, L. (2003), "Geographically and technologically mediated knowledge spillovers between European regions", *The Annals of Regional Science*, Vol. 37, No. 4, pp. 657-680; Okubo, Y. and M. Zitt (2004), "Searching for research integration across Europe: A closer look at international and inter-regional collaboration in France", *Science and Public Policy*, Vol. 31, No. 3, pp. 213-226; Thoma, G. (forthcoming), *OECD Regional Development Working Papers*, forthcoming, http://dx.doi.org/10.1787/20737009.

Regional strategies need to consider cross-border neighbours as well as wider global networks

A strong cross-border regional innovation system can better take advantage of global networks. The literature on regional innovation systems highlights the relationships among different types of actors co-located in the same place (Cooke et al., 1997). The so-called "triple helix" refers to the close interaction of: *i)* firms; *ii)* universities; and *iii)* the public sector in promoting a strong innovation system (Leydesdorff and Etzkowitz, 1996). If some important knowledge generation or innovation partners are interacting with farther global partners, and they are actively connecting to other actors locally, that global knowledge can be better diffused locally (Benneworth and Dassen, 2011). The terms "local buzz" and "global pipelines" have been used to illustrate the importance of having both strong local and global connections (Bathelt et al., 2004). A regional innovation system on a cross-border basis overcomes obstacles associated with an international boundary for a more integrated system. It therefore can access the two national innovation systems and reach a broader range of global actors (Figure 1.4).

Figure 1.4. **Stylised depiction of cross-border regional innovation system integration**



Notes: NIS = national innovation system, RIS = regional innovation system, see Annex 1.A1 for the characteristics associated with each stage.

Source: Lundquist, K. and M. Trippl (2013), "Distance, proximity and types of cross-border innovation systems: A conceptual analysis", *Regional Studies*, Vol. 47, No. 3, pp. 450-460.

Collaborations driven by physical proximity and collaborations driven by global excellence are not mutually exclusive. Innovation system actors operate on different spatial scales. Cross-border clusters of firms may jointly seek opportunities for collaboration with markets further away. Universities can promote together mobility schemes for staff and students. Irish and Northern Ireland universities, for example, are active in establishing common platforms of collaboration with leading academic institutions in the United States. Cross-border efforts can make the area more attractive for global actors to interact with the region.

Collaborate across borders to compete globally

There are many reasons why public authorities may seek to collaborate with cross-border neighbours

Cross-border policy efforts have traditionally tackled planning, transport and environmental considerations. Local cross-border spatial planning and transport policy have been the main objectives of many early cross-border partnerships, and remain so today. These are competencies often in the mandate of the local jurisdictions along a border. Environmental considerations, such as the joint management or protection of water resources, are another frequent subject of cross-border intervention.

Over time, other priorities of cross-border co-operation have been added, such as tourism, public service delivery and economic development. Tourism is a popular subject for collaboration, such as for destination branding or shared infrastructure. The Hedmark-Dalarna cross-border area between Norway and Sweden, for example, is focusing its cross-border activity on tourism. Cross-border efforts may involve arrangements to access key infrastructure and public services, such as a shared hospital on the border between southern France and Catalonia, Spain. Economic development, including that which is innovation-driven, has also gained prominence in cross-border co-operation arrangements. Such initiatives often seek to reduce trade barriers, promote labour market integration and achieve greater co-operation for education, research and innovation policy.

There are several rationales for cross-border collaboration related to innovation and economic development. Some seek to address the positive or negative externalities that cross the border, be that the benefits of a science facility for industry in the other region, or tax arrangements to compensate for service use due to cross-border commuting. Another set of rationales helps regions to overcome different forms of peripherality. They want to be more visible to national policy makers as well as globally competitive for firms and talent. For example, the motto of the Bothnian Arc cross-border area in Northern Finland and Sweden is “Together we are more”. Several drivers for cross-border collaboration for innovation policy support such overarching collaboration goals (Table 1.1).

The strongest rationale among case study areas for cross-border innovation policy is that of **economies of scale**. Regions are collaborating to join forces across a wider territory by better pooling their assets and achieving greater **critical mass**. This may increase opportunities for firms and workers through a larger labour market, an asset for knowledge-based companies. Access to expanded business and knowledge networks helps firms, particularly small and medium-sized enterprises (SMEs) that may not be able to source globally to the same extent as large firms. Reaching this critical size can increase the visibility of the area as an innovation node in global networks, raising the area’s profile for public and private, as well as national and international innovation-related investments. All the case study regions noted this as a core rationale for collaboration. Economies of scale, beyond critical mass, also have implications for political power and the delivery of specialised services for innovation.

Table 1.1. **Rationales for cross-border collaboration for innovation policy**

Economic concept	Driver	Explanation
Economies of scale	Critical mass	Access to larger labour markets or wider business and knowledge networks to increase critical mass, characteristics associated with agglomeration economies
	Political power	Increase the recognition of areas of strength (or special needs) in regions that are far from capitals to better compete for resources from higher levels of government
	Specialised services	Innovation support services can be more specialised and thus of higher quality
Economies of scope	Complementarities	Build on a diversity of assets in terms of research, technology and economic base, also known as "related variety", as well as supply chain linkages; in some cases, complementarity may also be due to differences in price levels, cost structures or functions
Public and club goods	Regional identity	Increase internal recognition of the cross-border area for greater integration and social capital (including knowledge of the partners on the other side of the border)
	Regional branding	Attractiveness and recognition of the area to firms and skilled labour both within the cross-border area and beyond
	Specialised infrastructure	Shared science and technology parks, centres or research facilities reduce financial costs and risks for the regions or countries involved, and allow access to a greater number of researchers and firms
Externalities	Border issues	Address the day-to-day issues associated with flows of people, goods and services (including public services) across the border for both positive and negative spillovers

Raising **political power** with higher level authorities is important for cross-border regional innovation efforts. There are some cross-border areas that involve capital cities, whereby national policy makers live in the area and are more attuned to their problems and needs. In a couple of the case studies, there are capital cities on one side of the border, where gaining political recognition is less difficult than on the other side. Helsinki-Tallinn is a unique case of national capitals on both sides with important shares of national population and production. However, generally cross-border areas do not involve a capital region; therefore, this rationale is even more relevant for their joint activities.

Specialised innovation services and other supporting conditions can be more efficiently delivered jointly rather than in isolation. Achieving a sufficient level of critical mass of innovation activities is also important for the delivery of specialised and targeted innovation services. Often, such services need a minimum number of beneficiaries or actors to be effective. A sufficient number of actors cannot always be found in a single region. Moreover, services related to specific sectors and technologies need particular capacities that can be sustainable only if the number of recipients is over a certain threshold. For example, business angel networks and venture capital funds need a sufficiently large potential deal flow of firms of a certain field or technology area to make investments profitable and to diversify their portfolios.

Economies of scope, such as **complementarities** across innovation assets, can be used to create competitive advantages for firms in several aspects. One side of the border may have strong research in a field and another may have a strong industrial base that can use that knowledge. Differences in research specialisations, technological expertise and industrial profiles may be helpful to combine. Many innovations are at the intersection of different research, technology and industrial areas (OECD, 2010b). Such complementarities are what have been termed "related variety" in the sense that the

research or technology is different enough to bring a value added, but similar enough to effectively bridge the gaps for being able to combine them. These combinations can then serve to "construct regional advantages" (Asheim et al., 2011). Such conditions also have a positive influence on regions' capacity to find a new direction for their development and renew their industrial structures, thus avoiding lock-in. This is also one of the rationales that underpins the new efforts to promote "smart specialisation" by the European Commission in the design of regional innovation policies more generally: regions should focus on unique combinations that give them a competitive advantage internationally (European Commission, 2012). For example, the TTR-ELAt (Top Technology Region/Eindhoven-Leuven-Aachen Triangle, at the intersection of the Netherlands, Germany and Belgium) is taking advantage of such complementarities in its cluster-oriented collaboration approach. Helsinki (Finland) and Tallinn (Estonia) have a potential to link different ICT competencies, business environments and public service approaches for creating new products and services. The two main cities in the Bothnian Arc are strong in the ICT sector, building on the heritage of the Nokia R&D Centre in Oulu (Finland) and the forthcoming Facebook data centre in Luleå (Sweden).

Additional drivers for cross-border collaboration are related to the creation of **public and club goods**, like **regional identity**. Many of the missed opportunities for the cross-border area are related to a lack of knowledge and understanding of possible employers, businesses or other innovation collaboration partners on the other side.[7] Instruments in several case studies were targeted at overcoming this lack of knowledge regarding neighbours, commonly in the form of networking and matchmaking events. In the Oresund, for example, a magazine with relevant socio-economic information on the cross-border area is issued monthly by the Oresund Institute. The provinces constituting the TTR-ELAt have been mapping actors and institutions active in the cross-border area to increase their knowledge of their neighbours. Many initiatives that support internal identity are not focused on innovation *per se*, as they may address cultural issues, but they are also found to be important in creating a greater sense of social proximity within the cross-border area, which underpins many forms of innovation interactions. Cultural and sporting events were reported as having important symbolic value for creating a sense of regional identity.

Branding for external audiences to attract business and talent is a common public good rationale for collaboration. In regions that are not top global hubs, external branding is particularly important. The efforts to build greater critical mass also strongly support such branding initiatives. Branding strategies therefore involve some presentation of the joint assets in the cross-border area. For example, the TTR-ELAt area seeks a common branding of its network of small and medium-sized cities to better attract and retain international workers and firms. In the Oresund, the branding of the life sciences sector has been internationally successful.

Specialised infrastructure for innovation activities often requires important levels of investments by public authorities. As a consequence, it may be necessary to tap into more funding sources than a particular region. In addition, shared research infrastructure can be used by a higher number of researchers and R&D personnel, thus facilitating the creation of inter-regional innovation networks and avoiding the development of big facilities whose capacity is not sufficiently exploited by local stakeholders. Examples in case study regions include the Chemelot Business Park in the TTR-ELAt area (Chapter 3, Box 3.12) or the European Spallation Source in the Oresund, albeit the latter has a much wider impact than the cross-border region (Chapter 3, Box 3.7).

There are many day-to-day **border issues** for people and firms that interact across the international border. Cross-border partnerships serve to overcome barriers to cross-border flows. Common problems are related to labour market regulation differences, transport systems, environmental issues, tax systems and other very practical issues. Such considerations are thus tangible to citizens and politicians, particularly at the local level. This rationale is at the core of cross-border regions' development strategies. Such barriers also hinder economic development and impede the exploitation of innovation opportunities. In some cases, the practical solution of border issues may result in the development of innovations. Sometimes these border issues are actually not costs, but benefits associated with being part of a cross-border area.

International experience shows the importance of different rationales for cross-border efforts

Nordic countries established a political co-operation framework after World War II, but in recent years innovation policy has risen on the agenda.[8] Some elements for a favourable environment for cross-border collaboration include a shared value system as well as cultural and geographic affinities. The goal of removing obstacles for the free movement of goods, services, people and capital is high on the agenda. Since 2005, there has been a particular focus on the development of synergies in the field of innovation. The Nordic Regional Innovation Policy Programme 2009-2012 includes cross-border integration among its three main goals: sharing experiences and knowledge building; globalisation and cross-border collaboration; and third-generation regional policy. Cross-border areas have been formed and supported by Nordic Council funds. Financial and symbolic support from the Nordic Council of Ministers plays a vital role in the cross-border collaborations. This funding source has evolved since 2009, when subsidies for cross-border collaborations began to be allocated on a competitive basis (Lindqvist, 2010).

The European Union (EU) instruments under its Cohesion Policy have been a driving force for the development of cross-border areas in the EU. The goal of creating a borderless economic space has stimulated cross-border co-operation in many parts of the continent. Progressive harmonisation of the regulatory framework provides a more favourable context for these co-operations. Several cross-border co-operations have been initiated by European Territorial Co-operation, such as the first Interreg I programme (1990-93), which has supported the emergence of cross-border structures, the so-called "Euroregions" in the old core of Europe (Benelux, France, Germany and other central areas of the European Union). Subsequent Interreg programmes have provided support to different forms and spatial scales of cross-border co-operation arrangements, and injected funding sources to kick-start cross-border partnerships (Box 2.6). More recent examples of cross-border collaboration with new member states builds on the unbalanced level of economic development, bringing together "catching up" regions with strong but slower-growing regions from old member states.

In North America, cross-border efforts are more bottom-up, but are increasingly hampered by security concerns. The co-operations tend to have a pragmatic and focused rationale, aiming to resolve issues arising from cross-border relationships, and driven more by public sector initiative and local governments than by higher level public authorities (OECD, 2003). Many collaborations therefore remain bottom-up.[9] Typical issues for cross-border co-operation initiatives between countries are: water resources management; environmental protection; public health; and fiscal/regulation issues in areas with large cross-border commuting patterns.[10] Governance structures tend to be

domain-specific rather than overarching structures covering many regional development issues at the same time, albeit there are several large areas of co-operation with several states or provinces that have more multi-purpose collaboration agendas, such as the Pacific Northwest Economic Region (Canada and the United States) and the Conference of Border Governors (Mexico and the United States).[11] Since 2001, tighter border controls have increased the significance of borders in North America.

In South America, and beyond trade agreements, cross-border co-operations are more rare and informal. The cross-border area around Iguazu Falls in Argentina, Brazil and Paraguay is an exception (Iguazu-Foz de Iguaçu – Ciudad del Este). There has been, however, a recent increase in collaboration among cross-border regions on the continent (Association of European Border Regions, 2010). Local and regional authorities, as well as the economic sector and non-governmental organisations (NGOs), are playing a growing role in many cross-border fields in this part of the world, but the co-operations are still informal and not well structured. Regionalisation and cross-border co-operation are increasingly present on the political agendas of all Mercosur member states (particularly in Argentina, Brazil, Paraguay and Uruguay).[12]

In Asia, the cross-border efforts can take the form of a "growth triangle" where the focus is on taking advantage of imbalances in levels of economic development and innovation potential. These areas are an international zone of adjacent regions from different countries – or very often, regions that are neighbours, but separated by a sea. The specificity of Asian growth triangles is that they are based on complementarities, such as the exploitation of different economic specialisations and competitive advantages, most frequently in the form of different levels of development and thus price and wage levels, across the cross-border area. The public sector is often an initiator or major funder, but with the goal of attracting foreign investment. The first growth triangle was the SiJoRi triangle between regions from Singapore, Malaysia and Indonesia, initiated in 1989, formally established in 1995, and extended in geographical scope over time. The uneven level of development has changed the organisation of production in the triangle.[13] Attracted by low labour costs in Batam (Riau Archipelago, Indonesia) and a relatively skilled workforce in Johor (Malaysia), industrial production has moved out of Singapore where, nevertheless, planning, marketing and distribution have remained (Kivikari, 2001).

In some cases, not collaborating may make more sense

A neighbouring region may not be the best partner for different types of regional innovation collaboration. Regional innovation strategies need to reveal the reasons why the neighbouring area is a good partner for collaboration in this field, whether due to complementarities in areas of specialisation, cost differentials in labour or land markets, common interests in branding, etc. However, if there are few opportunities for firms to collaborate with other firms, universities or technology transfer offices on the other side of the border, then forcing collaboration will only waste resources. InterTradeIreland performs regular studies and surveys to identify policy targets where the cross-border approach can be useful (Box 1.4). In the North of England, within-country cross-regional efforts sought to build greater critical mass and political power. However, individual regions in the North of England were more likely to co-patent with the London area than with their neighbours, as that is where the most relevant collaboration partners were located (OECD, 2008).

In areas where international excellence is required, partners elsewhere in the world may be more relevant. Academic co-operation is often looking to international partners on the basis of the specific domain of strength in research rather than physical proximity. University researchers are evaluated by publication quality and research excellence, which requires that they focus on the best knowledge anywhere in the world. The international mobility of research staff facilitates this global reach, as both professors and graduate students are generally highly mobile in their careers and can organise long-term visiting periods in other institutions. Multinationals are very strategic in their location decisions, particularly for tapping into a knowledge-intensive region elsewhere in the world. The same is not always true for many SMEs that lack the same capacity or benefit from a global partner search as a large multinational.

Box 1.4. **Cross-border economic and innovation relationships: InterTradeIreland analyses**

An InterTradeIreland survey highlights a positive relationship between innovation and export orientation, where firms who export off the island of Ireland display a higher level of innovation activity compared to non-exporters. This positive influence is evident to a lesser degree for cross-border traders, which could signify benefits to businesses of accessing diverse knowledge inputs at the cross-border level. Larger firms (55%) are more likely to be partnering for innovation than smaller firms (36%), while the same holds for exporters (58%) and cross-border traders (53%) compared to domestic firms (31%).

The survey also shows the link between export orientation and firm growth as more international exporters (19%) and cross-border traders (15%) reported themselves in a growing or expansion mode than businesses focused on the domestic market (9%). Exporters have a systematically higher rating in all kinds of business innovation attributes than cross-border traders, while the latter display higher ratings than domestic firms.

A fifth (19%) of innovators are working with cross-border innovation partners. These relationships are focused heavily on clients/customers and suppliers, with collaboration generally much less widespread for other partners.

A quarter (24%) of innovators have international partners. Overall, international partnerships are more widely reported than cross-border relationships for links with suppliers, higher education institutes, intermediaries and business services.

Source: InterTradeIreland (2012), *Leveraging the Innovation Ecosystem for Business Advantage: A Cross-Border Study*, InterTradeIreland, December.

Regions often compete and collaborate at the same time, particularly if in close proximity. In presentations of the foreign investment agencies of the case study regions, often common information on size and unique assets in the whole cross-border area are part of the sales pitch. These are the public agencies generally most keenly focused on competition to bring a win to their jurisdiction. They reported that if for any reason they cannot win for their jurisdiction, it is better for them to have a nearby jurisdiction win than to have a firm or investment occur farther away. In the Helsinki-Tallinn area, the competition is often with Stockholm, therefore recognition of Tallinn is more relevant for their efforts. This same principle has been applied by inter-regional collaboration within the same country as well, as evidenced in the greater Chicago metropolitan area. The Milwaukee Seven is a label that brands the seven counties to attract business and talent together. In contrast, competition takes place between neighbouring Indiana with Illinois, playing on tax differentials that result in no net gains for the region overall (OECD,

2012b). Multinationals such as Philips also collaborate and compete in these cross-border areas. Today, a pervasive network of linkages exists between Philips with private organisations (SMEs and multinationals) and research and academic institutions across the three countries of the TTR-ELAt (Belgium, Germany, the Netherlands).

Define the relevant cross-border area for innovation support

Cross-border collaboration differs from other forms of international innovation collaboration

Several forms of interactions among regions take place on an international basis. There are three basic forms of collaboration across borders, but with different spatial scales (examples in Table 1.2):[14]

- **Cross-border co-operation (contiguous areas)** involves a limited set of neighbouring regions from at least two countries, with adjacent borders, covering a restricted space (typically smaller than an average country). Those cross-border areas often have a long history, and sometimes represent historical regional definitions. For example, the Swedish part of the Oresund was part of Denmark until the end of the 17th century, and Danish remained an official language for two centuries. Due to their proximity or historical ties, such areas may show similarities in economic development and culture, or perhaps share the need to overcome peripherality with respect to economic and political centres in their respective countries.

- **Transnational co-operation (macro-regions)**, including a large continuous set of regions from different countries, as well as entire countries, covering a wide territorial area. Transnational approaches for such macro-regions have been the subject of trade arrangements around the world. They have also been considered in Asian co-operation approaches. They have received increased political interest at EU level, with the development of transnational programmes in macro-regions as well as macro-regional strategies, thus far for two areas that share a common water basin.[15,16] Two cross-border initiatives in the United States (with Canada and Mexico) resemble macro-regions given their scale.

- **Interregional co-operation (international, non-contiguous)** refers to networks of regions that do not share physical common borders but do share common characteristics or goals. Many such networks, with various degrees of depth and stability, exist. For example, several programmes within the European Union support such exchanges of experiences and joint projects among regions.[17]

The contiguous cross-border areas are the most relevant for developing joint, or at least co-ordinated, regional innovation policies. First, such configurations are more likely to focus on innovation-driven economic development opportunities than broader geostrategic or infrastructure considerations. Second, with geographic proximity, the economic exchanges and flows of people, capital and knowledge may be more intense within such cross-border regions than in the other types. Third, such forms of co-operation are likely to have greater longevity, as opposed to specific regional networks formed on a temporary basis for a time-bound financed project. Finally, there may be a more favourable environment for the development of a shared vision, which in many cases may be supported by greater cultural proximity than in macro-regions that group

many countries.[18] In other words, contiguous cross-border regions are closest to a functional region for the purposes of innovation policy.

Table 1.2. **Different spatial scales for cross-border collaboration: International examples**

Type of cross-border area	Examples
Cross-border co-operation (contiguous areas)	— Top Technology Region/ Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) across the Netherlands, Belgium and Germany — Centrope region at the intersection of Austria, Czech Republic, Hungary and Slovak Republic — Danish-Swedish Oresund Region — Paso del Norte region including Ciudad Juarez, Chihuahua (Mexico), El Paso, Texas (United States) and Las Cruces, New Mexico (United States)
Trans-national co-operation (macro-regions)	Transnational approaches and programmes in macro-regions — North Atlantic Cooperation Network (Faroe Islands, Greenland, Iceland and Norwegian coastal regions) — IPA Adriatic Cross-border Cooperation Program (Italy, Slovenia, Greece, Croatia, Montenegro, Bosnia and Herzegovina, and Albania) — Pan Yellow Sea region of cities (People's Republic of China, Japan and Korea) — Asian growth triangles (such as one with regions in Singapore, Malaysia and Indonesia) — Pacific Northwest Economic Region (Canada and United States) — Border Governors Conference (Mexico and United States) Macro-regional strategies (European Union) — Danube region — Baltic Sea region
Inter-regional co-operation (international, non-contiguous)	— "Four motors of Europe": Lombardy, Catalonia, Rhône-Alpes, Baden- Württemberg — "District of Creativity" Network of 13 regions in 3 continents (Europe, America and Asia)

Cross-border efforts should target "functional" regions for innovation, but data are often lacking

The definition of a functional cross-border area depends, of course, on the function. Several attempts have been made to quantify what makes a functional region (Box 1.5). A functional cross-border area with respect to innovation activities may, however, be different from a functional area defined mainly by commuting patterns. It is an area where there is a high density of innovation-relevant internal interactions among actors of the cross-border area. Such actors include workers, firms (both SMEs and multinationals, firm associations or clusters), public agencies and government bodies, universities and other higher education institutions. A high level of engagement of the civil society in cross-border initiatives is a further indicator for the potential to be a functional area for innovation activities. Different innovation functional spaces can be defined according to the intensity of cross-border linkages with respect to specific sectors or among certain types of actors. The functional area for research institutions may be different from the functional area for firms, for example. In addition to cross-border linkages, an assessment of the degree of innovation capacity in general has been used to assess the potential functionality from an innovation perspective.

The definition of a functional region calls for data; however, such data are often not generated or analysed. These indicators are above and beyond the traditional indicators related to administrative areas focusing on commuting patterns. Data for innovation-related flows, or even basic cross-border commuting flows, is generally lacking. National statistical offices collect data related to administrative regions in their respective countries only. However, they typically do not focus on collecting data or

tracking indicators on innovation linkages and flows both within and across administrative borders. Furthermore, tight budgets at national statistics agencies make it difficult to request information for cross-border areas. The regions themselves are generally not able to devote the resources to developing such cross-national data harmonisation. Nevertheless, there are some interesting examples of cross-border statistical agencies or task forces such as Orestat (for the Oresund area), or the All-Island Research Observatory (AIRO) in Ireland and Northern Ireland (United Kingdom).[19]

Box 1.5. **Defining and measuring functional areas: Implications for innovation policy**

A functional region is a territory sharing commonalities and linkages that create interdependencies and thus cohesiveness, making it distinctly different from other regions. Functional regions are frequently defined as territories organised around a central node, while the rest of the territory displays linkages to that node through different types of relationships, associations and activities. Other types of functional regions do not display such a centre-periphery profile and may have a multi-hub configuration. The boundaries of a functional region frequently differ from those of a formal region, defined as political entity by laws and institutions. Contrary to formal regions, which tend to have stable definitions, the definition of a functional region is contingent on the type of function taken into consideration.

Typical functional regions are metropolitan areas, i.e. areas dominated by the attraction power of a main city. The OECD has developed a methodology to identify urban areas as functional economic units using density and travel-to-work flows as indicators (OECD, 2012a). In this case, the "workers catchment" power of the city is the main function taken into consideration to define the functional metropolitan region, but that region may have one or more cores with associated hinterlands. This new definition is wider than the earlier OECD definition of functional regions, meant to simply correspond to local labour market areas, where labour supply matches labour demand (OECD, 2002).

Functional regions from an innovation perspective are regions which show a high density of internal interactions in innovation-related activities. Two approaches have been used to assess the reality of such innovation-oriented functional areas:

- **Cross-border interactions:** those interactions can be measured, data permitting, with indicators such as: co-patents; co-publications; co-operations in innovation; flows of technology transfer; flows of venture capital for innovative start-ups; mobility of highly qualified knowledge workers, etc. calculated as shares of these interactions occurring within the cross-border area, on total interactions.
- **Cross-border critical mass:** the critical mass can be measured by calculating the total weight of innovative sectors in the cross-border area, in a comparative way. This is the approach taken by BAK Basel Economics, calculating a competitiveness index as the non-weighted average of four indicators: the nominal gross value added (GVA) share of the technology sectors; their GVA growth; the number of patents; and the number of publications in the cross-border area. This index is calculated for different technology-based sectors and compared to those in other knowledge-based areas.

Sources: OECD (2002), *Redefining Territories: The Functional Regions*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264196179-en; OECD (2012), *Redefining "Urban": A New Way to Measure Metropolitan Areas*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264174108-en; BAK Basel Economics (2008), *Technological Top Region Benchmarking Report 2008*, BAK Basel Economics, Basel, Switzerland.

A thorough analysis for the measurement of innovation functional areas requires indicators capturing knowledge and innovation flows as well as more basic indicators of

integration. Flow indicators could refer to different areas of economic and innovation activities: R&D investments, research, innovation, tertiary education, skilled and R&D personnel as well as participation in research projects. Other than indicators capturing the thickness of flows and connections, measurement of proximity, balance and complementarities in industrial and scientific specialisation may be identified. Cultural and language linkages should also be considered and measured as factors enabling a favourable cross-border innovation environment. An example of a list of possible indicators is found in Table 1.3. Different statistics can be combined and used to develop indexes and composite variables measuring the stage of cross-border integration and co-operation, as in the case of the Oresund Integration Index (Figure 1.5, Annex 1.A2).

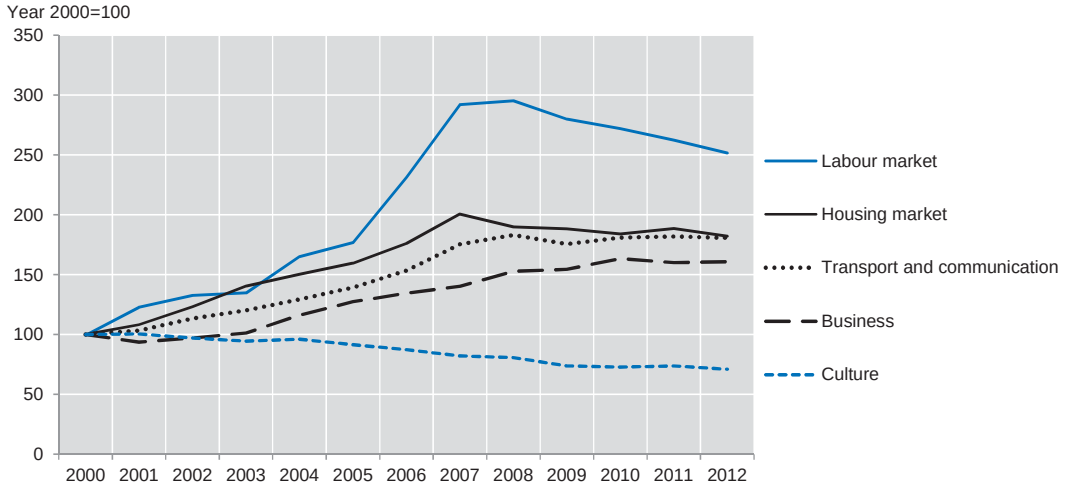
Table 1.3. **Cross-border regional innovation system integration: Menu of possible indicators**

Indicator	Description
Commuting linkages	
Intensity and direction of commuting flows	Capturing the thickness of labour market connections and the directions towards the main centres of economic activity in the cross-border area
Transport and infrastructure connections	Measuring the type (roads, railways, airports) and the time/cost necessary to connect to different places
Residents from the neighbouring cross-border region	Measuring the degree of integration in the area as well as the degree of mobility of the workforce and the population in the area
Skills linkages	
Student flows	Measuring the degree of integration of education and higher education systems
R&D personnel flows	Capturing the intensity of exchanges of innovation-related human capital
Employment specialisation by sector or scientific domain	Mapping the areas of employment specialisation of different sub-regions to highlight similarities, complementarities or differences
Science and technology linkages	
Co-publications (total and by scientific domain)	Measuring the level of scientific collaboration among research institutions
Co-patents (total and by sector)	Measuring the level of technological collaboration among R&D centres, private organisations, etc.
Joint participation in EU FP7 or other international scientific projects	Measuring the intensity of collaboration among research organisations
Joint participation in R&D projects	Measuring the intensity of collaboration among research organisations
Business linkages	
Firm specialisation in similar or different sectors by sub-region	Similar, different or complementary characteristics of the firm base in the different sub-regions of the cross-border area, capturing either ongoing or potential opportunities for collaborations
Linkages in the value chain	Type of relations along the business value chain in the cross-border area
Business co-operation linkages	Types and kinds of collaboration among firms in the area
Industry-science co-operation	Nature and intensity of co-operation between universities or research centres, on the one hand, and companies on the other, spanning over the area
Export linkages	Directions and intensity of export flows within the cross-border area
Cultural linkages	
Percentage of people speaking and/or understanding languages in the cross-border area	Measuring the level of language integration
Number of joint cultural and entertainment events	Proxy for cultural integration across different areas
Tourism flows	Measuring both internal (cross-border tourism flows) and external attractiveness of the area (in-coming flow of tourists from outside the cross-border area)

Co-patents, which represent collaboration for inventive activity, are one of the innovation-related indicators used for assessing functionality for innovation. For example, analysis of co-patent data in Switzerland reveal the existence of a large functional area in northern Switzerland, spanning several cantons and extending over national borders to the north. [20] The three northern *Grandes Régions* in Switzerland (Espace Mittelland, North West Switzerland and Zurich) are all linked through co-patents to the same nearby foreign regions: Baden-Württemberg and Bavaria (Germany) and Alsace (France), accounting for 30-60% of foreign co-patents in those areas (OECD 2011d).[21] Other examples of possible functional regions are observed in sectoral co-patenting trends, such as between Ontario, Canada and neighbouring US states or Alsace (France) with German regions (Ajmone Marsan and Primi, 2011).[22] Such evidence was also found in the area of the TTR-ELAt, where much of co-patenting across borders was due to the multinational Philips that has branches and relationships in different parts of the cross-border area.

The Oresund Integration Index is an interesting example of a measurement for functionality in the cross-border area, albeit not specific to innovation activities only. The index was originally developed at the beginning of 2000s by the Oresund Chamber of Commerce. A new version of the index has been recently released by the Oresund Committee. Five groups of variables comprise the index addressing: *i)* labour market; *ii)* transport and communications; *iii)* housing market; *iv)* business; and *v)* culture (Figure 1.5, Annex 1.A2). The general index (a composite of these five sub-indices) shows a steep increase in integration until the year 2007, from 100 (for the base year) to 180; whereas, between 2007 and 2012, the index declined to 169. The lack of dynamism as reported by the integration indices is perhaps one of the reasons the region is looking for renewed political interest in cross-border support.

Figure 1.5. **The Oresund Integration Index: Measuring cross-border functionality**



Source: Oresund Committee (2013), *Oresund Integration Index 2012.*

Definitions of a cross-border area need to recognise variable geometry and avoid new borders

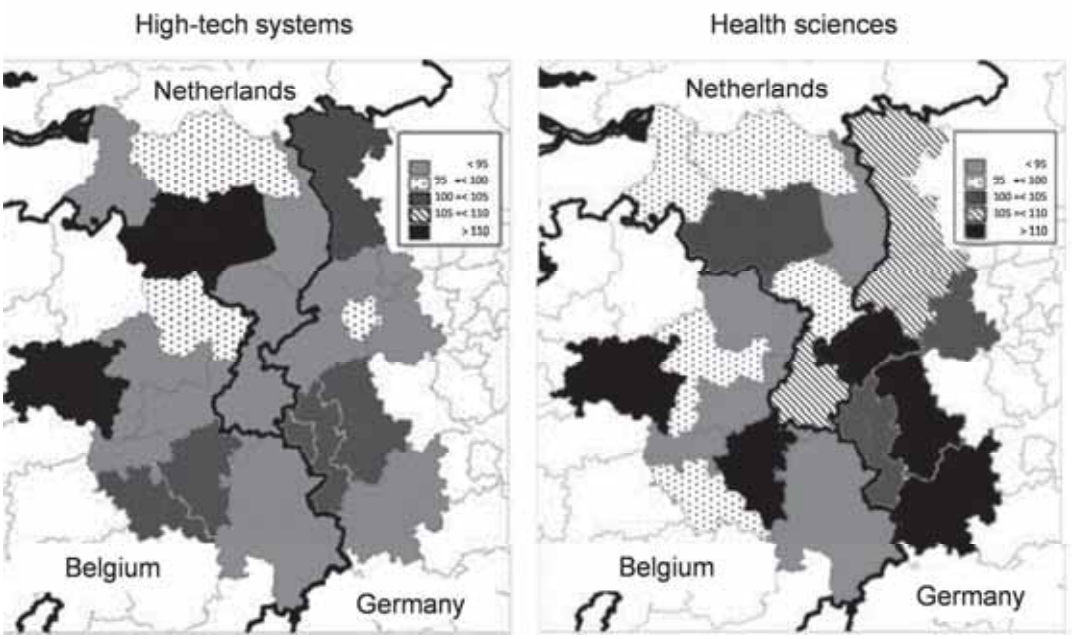
Definitions of an area may change over time. In some examples, the definition of the cross-border area may have been defined decades ago. However, industrial restructuring and the emergence of new technologies has radically changed the industrial landscape.

The creation of a new university may be an asset not considered before. Municipal reforms may change the political landscape. While not all changes are quick, the path dependency associated with such cross-border definitions can be strong, in part due to the significant time for building relationships and trust.

The need for variable geometry is also due to differences in specialisations. There are instances where, for particular projects, some parts of the cross-border area may have more or less of an incentive to engage. For example, a detailed study of the TTR-ELAt regions indicates the degree of specialisation by sub-region, illustrating why sub-regions may be more or less interested in collaboration depending on the topic (Figure 1.6).

Figure 1.6. **Strengths in common sectors differ by sub-region across the TTR-ELAt**

Competitive Index 2011 at NUTS 3 Level



Note: The index is standardised for 17 Western European countries (WE17) = 100. These maps are for illustrative purposes and are without prejudice to the status of or sovereignty over any territory covered by these maps.

Source: BAKBASEL, IBD (2012).

Variable geometry can also be necessary to allow flexibility in the application of the area definition, such as to involve an institution or firm not located in the defined area. The regions of Hedmark (Norway) and Dalarna (Sweden) have defined a cross-border functional area related to the tourism sector. However, for more general and broader innovation co-operation, it would appear more relevant for both regions to establish linkages with other domestic neighbouring regions, especially in the fields of ICT and biotech. In some other cases, innovation actors may establish relevant connections with organisations located further away, based on the nature and the excellence of actors rather than physical proximity, as it often happens in the case of higher education institutions (HEIs) and science and research centres. Some studies question if Centrope's borders are adequately drawn given that the current definition excludes the scientific hotspots of the Czech Republic (Prague) and Hungary (Budapest) (Trippl, 2013). While most of the innovation-related flows between Estonia and Finland are between Tallinn and Helsinki,

the University of Tartu is located outside of Tallinn but has many strong ties with Finland, particularly actors in Helsinki.

As a consequence, policies target different functional areas depending on the subject, the aim and the means of intervention, resulting in additional complexity. The same cross-border area may be the target of more than one policy programme, implemented by different authorities (local, regional, national and supra-national), and with different footprints. In the Bothnian Arc cross-border area, there are several small and large-scale cross-border efforts which overlap geographically in part or in whole with that definition (Box 1.6). The definition of the TTR-ELAt is similar to that of the Euregio Meuse-Rhine, but extends further to include more innovation-intensive cities and is therefore not identical. In Ireland and Northern Ireland, there are three border organisations managing European Territorial Co-operation cross-border programmes corresponding to three different segments along the border. This collaboration is further nested in the broader all-island cross-border area definition used by InterTradeIreland – the bi-national agency for promoting trade and innovation (Figure 1.7).

Figure 1.7. **Two definitions of the Ireland-Northern Ireland (United Kingdom) cross-border area**

Narrow border area

All-island definition
(international border denoted by the gray line)

Note: These maps are for illustrative purposes and are without prejudice to the status of or sovereignty over any territory covered by these maps.

Sources: (left) Special EU Programmes Body; (right) Irish Academy of Engineering & InterTradeIreland (2010), *Infrastructure for an Island Population of 8 Million*, Engineers Ireland, Dublin.

Even within a cross-border area designated for innovation support, those administrative boundaries do not always correspond to the relevant areas for innovation activities. They may be either too big (when the activity is concentrated in only a part of the cross-border area), or too small (when the intensity of linkages is observed outside the defined perimeter of the cross-border area). In the Bothnian Arc cross-border area, the potential for innovation collaboration is mainly between the two cross-border hubs of

Oulu (Finland) and Luleå (Sweden), a subset of the area. The border towns also promote joint business development. In some cases different geometries for the relevant innovation area may co-exist: not all jurisdictions in the Oresund Committee are as equally engaged in the cross-border activities. For example, after a sub-national reform, the Danish part of the Oresund was split into two administrative regions. Interactions are strongest in the Capital Region of Denmark, but the much less innovation-intensive Zealand region remains part of the cross-border definition.

Box 1.6. **The Bothnian Arc: Nested in several cross-border collaborations**

There are several smaller scale cross-border initiatives that overlap in part or in whole with the Bothnian Arc's efforts to support cross-border collaboration along the coast of the northern tip of the Bothnian Bay (Finland-Sweden):

- **Haparanda-Tornio:** Co-operation takes place between two municipalities, Tornio (Finland) and Haparanda (Sweden) at the Finnish-Swedish border along the gulf. It focuses on physical planning, joint infrastructure and services (schools, fire and rescue services, district heating, etc.). This area is fully included in the Bothnian Arc space.
- **Torne Valley:** This cross-border area gathers the 21 border municipalities and 80 000 inhabitants at the intersection of the Finnish-Swedish border to the north of the Bothnian Gulf. The focus of the co-operation is on cross-border labour mobility and business interactions. It overlaps with a small part of the Bothnian Arc.
- **North Calotte Council:** The area includes the northernmost regions of Finland, Norway and Sweden. This area overlaps with the Bothnian Arc, mainly on the Swedish side, but excludes Oulu on the Finnish side.

In addition, three large EU-supported macro-regions are relevant for the Bothnian Arc actors. These regions, falling under the European Territorial Co-operation objective, address geo-strategic, transport infrastructure and environmental objectives. They include:

- **The Barents Euro-Arctic Region:** This area includes the following regions: in Finland: Kainuu, Lapland and Oulu Region (North Karelia was granted an observer status in 2008); in Norway: Finnmark, Nordland and Troms; in the Russian Federation: Arkhangelsk, Karelia, Komi, Murmansk and Nenets; and in Sweden: Norrbotten and Västerbotten. The majority (75%) of the population of the cross-border area lives in the Russian Federation.
- **Baltic Sea region:** This macro-region covers Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Norway, Poland, Sweden, North Western Russia and Belarus. The co-operation concerns spatial planning, infrastructure and environment.
- **Northern Periphery area:** This very large area includes parts of Finland, Ireland, Sweden and the United Kingdom (Scotland and Northern Ireland) – in co-operation with the Faroe Islands, Iceland, Greenland and Norway. The whole of the Bothnian Arc is contained in this initiative. The Northern Periphery is part of the European Territorial Co-operation efforts aimed at supporting transnational co-operation among regions in Northern Europe.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Bothnian Arc (Finland-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/17, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k3xv0r6v26b-en; Hörnström, L. and A. Tepecik Diş (2013), "Crossing borders: Linkages between EU policy for territorial cooperation and Nordic cross-border cooperation", *Nordregio Working Paper*, No. 2:2013.

The definition of a functional cross-border area for innovation therefore needs to avoid building unhelpful new borders. Rendering the definition of the area rigid is a way to create a new border. The goal is therefore to minimise the potential for relevant missed opportunities for co-operation on innovation. Multiple definitions of relevant functional areas targeted by policy intervention may apply to the same region. Programmes and instruments can refer to larger or smaller cross-border areas depending on different goals, topics and industrial sectors. Some form of flexibility with respect to openness of funding to include partners outside of the area can help overcome this inevitable, but hopefully more relevant, new border.

The type of functionality for innovation therefore depends on a wide range of "proximities"

Even when focusing only on a small contiguous cross-border area, many different situations of functionality are possible. These conditions depend on those factors driven by different forms of proximity (Box 1.2). The in-depth case studies illustrate variations along these factors that represent the different degrees of integration within the cross-border area influencing the innovation system (Table 1.4). In general, the degree of integration is easiest with the highest level specification noted in each category.

Table 1.4. **Characteristics of innovation functionality for case study regions**

Category	Specification	Case study examples
Region settlement patterns *(geographic proximity)*	Metropolitan area	Helsinki – Tallinn; Oresund
	Network of small and medium-sized cities	TTR-ELAt (densely populated); Dublin and Belfast (within Ireland and Northern Ireland)
	Sparsely populated with small cites/towns	Hedmark-Dalarna; non-metropolitan Ireland-Northern Ireland; Bothnian Arc
Internal accessibility and flows *(geographic proximity)*	Strong	Oresund; TTR-ELAt
	Intermediate	Helsinki-Tallinn; Ireland-Northern Ireland
	Weak	Bothnian Arc; Hedmark-Dalarna
Industrial and knowledge specialisations *(cognitive proximity)*	Similar with complementarities	TTR-ELAt; Oresund
	Same	Bothnian Arc
	Different	Hedmark-Dalarna (tourism in common); Ireland-Northern Ireland (some common sectors such as agri-food); Helsinki-Tallinn (ICT, e-services in common)
Socio-cultural context *(institutional proximity)*	Very similar	Ireland-Northern Ireland; Hedmark-Dalarna
	Somewhat similar	Bothnian Arc; Oresund; Helsinki-Tallinn; TTR-ELAt (most sub-regions)
	Different	--
Innovation system interactions *(multiple forms of proximity)*	Pervasive	TTR-ELAt; Ireland-Northern Ireland
	Hub-to-hub	Bothnian Arc; Helsinki-Tallinn; Oresund
	On the border	Hedmark-Dalarna
Level of innovation development across border *(cognitive proximity)*	Balanced, strong	Bothnian Arc; Oresund; TTR-ELAt
	Balanced, weak	Hedmark-Dalarna
	Unbalanced	Helsinki-Tallinn; Ireland-Northern Ireland

Region settlement patterns influence not only the dynamics of functional flows within the cross-border area, but also social and political considerations. The cross-border area can include big metropolitan areas, like in the case of two capital cities, a network of small and medium-sized cities, or perhaps be more sparsely populated with small cities and towns. The settlement pattern has a strong impact on the form of cross-border linkages both with respect to innovation and more generic economic co-operation. Case study examples characterised by predominantly metropolitan areas include the Oresund, Helsinki-Tallinn as well as the two main cities in Ireland and Northern Ireland respectively: Dublin and Belfast. When the focus is around one core metropolitan area, as opposed to collaboration between two hubs, the associated functional linkages such as those related to commuting and labour force dynamics render the innovation policy collaboration more obvious. Other case study areas were networks of cities or sparsely populated areas and therefore not centred around one or two core hubs.

Internal accessibility and flows are an important enabling condition for the development of a well-functioning cross-border regional innovation system. Students, researchers and skilled and innovation personnel all need to be able to meet regularly in order to establish and maintain long-lasting connections. Strong internal accessibility thus promotes knowledge exchange between innovation centres in a cross-border region. Moreover, good infrastructure connects the cross-border area to international hubs, a consideration for attracting mobile investments, high-level international events and skilled expatriates. Depending on the geographic scale and on the level of development of the transport infrastructure, the internal accessibility of the area can be strong, moderate or weak. Internal accessibility and flows are strong in areas like the Oresund and the TTR-ELAt and to a lesser extent Helsinki-Tallinn, where, respectively the bridge, a dense network of roads and good fast-boat connections help connect the various parts of the areas. The non-capital parts of Ireland and Northern Ireland have more complex internal accessibility via roadway for most areas, while the situations of the Bothnian Arc and Hedmark-Dalarna are characterised by much greater accessibility barriers.

Industrial and knowledge specialisations that are similar or complementary provide interesting opportunities for innovation collaboration. A cross-border area may be constituted by sub-regions with the same, different or complementary industrial, economic and knowledge specialisations. There is debate on the suitable degree of specialisation of the firm structure to support innovation. In this context, the term "related variety" implies a sufficient degree of proximity between knowledge bases that permits a deeper specialisation, with a sufficient degree of distance that offers opportunities for innovation-enhancing diversification (Asheim et al., 2011).

The case studies illustrate examples of the same, complementary or different specialisations and thus varying degrees of potential to benefit from collaboration opportunities. The two sides of the Bothnian Arc exhibit a very similar specialisation in ICT, energy technologies and wood and paper processing, suggesting strong potential to build greater critical mass for innovation in those sectors. Other areas like Hedmark-Dalarna share a common specialisation in winter ski tourism, and a goal of further developing summer tourism. The specialisations in other parts of the regions are very different and less amenable to functional linkages (biotech and farming on the Norwegian side and ICT and steel on the Swedish side). In Ireland and Northern Ireland, despite some similar specialisations in broad technological domains (like ICT, food or renewable energy), the different weight of the public sector in the two economies (higher in Northern Ireland than in Ireland) and the different industrial fabric composition (the greater concentration of multinational enterprises

in the Dublin area vs. the predominance of SMEs elsewhere in Ireland and in Northern Ireland) make collaboration within those industrial and knowledge specialisations less spontaneous. The TTR-ELAt, the Oresund and Helsinki-Tallinn all show similar specialisations with some degree of distance, opening the door to complementarities in knowledge and innovation activities. Examples of niches with cross-border complementarities can be found in areas such as nanotechnologies with energy and health in the TTR-ELAt and in ICT and e-services in Helsinki and Tallinn. In the Oresund, the presence of multinationals, dynamic SMEs and leading higher education and research institutions on both sides of the border favour the development of connections on the basis of complementary expertise, such as in life science.

The **socio-cultural context** is important for the functionality of a cross-border area with respect to innovation, but that importance is often underestimated. The socio-cultural features of the cross-border area can be very similar, somewhat similar or different depending on the presence or not of common historical background, high or low language barriers, similar business and working culture, etc. Like accessibility issues, the socio-cultural context is an important enabling factor for a well-functioning business and innovation eco-system (Box 1.7). Ireland and Northern Ireland, thanks to the same language and a common historical background, can be considered to have a very similar socio-cultural context. However, this does not mean that the functional ties are fully in place, which the organisation InterTradeIreland, through the creation of "networks of trust", seeks to change. The northern European case studies tend to have similar socio-cultural contexts with small differences in comparison with OECD countries. Languages are understood across the border and the business environment can benefit from a common Nordic culture of trust. But even in a cross-border area like the Oresund, cultural differences are often raised as an issue that was more important than initially thought. The different areas comprising the TTR-ELAt have some common socio-cultural characteristics, but notable differences in language and culture are present with particular sub-regions.

Language barriers, a key element of the socio-cultural context, are reported to be increasing in several cross-border areas. As students look to be relevant globally, they are more motivated to study English than the language of a neighbour. Furthermore, television habits have changed language acquisition skills, with the rise of English-based programming. In the TTR-ELAt, it is reported in parts of the Netherlands that French used to be a desired language in education, but is less the case today. The same challenge for mutual language comprehension is reported in the Oresund. While Denmark requires that school children learn Swedish, they are seeking more innovative ways of ensuring that language acquisition has a more lasting impact.

Innovation system interactions among firms, universities, technology centres and other actors are not always pervasive throughout a cross-border area. Those interactions may be intense in the whole cross-border area (pervasive interaction). They may also be limited to the main innovation hubs of the region (hub-to-hub interaction), or only concentrated at the border. These different kinds of interaction are due to the geography and accessibility features of the cross-border region and shaped by the role, characteristics and strengths of the different innovation system actors. Given the richness and the intensity of the linkages among innovation actors, both the TTR-ELAt and the Oresund can be considered areas where the interaction is pervasive: the degree of collaboration among research centres, universities and firms is high in many science, technology and innovation (STI) domains. In other cases, like the Bothnian Arc and Helsinki-Tallinn, the main potential for interaction is mostly concentrated between the hubs, typically the largest cities in the region. Between

Hedmark and Dalarna, interactions are predominantly concentrated on the border and in a very specific sector (tourism). For more innovation-specific interactions, the other parts of two regions have connections with other areas.

Box 1.7. **Socio-cultural distance an impediment to cross-border innovation efforts**

Several studies have shown that mental and cultural borders tend to be long-lived and have a negative impact on cross-border relations. Van Houtum (1998) has demonstrated that mental distance (defined as the perception of differences between a foreign country and the home country with respect to business formalities and conventions and the perception of the consequences of these differences) is an important factor that can limit the frequency and number of cross-border economic interactions. Krätke (1999) has shown that communication barriers, fears of competition and a low trust environment are the main impediments to interaction in the German-Polish cross-border area (see also Matthiesen and Bürkner, 2001) and Koschatzky (2000) has found that cultural and institutional barriers are key explanatory factors for the relatively low level of innovation interaction in the Baden (Germany)-Alsace (France) cross-border area. Hahn (2013) and Trippl (2013) have shown that differences in language, business and working cultures are constraining cross-border innovation in the Saar-Lor-Lux region and in Centrope.

Sources: Trippl, M. (2010), "Developing cross-border regional innovation systems: Key factors and challenges", *Tijdschrift voor Economische en Sociale Geografie*, Vol. 101, No. 2, pp. 150-160; Van Houtum, H. (1998), *The Development of Cross-Border Economic Relations*, Center for Economic Research, Tilburg, Netherlands; Krätke, S. (1999), "Regional integration or fragmentation? The German-Polish border region in a new Europe", *Regional Studies*, No. 33, pp. 631-641; Matthiesen, U. and H.-J. Bürkner (2001), "Antagonistic structures in border areas: Local milieux and local politics in the Polish-German Twin City Gubin/Guben", *GeoJournal*, No. 54, pp. 43-50; Hahn, C. (2013), "The transboundary automotive region of Saar-Lor-Lux: Political fantasy or economic reality?", *Geoforum*, No. 48, pp. 102-113; Trippl, M. (2013), "Innovation networks in a cross-border context: The case of Vienna", in: Van Geenhuizen, M. and P. Nijkamp (eds.), *Creative Knowledge Cities*, Edward Elgar, Cheltenham, pp. 273-302; Koschatzky, K. (2000), "A river is a river: Cross-border networking between Baden and Alsace", *European Planning Studies*, Vol. 8, No. 4.

The **level of innovation development** across the border can be balanced, and thus more favourable for knowledge-intensive interactions, or imbalanced and interactions focus on price differentials. The level of innovation development can vary overall and according to specific S&T domains or innovation system actors. A significant imbalance in the level of innovation system actors or S&T domains can limit the functionality of the area. A strong level of innovation development on both sides of the border definitely facilitates the emergence of strong cross-border innovation linkages. However, this characteristic alone is not sufficient and depends also on the enabling environment and level of pre-existing co-operation. For example, all the sub-regions in the Oresund, the TTR-ELAt and the Bothnian Arc have reached an advanced stage of innovation development. However, some of these areas exhibit a greater intensity of cross-border innovation interactions (the TTR-ELAt and the Oresund) than others (the Bothnian Arc), the latter having greater accessibility challenges among other differences.

Conclusions and recommendations

Regional strategies need to build on geographic proximity, including with cross-border neighbours, to be more effective globally. A strong cross-border regional innovation system can better take advantage of global networks. But that geographic proximity is not enough. Other forms of proximity in terms of knowledge bases and socio-cultural factors, as well as

institutional practices, are also important dimensions to consider when deciding if cross-border innovation policies make sense.

There are many reasons why public authorities may seek to collaborate with a cross-border neighbour. Such rationales are based on the need for economies of scale (to build critical mass, gain political power or obtain specialised services for innovation); economies of scope (complementarities in assets, innovation domains and price differentials); public and club goods (regional identity, regional branding or specialised infrastructure) and externalities related to the day-to-day issues of cross-border flows.

Cross-border efforts should target "functional" regions for innovation, but data are often lacking to make that determination. The definition of a functional cross-border area depends, of course, on the function. Indicators measuring innovation-related flows of people, goods, services, capital and knowledge, in addition to those that measure integration more generally, help to assess the relevant geographic scale for the cross-border area. Such measures consider the different proximities that provide the more favourable conditions for collaboration. Definitions of a cross-border area also need to recognise variable geometry and avoid new borders. They can change over time, or simply depend on different specialisations within which innovation interaction takes place. Competing definitions of the cross-border area co-exist in many places.

Key recommendations for defining the cross-border area include:

- **Understand what the data show, but don't wait for complete data to start collaborating.** Despite a long history of cross-border flows in some areas, there is a notable lack of data to support decision making about the utility and progress of cross-border collaboration. Launching some form of collaboration should not wait for a three-year study, but some basic indicators can draw attention to the need for collaboration. Three forms of data analysis can be important. First is internal data on the flows and level of integration. A second set of data benchmarking international performance is helpful for supporting a strategic vision for the cross-border area. A third set of useful data involves micro-analyses, which highlight the possible failures in the innovation system, and how policy, or other efforts, can help remedy them.
- **Only pursue the cross-border element when it makes sense.** In some cases, geographic proximity is important for a particular innovation partner or project. In others, accessing the best global partner is the priority. One test for the relevance of the collaboration is whether the workers, firms and research-intensive actors in the region see a benefit to cross-border interactions, because if they do not, publicly co-funded innovation projects may only last as long as public money is available. The public sector can stimulate demand by innovation actors by raising awareness of cross-border opportunities.
- **Allow a certain degree of flexibility in the area definition to avoid creating unhelpful new borders.** It is not in the interest of developing the cross-border area to artificially create a barrier to connections outside the border through funding streams. Area definitions are subject to political realities of administrative borders, and thus funding sources. While the perimeter will be set somewhere, some flexibility in funding opportunities to outside actors helps overcome the rigidities of new definitions.
- **Do not under-estimate the importance of other "hard" and "soft" factors beyond innovation.** Innovation policy instruments are generally part of economic, industrial or research policy. However, the functionality of the region for innovation

also depends on some basic transport infrastructure to improve internal accessibility, which proved "game-changing" in certain case study regions. Other soft factors help build contacts and interest in the other side of the border, including language and culture, which were reported to also be important.

Notes

1. See Puga (2010) and cited articles for a literature overview on this issue.
2. The English economist Alfred Marshall noted back in the 1890s that clustering of firms and workers resulted in productivity benefits arising from these three factors. These ideas have since developed and spawned a large and growing literature attempting to understand these benefits of agglomeration.
3. Large OECD regions are the TL2 level, the first sub-national level. The statistic refers to 26 OECD countries with sub-national R&D data (2010 data).
4. Small OECD regions are the TL3 level, the second sub-national level (2008-10 avg.).
5. It is 25.4% for employees in high-tech manufacturing sectors and 24.2% for employees in knowledge-intensive services sectors in TL2 regions (2008 data).
6. Codified knowledge is that which is recorded for others to use, in a form that is easily transferable, such as patents, books or scientific articles. Tacit knowledge is knowledge that must be obtained through interaction with other people, and that is not physically stored after the interactions have happened, such as the oral discussion during a conference or a meeting.
7. In understanding the barriers to cross-border collaboration between research centres in Ireland and Northern Ireland, it was found that "responding centres have only a general idea of where opportunities lie among academic organisations in the other jurisdiction" (InterTradeIreland, 2008).
8. The Nordic Council was formed in 1952, the Nordic Council of Ministers in 1971.
9. Studying the (lack of) structural and official cross-border relationships in the US-Canadian Detroit-Windsor region, with a cross-border automotive cluster, Nelles states that: "This is not a case of North American exceptionalism. Clarke (2001 & 2002) and others (Scott, 1999) have identified a distinctive configuration of regional cross-border networks in the Cascadia region that had formed from the bottom-up, are more likely to be sector specific and driven by the private sector" (Nelles, 2011).
10. Inter-state or inter-province partnerships are also developing respectively in Canada and the United States. It should be noted that in some cases, these cross-state relationships are stronger among private and non-profit sector actors than public actors (OECD, 2012b).
11. Examples include: the Pacific Northwest Economic Region (PNWER) gathering the US states of Alaska, Idaho, Montana, Oregon and Washington; and the western Canadian provinces of Alberta, British Columbia, Saskatchewan and Yukon and Northwest Territories; and the Conference of Border Governors for four US and six Mexican, committed to promoting economic growth on both sides of the border.

12. The AEBR study proposes three sets of objectives for developing such cross-border partnerships in the region (AEBR, 2010): 1) defining short-term objectives: concrete projects, need of decentralised co-operation, establishment of partnerships, informal structures for cross-border in general; 2) defining mid-term objectives: to increase local/regional/national capacities for sustainable cross-border co-operation, to elaborate joint strategies/programmes and projects, as well as strengthening cross-border institutions; and 3) defining long-term objectives: with a view to the regional integration process throughout Latin America.

13. The per capita national income of Singapore (USD 12 890 in 1991) was about 25 times higher than that of Batam in Indonesia (USD 500) and approximately quadruple in comparison to Johor in Malaysia (USD 3 600) (Kivikari, 2001).

14. These three types of collaborations have been supported by different strands of European Territorial Co-operation, commonly referred to as Interreg. The list refers to strands A, B and C respectively.

15. These two macro-regional strategies are: the EU Strategy for the Baltic Sea Region, adopted in October 2009; and the EU Strategy for the Danube Region, for which implementation began in June 2011.

16. The IPA Adriatic Cross-border Cooperation Programme is noteworthy for its strong emphasis on innovation. This macro-regional effort includes seven, possibly eight in the future, countries. Its first priority is "strengthening research and innovation in order to contribute to competitiveness and increasing the development of the Adriatic area through economic, social and institutional cooperation." For example, Italian projects funded by this measure include: Caps2 (Strengthening of Centres for Aquaculture production and Safety surveillance in the Adriatic); the Cluster Club (a range of cluster development and cross-border co-operation efforts, with the involvement of Chambers of Commerce, including a focus on the nautical sector and its supply chain), as well as other projects supporting miniaturisation technology, collaboration research and technology platforms, and boosting research and innovation potential more generally.

17. Such as the former European "Regions of Knowledge" programme.

18. Per two recent OECD Territorial Reviews examining collaboration opportunities in macro regions: the Arctic regions of Greenland, Faroe Islands, Iceland and Northern Norway (OECD, 2011c) and the Pan Yellow Sea region in Asia covering parts of northern China, southwest Japan and western/southern Korea (OECD, 2009).

19. For further information on these initiatives, see the full case studies (Nauwelaers et al., 2013d and 2013e).

20. Cantons correspond to the TL3 level in the OECD classification of regions, and "*Grandes Régions*" to TL2 level (the same as German *Länder* or French *régions*).

21. Région Lémanique in the west and Ticino in the south show distinctly different co-patenting patterns: the former has more partner regions with French regions, in particular with Rhône-Alpes, whereas the co-patent links of Ticino are dominated by the German region of Bavaria, with limited relations with other regions.

22. Patents, while measuring inventive activity only, are often used as a proxy for innovation outputs. However, this indicator only tends to capture certain S&T-related innovation activities. It does not measure marketing, organisational or other forms of non-technological innovations. Moreover, patenting is not necessarily linked to successful commercial exploitation, due notably to strategic patenting behaviour.

Annex 1.A1
Cross-border regional innovation system integration

A regional innovation system has been defined in different ways, but the term generally refers to a regional space within which people, firms, universities, technology transfer offices and other organisations interact to develop and use knowledge for innovation. In this context, the degree of integration of a regional innovation system that contains an international border may take different stages, as described in Table 1.A1.1.

Table 1.A1.1. **Different stages of cross-border regional innovation system integration**

RIS dimensions	Stage I: Asymmetric cost-driven system (weakly integrated)	Stage II: Emerging knowledge-driven system (semi-integrated)	Stage III: Symmetric innovation-driven system (strongly integrated)
Economic structure/ specialisation pattern	Strong differences in specialisation --> cognitive distance (lack of synergies). Functional distance	Emerging synergies and complementarities (cognitive proximity) and functional proximity in a few business areas	Related variety, complementarities (cognitive proximity) and functional proximity in a wide range of business areas
Science based/knowledge infrastructure	Strong differences in specialisation --> cognitive distance (lack of synergies). Functional distance	Fruitful synergies (cognitive proximity) and functional proximity in a few scientific fields	Related variety, complementarities (cognitive proximity) and functional proximity in a wide range of scientific fields
Nature of linkages	Cost-driven asymmetrical linkages. Lack of knowledge flows. Strong embeddedness in established RIS/NIS/ international linkages	Decreasing asymmetry --> interactive links in selected fields. Links to existing RIS/NIS/global level more important	Intensive cross-border knowledge exchange. Reshaping the importance of established links
Institutional set-up	High degree of (hard and soft) institutional distance. Institutional thinness at the cross-border level. Low acceptance of cross-border integration processes	Decreasing levels of (hard and soft) institutional distance. Rise of institutional set-up at the cross-border level. Increasing acceptance of building a common cross-border region	Low levels of (hard and soft) institutional distance/remaining distances mediated by specialised bridging organisations. Institutional thickness at the cross-border level. High acceptance of creating a common innovation system
Policy structures	Absence of policy "leadership" with vision and lack of legitimacy. Low or asymmetric support from nation-states	Emergence of mechanisms for co-ordination of innovation policies	Transparent and democratic governance structures. Inclusive forms of governance and civic participation
Accessibility	Low/medium degree of physical proximity	Medium/high degree of physical proximity	High degree of physical proximity

Notes: NIS = national innovation system; RIS = regional innovation system.

Source: Lundquist, K. and M. Trippl (2013), "Distance, proximity and types of cross-border innovation systems: A conceptual analysis", *Regional Studies*, Vol. 47, No. 3, pp. 450-460.

Annex 1.A2
The Oresund Integration Index

The Oresund Integration Index shows the growth in integration between the Danish and Swedish parts of the Oresund Region (Oresund Committee, 2013). The index is a combination of five sub-indices measuring the integration within the labour market, housing, business, culture and transport areas. Each of the five sub-indices receives a weight of 20% in the total index.

The five sub-indices

The five sub-indices consist of between three to five adjusted basic indices. The aim is to have indices reflecting all of the relevant areas, but in reality the choice of indices is restricted by which statistics are available. Many of the statistics in the Oresund Integration Index are taken from the Oresund Database www.orestat.se, www.orestat.dk.

Each basic index is adjusted with a comparable index reflecting the domestic development. The purpose is to remove any trends and cyclical movements. The basic index is divided by the comparable index to obtain the adjusted basic index. Table 1.A2.1 presents an overview over indices and their comparable indices.

The basic indices are assigned a weight reflecting the importance of the index or the proportions between the basic indices included in a sub-index. The purpose is to avoid that change in an index covering only a few units/persons will change the sub-index dramatically. An example is the basic index for Danish passengers travelling from Malmö Airport. In the period from 2008 to 2012, the number of Danish passengers travelling from Malmö Airport quadrupled, but in total only 100 000 Danes travel from Malmö Airport, which is a very few compared to, for instance, the number of train passengers at the Oresund Bridge, which was 11 million in 2012.

If it is not possible to assign a weight reflecting the importance of the index or the proportions between the basic indices, all weights of the basic indices included in a sub-index are equal to 1/n, where *n* is the number of basic-indices in the sub-indices.

A basic index based on survey data is used in both the labour market index (interest in working on the other side of the Oresund) and in the housing market index (interest in migrating to the other side of the Oresund). Both of these basic indices are assigned a weight of 15% for the reason that survey data is not as precise as regular statistics. The rest of the basic indices have a weight reflecting the relative importance as measured in terms of people.

The housing market index consists of a flow index (migration across the Oresund) and a stock index (number of Danes and Swedes living in the other country) besides the survey-based index. The stock index has been assigned a weight of 70% since it is more persistent than the flow index, which is assigned a weight of 15%.

Table 1.A2.1. **Oresund Integration Index: Basic and comparable indices**

Basic indices	Comparable indices
Labour market	
Commuters across Oresund	Number of domestic commuters across the municipal borders
Interest in working on the other side of the Oresund	Interest in taking a new job
Number of Danes and Swedes working and living in the neighbouring country	Number of persons working and living in the Oresund Region
Number of Danish and Swedish students in the neighbouring country	Total numbers of students in Skåne (Sweden) and the two Danish regions part of the Oresund
Housing market	
Migration over the Oresund – gross flow	Domestic migration between municipalities in the Oresund Region
Interest in migrating to the other side of the Oresund	Difference in housing prices
Number of Danes and Swedes living in the other country	Population in the Oresund Region
Business	
Trade between Denmark and Sweden	Total foreign trade in Denmark and Sweden
Lorries across the Oresund	Domestic transport by lorries
Investments, Danish in Sweden and Swedish in Denmark	Consumption price index
Number of companies owned by the neighbouring country	Total foreign-owned companies in Denmark and Sweden
Culture	
Language understanding	
Use of the neighbouring country's TV channels	Total TV use in Denmark and Sweden
Danish-Swedish new marriages registered	Total registered new Danish-Swedish marriages
Nights spent at hotels in the neighbouring country	Total nights spent in the Oresund Region
Transport and communication	
Personal cars on the Oresund Bridge	Domestic development in road traffic
Train travellers on the Oresund Bridge	Number of passenger-kilometres in train in Denmark and Sweden
Travellers between Helsignør and Helsingborg	Domestic development in road traffic
Passengers from Southern Sweden at Copenhagen Airport (CPH)	Total passengers at Copenhagen Airport (CPH)
Danish passengers travelling from Malmö Airport	Total passengers at Malmö Airport

The culture index is assigned a value of 20% for three of the four basic indices. The last basic index, nights spent at hotel in the neighbouring country, which as a rather strong index, is assigned a weight of 40%.

The weighting scheme of the transport and communication index is calculated on the principle that each basic index gets a weight reflecting its proportion of the total number of people travelling. The two "smallest" indices, passengers from Southern Sweden at CPH and Danish passengers travelling from Malmö Airport, nevertheless have a larger weight because otherwise their weight is too small.

Table 1.A2.2. **Oresund Integration Index: Weighting system**

	Weight
Labour market	20%
Labour market – basic indices	
Commuters across the Oresund	40%
Interest of working on the other side of the Oresund	15%
Number of Danes and Swedes, working and living in the neighbouring country	40%
Number of Danish and Swedish students in the neighbouring country	5%
Housing market	20%
Housing market – basic indices	
Migration over the Oresund – gross flow	15%
Interest of migrating to the other side of the Oresund	15%
Number of Danes and Swedes living in the other country	70%
Business	20%
Business – basic indices	
Trade between Denmark and Sweden	25%
Trucks across the Oresund	25%
Investments – Danish in Sweden and Swedish in Denmark	25%
Number of companies owned by the neighbouring country	25%
Culture	20%
Culture – basic indices	
Language understanding	20%
Use of the neighbouring country's TV channels	20%
Danish-Swedish new marriages registered	20%
Nights spent at hotels in the neighbouring country	40%
Transport and communication	20%
Transport and communication – basic indices	
Personal cars at the Oresund Bridge	41%
Train travellers at the Oresund Bridge	31%
Travellers between Helsignør and Helsingborg	22%
Passengers from Southern Sweden at Copenhagen Airport (CPH)	5%
Danish passengers travelling from Malmö Airport	1%

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Chapter 2

Governing cross-border collaboration

Finding the right governance arrangements for collaboration is perhaps the most complex task for cross-border innovation policy. An overarching vision for collaboration is a useful place to start. The local and regional levels on each side of the border can identify the costs, benefits and opportunities before pointing out to national or other levels of government how they are helping or hindering cross-border efforts. While the innovation policy field offers a strong potential to create value, the high degree of uncertainty also renders the assessment of costs and benefits, as well as the urgency for action, more difficult. Innovation-driven economic development is a field where jurisdictions are also competing, but the real competition is not with the neighbour, it is on a global scale, implying potential for "co-optition" (co-operation for competition). Cross-border areas need to rely on both formal or informal governance arrangements, or both, but in all cases trust is essential and takes time. And since governance goes beyond government, wider stakeholder involvement beyond the public sector is necessary for sustainability.

It appears the most difficult part of supporting a cross-border area for innovation purposes concerns who should be involved in the governance and what form that governance takes. The types of public authorities involved will depend on the level of devolution of powers to the regions, particularly with respect to innovation policy. Regions with greater powers are better able to engage across the border, whereas other regions will need to seek the support of their national governments for action. The interest in developing cross-border collaboration depends on the possible benefits and costs as seen by the different parties. In the field of innovation policy, there is greater scope to create economic and social value of mutual benefit, and not simply engage in a zero-sum game of competition. That is because the benefits for such collaboration depend on the actions taken to maximise them. The capacity of public authorities to engage in this complex policy field (innovation) and the set of relations (cross-border) is a further consideration. The case studies, and beyond, include a range of examples with respect to different governance issues, both in terms of frameworks and institutionalisation of that collaboration (Table 2.1). This chapter considers:

- what levels of government should be involved, and how, in supporting regional cross-border collaboration efforts for innovation
- the incentives for collaboration and the associated benefits and costs
- the forms of governance arrangements to manage such collaborations.

Table 2.1. **Governance characteristics in case study areas**

Characteristic	Specification	Case study examples
National political capitals	Yes, each side	Helsinki-Tallinn
	Yes, at least one	Oresund, Ireland-Northern Ireland
	None	TTR-ELAt, Hedmark-Dalarna, Bothnian Arc
Longevity of public co-operation	>20 years	Oresund, TTR-ELAt (including in other forms)
	10-20 years	Ireland-Northern Ireland, Bothnian Arc, Helsinki-Tallinn
	<10 years	Hedmark-Dalarna
Innovation policy competencies	Balanced, strong	--
	Balanced, weak	Bothnian Arc, Helsinki-Tallinn, Hedmark-Dalarna
	Unbalanced	Ireland-Northern Ireland, TTR-ELAt, Oresund
Political commitment	Balanced, strong	Ireland-Northern Ireland, Oresund (sub-national level)
	Balanced, weak	Bothnian Arc, Hedmark-Dalarna, Helsinki-Tallinn
	Unbalanced	TTR-ELAt
Institutionalisation of funding sources	Present, strong	Ireland-Northern Ireland, Oresund
	Present, weak	Bothnian Arc, Helsinki-Tallinn, Hedmark-Dalarna
	Not present	TTR-ELAt

Catalyse local, regional and national (supra-national) levels of government

Political commitment was an important consideration in the case studies. This implies commitment from various levels of government depending on the institutional context. In some cases that commitment is high and balanced on both sides of the border, such as the case of Ireland-Northern Ireland (United Kingdom). In others, such as Helsinki-Tallinn,

the Bothnian Arc and Hedmark-Dalarna, that political commitment is perhaps at a balanced level on both sides but not as strong as in other cases, for various reasons. The area of the TTR-ELAt shows varying levels of commitment, which is almost inevitable given the large number of jurisdictions that comprise the area. But political commitment is not enough. It needs to be matched by a more bottom-up interest by the firms, higher education institutions (HEIs) and other stakeholders supporting innovation so that public efforts are not in vain. Different tools, beyond regional innovation policy, may be required to build that sense of importance among the residents that elect the politicians who, in turn, have to justify the use of funds for cross-border activities.

Regions and cities need to identify the opportunities to collaborate cross-border

The effects of cross-border collaboration are generally felt most strongly at the local level. Those municipalities on the border see the benefits and costs associated with cross-border movements. Mayors feel the importance of the border with respect to local labour markets, spatial planning, housing markets, firm location, etc. They need to find concrete solutions to tangible "border problems" important to their constituents. In countries with a strong role for inter-municipal associations, cross-border co-operation is often pursued by local actors. In Germany, the *Kreise* (association of municipalities) are the driving force behind cross-border initiatives in most cases. In other countries (such as Italy or France), cross-border regions are a domain pursued by regional or provincial authorities given the greater level of municipal fragmentation (AEBR, 2010). Local level collaboration is therefore at the heart of these day-to-day cross-border efforts.

The cross-border collaboration for innovation in some of the case studies, and other international examples, builds on strong support by mayors. The collaboration for Helsinki-Tallinn is driven in large part by concerns and motivations of the respective city governments. In the Bothnian Arc, the mayors of the two largest cities (Oulu, Finland and Luleå, Sweden) view this collaboration as important for their respective success. In this case, their desire to be visible on the global map for innovation is their primary interest, despite being a 300 kilometre drive from each other. In San Diego (United States), the previous mayor was a leader in promoting greater cross-border collaboration with Mexico for the area's economic development, such as opening an office in neighbouring Tijuana, suggesting that "we need to make the border the centre, not the end" (Medina, 2013).[1]

Regions, as opposed to localities, are a more appropriate scale for developing an innovation strategy that builds on the workforce, industrial base and research assets. A city is often only part of a larger metropolitan area that is a functional economic unit. Typically the core of cities specialise more in the knowledge-intensive services while surrounding areas may be the location for other industries, such as high-technology manufacturing. A regional scale is likely to include a larger set of firms, universities, technology centres and other assets that are all needed to develop a more diversified set of actors for a regional innovation system. In the Centrope area, for example, knowledge-intensive services are strongly concentrated in the capital cities Vienna (Austria) and Bratislava (Slovak Republic), while high-tech manufacturing is located in Hungarian and Czech regions. Universities and technology parks may also be located outside of the main city. In many cross-border areas, the settlement pattern is not necessarily centred around one core city, which also implies a greater need for a more regional approach to defining those cross-border areas for innovation.

Due to their own initiative or at the impulsion of a higher level of government, regions generally have some form of economic or innovation strategy. The development of such a strategy therefore needs to take into account the relevant conditions for supporting a region's growth, including building on strong resources and opportunities in proximity. Regions located in the European Union have been tasked with developing a "smart specialisation" strategy as a way of setting priorities, based on unique regional assets and strengths in a national or global context, for innovation-driven economic growth (European Commission, 2012).

The potential for cross-border governance approaches is also based in part on the regional competencies for developing and implementing innovation policy instruments. For example, the sub-national share of public STI spending ranges from less than 10% in many countries to around 50% in Germany or the People's Republic of China to around 80% in Belgium (OECD, 2011). Regions that have considerable competencies can themselves choose to devote budgets to cross-border-related efforts. Other regions may have the ability to identify cross-border potential, but have no funding or instruments to do this themselves. In those instances, the role of national governments becomes even more important.

In the case study regions, the regional competencies were generally weak or unbalanced, thus making national commitment particularly important. In other words, there were no cases where the regions on both sides of the border had the capability to develop, design and implement the instruments on their own. The imbalance in competencies also led to frustrations in some examples, where one side was better equipped to go forward but had to be patient for the other side to work through its multi-level governance structure. This is true in other cross-border areas as well, such as the more autonomous Swiss cantons collaborating with French regions. Another example is in the Centrope cross-border area, where the Austrian and Czech regions have own resources and institutions to formulate regional innovation policies and strategies, while the Slovak and Hungarian regions have a much weaker institutional and financial basis to do so.

The local and regional levels need to identify and articulate the ways that national policy and programme rules can help them be more effective in cross-border initiatives. Even in cases where there is a significant degree of decentralisation to regions for innovation policy, there are likely some issues that will still fall in the domain of the national level. The Oresund Committee, for example, established a common list of issues that require national action to address, including considerations for taxes, pensions, labour market issues, car registrations, cross-border transport, visas for non-EU citizens, etc. Several issues identified by the committee have been addressed.[2] Other cross-border areas have sought different forms of awareness raising (or lobbying) to national policy makers to make their cross-border work easier.

National policy makers can help and/or hinder cross-border collaboration for innovation

Many national governments recognise in principle the importance of cross-border collaboration for the competitiveness of their countries. The Dutch Ministry of Economic Affairs has financed cross-border efforts around one of its national technology hotspots, Eindhoven. The French government supports the *Mission Opérationnelle Transfrontalière* (MOT) that provides services to its cross-border areas (Box 2.1). Hungary, which borders seven countries, has supported initiatives that seek to build on

such cross-border ties, such as the Wekerle Plan for a cross-border economic development strategy in the Carpathian Basin as a source of growth for Hungarian-owned SMEs, or support to the Central European Service for Cross-Border Initiatives (Box 2.2). The federal governments of Switzerland and Canada have also noted the importance of federal and sub-national action to strengthen cross-border integration in the interest of national competitiveness (Box 2.3).

Box 2.1. *Mission Opérationnelle Transfrontalière* (MOT): France

The French *Mission Opérationnelle Transfrontalière* (MOT) was established in 1997 by the French Inter-Ministerial Committee of Spatial Planning and Development (CIADT). The MOT was then created as an inter-ministerial body, supervised by DATAR (the French Inter-Ministerial Delegation for Spatial Planning and Regional Attractiveness) and started working on five pilot cross-border areas: Lille Métropole (France/Belgium), Alsace (France/Germany/Switzerland), Geneva area (France/Switzerland), the Métropole Côte d'Azur region (France/Italy) and the Bayonne-San Sebastian area (France/Spain). Over the years, the MOT has become responsible for identifying and bringing together institutions and actors in charge of cross-border co-operation in France and abroad.

The MOT's primary goal is to promote cross-border efforts between French local jurisdictions and their neighbouring regions across the border, by means of concrete projects and initiatives. The MOT assists French institutions aiming at establishing cross-border co-operation and promotes the visibility of cross-border areas at both national and EU level. The MOT gives advice and guidance to those authorities and organisations (both in France and the bordering countries) affiliated to the organisation, for the development of common initiatives. It helps cross-border areas in multiple steps of the project: from the definition of projects and programmes to the phases of analysis and implementation. It actively provides advice to all project partners and seeks a balanced involvement of the different stakeholders in the project development.

During each intervention, the MOT adapts its expertise to different regions and areas, by bringing to the cross-border area multi-national and interdisciplinary teams. The MOT facilitates the close involvement of all actors and stakeholders at each step of the project and promotes the engagement of the civil society. Its support lasts until the relevant actors have become independent in political, juridical, technical, financial and operational terms so as to guarantee the long-term sustainability of projects.

Over time, the MOT has been able to build an international network of cross-border areas and stakeholders. The MOT's networks involve organisations over 11 countries in Europe, which include municipalities and networks of municipalities, national and regional authorities, cross-border entities and private sector organisations.

The MOT regularly organises seminars and working groups, where cross-border stakeholders meet and discuss different themes associated with cross-border governance and policy making. It also publishes documents and reports on cross-border issues, like the recent methodological guide on cross-border governance and policy programmes: *Methodological Guidebook: Articulate Cohesion Policy, Governance Structures and Cross-Border Territorial Approaches.*

Sources: www.espaces-transfrontaliers.eu; Mission Opérationnelle Transfrontalière (MOT) (2012), *Methodological Guidebook: Articulate Cohesion Policy, Governance Structures and Cross-Border Territorial Approaches*, Paris, November.

Box 2.2. **Central European Service for Cross-Border Initiatives (CESCI)**

Modeled after the French *Mission Opérationnelle Transfrontalière*, the Central European Service for Cross-Border Initiatives (CESCI) was founded in 2009 to serve cross-border co-operation efforts in Hungary and Central Europe. Association membership includes local and regional municipalities, professional bodies and individuals. The organisation's objectives include:

- provide professional support for cross-border co-operation along the Hungarian borders as well as in several other states of Central and Southeast Europe
- incorporate the Euroregions, the European Groupings of Territorial Co-operation (EGTCs) and the local and regional authorities participating in the cross-border co-operation into a network
- promote good examples from Western European initiatives
- establish strategic co-operation with the competent decision-making and decision-preparing institutes of the European Union as well as with Northern and Western European networks created for the same purpose
- strengthen the internal cohesion and mutual rapprochement within the region by establishing partnerships among the nations of Central and Southeast Europe.

CESCI seeks to promote a holistic approach to strategic planning in cross-border areas that takes into account territorial, social and economic cohesion. It also provides research and training on cross-border issues as well as support for institution and project development to secure long-term, sustainable co-operation in support of its objectives.

Source: www.cesci-net.eu.

Box 2.3. **The importance of cross-border regions: Switzerland and Canada**

Switzerland

The State Secretariat for Economic Affairs has noted several rationales for seeking to strengthen cross-border regions involving its cantons, as highlighted in a recent report.

Of the 26 cantons, 15 share a border with a neighbouring country. Political, cultural and especially economic relations are correspondingly close. In 2010, 75% of Switzerland's nominal gross domestic product was generated in those 15 cantons. Not all border regions are alike, however, they range from metropolitan conurbations to alpine zones.

The border regions offer good prospects for cross-border collaboration, generating benefits on both sides of the border and also having effects beyond those territories. Frontiers also give rise to so-called arbitrage opportunities: businesses can exploit mismatched conditions on each side of the frontier: differences in price, taxation, wages and labour costs, for example – and also differing technological capabilities. Territorial proximity to neighbouring countries can constitute a competitive advantage (contact function), in that border regions become a starting point for cross-border networks or take on specific functions, such as transport hubs or transit centres (known as gateways).

Appropriate institutional frameworks are crucially important to regional economic success. Regions are not pre-ordained territorial units, but spaces that develop through social and economic exchange. Fields in which the actions of the federal government are of central importance to the economic development of the border regions include: enhancing locational quality and competitiveness; the labour market; foreign trade; infrastructure; and education, research and innovation. It is not only the federal government that makes a contribution to regional economic integration but also supra-regional and cantonal bodies.

Box 2.3. **The importance of cross-border regions: Switzerland and Canada** (*cont.*)

Canada

The Canadian government has recognised the importance of cross-border regions, particularly since a significant share of its population lives within short driving distance to the United States (US).

The report *Beyond the Border: A Shared Vision for Perimeter Security and Economic Competitiveness* highlights opportunities for Canada and the United States to work bilaterally to achieve such goals. One of the four themes in the Beyond the Border Action Plan for bilateral Canada-US relations is trade facilitation, economic growth and jobs, including through innovation.

In addition, the Government of Canada's Policy Research Initiative (PRI) issued a report: *The Emergence of Cross-Border Regions Between Canada and the United States: Reaping the Promise and Public Value of Cross-Border Regional Relationships.* The report notes some actions for the federal government to take, the important role of the sub-national level and the need for coherence between the two.

1. Stronger and more diversified trade linkages, higher correlation in economic activity and lower border effects (resistance to trade due to the presence of the border) within cross-border regions emphasise the great extent to which the economies of neighbouring provinces and states depend on each other.
2. Analysis using socio-cultural values shows that the northeast and northwest coastal regions are especially characterised by shared values. The socio-cultural values of Atlantic Canada are closer to those of the US east coast, while Alberta and British Columbia have socio-cultural values that are closer to those of the western parts of the United States.
3. Regional cross-border networks and organisations have proliferated since NAFTA, and provide a useful vehicle for bi-national business and community groups to work together on issues of mutual interest, often with the ultimate aim of problem solving or creating local competitive advantages in the larger North American and global economies.

Sources: State Secretariat for Economic Affairs SECO (2012), *The Foreign Economic Policy Report 2012*, Berne, www.seco.admin.ch/dokumentation/publikation/00008/00101/05062/index.html?lan=en; Government of Canada (2011), *Beyond the Border: A Shared Vision for Perimeter Security and Economic Competitiveness*, http://actionplan.gc.ca/grfx/psec-scep/pdfs/bap_report-paf_rapport-eng-dec2011.pdf; Government of Canada (2009), *The Emergence of Cross-Border Regions Between Canada and the United States: Reaping the Promise of Public Value of Cross-Border Regional Relationships*, Policy Research Initiative, Ottawa, Ontario, www.horizons.gc.ca/sites/default/files/Publication-alt-format/2009-0001-eng.pdf.

National regulatory and administrative barriers nevertheless hamper collaboration, not only on innovation, but in a more general sense for many cross-border activities. Differences in regulations and administrative provisions from one country to another create difficulties for the mobility of goods, services, people and capital and for the development of joint actions. Barriers to trade impede firm interactions (Box 2.4). Labour market differences in terms of certification requirements, benefit schemes, pension rights or tax systems are barriers for people to work across the border. This severely limits the possible benefits for cross-border efforts to promote innovation given the important role of skilled workers in knowledge-based economies. Different legal and administrative rules generate complexity, burdens and costs for workers and their employers.

National governments in most countries are still responsible for the bulk of science, technology and innovation funding. National governments determine the nature, priorities, funding levels and eligibility rules for many innovation-related programmes. Such rules can either facilitate or render difficult to impossible the participation of actors from both sides of the border. The issue may be the timing of the funding cycle, the

sectoral or technological priorities for innovation funding, the eligibility rules or the reporting requirements. Efforts to better mainstream the cross-border dimension in national programmes is a way to tap these much larger funding sources to the benefit of a region's development.

Box 2.4. **Cross-border trade barriers: Addressing the innovation enabling environment**

Barriers to cross-border trade of firms have been highlighted by analysis on several cross-border areas. According to the **Nordic Innovation Center**, trade barriers are defined as all kinds of measures from national governments that hamper or complicate the trade of goods and services between countries. They cover:

- technical rules and standards that place requirements on goods in the form of technical qualities
- testing, control, certification, labelling, packaging, etc.
- requirements for import licenses, import quotas or import bans
- certificates of origin, foreign exchange regulations
- company and tax laws
- tax regulations, for instance environmental
- demands on/of investments
- rules for setting up companies as well as authorisation requirements.

An analysis performed by **InterTradeIreland** across the island of Ireland on the barriers expressed by companies to cross-border trade were typically:

- **Difficulty in sourcing equivalent regulations:** Companies have to use a variety of sources to identify and map the equivalent legislation North and South. SMEs, in particular, have difficulty in distinguishing the comparable legislation.
- **Duplication requirements in relation to compliance matters:** A business which holds or processes data in Northern Ireland and is also established in Ireland has to register with the data commissioner and maintain that registration appropriately in both jurisdictions.
- **Subtle but important differences in regulation essentially aimed at the same mischief:** Pursuant to the distance selling regulations, in the case of telephone communication in relation to distance sales in Northern Ireland, the identity of the business and the reason for the call must be stated at the beginning of the conversation. There is no requirement to do this at the outset of the call in Ireland so long as the identity of the supplier and the purpose of the commercial call is made explicitly clear at some stage during the call.
- **Differences in the timing for the implementation of regulations:** When adopted, an EU directive gives member states a timetable for the implementation of the intended outcome. Therefore different member states will implement the changes at different times with the potential to create confusion.
- **A failure to recognise differing yet adequate standards imposed in each jurisdiction:** Where a construction-related contract is performed partly in Northern Ireland and partly in Ireland (for example, haulage activities) the Relevant Contracts Tax scheme needs to be applied to the part of the contract that is performed in Ireland.

Sources: Nordic Innovation Centre (2007), *From Cross-Border Barriers to Market Opportunities*, Nordic Innovation Centre, Oslo; InterTradeIreland (2009), *Regulatory Barriers to Cross-Border Trade and Business*, InterTradeIreland, June.

While many national innovation strategies acknowledge the importance of internationalisation *per se*, making cross-border international collaboration work is somewhat different. Policy makers recognise the value of global connections for the success of their research initiatives and for innovation. Policies may also encourage foreign participation in projects. However, the cross-border international collaboration often takes a different form than internationalisation more generally since it is a longer term and more comprehensive type of collaboration. It also implies that many more details need to be resolved given the close proximity. For example, an exchange agreement with a school in China will not raise the same day-to-day issues as an exchange whereby students can take classes in different institutions across the border on a daily basis because they can easily commute.

One of the main challenges is that national money tends to stop at the border. National, or regional or local politicians face difficulties explaining to their constituents why funding from their jurisdiction went to another jurisdiction. Within the European Union, which has been actively promoting integration across its member states and regions, some 85% of all public research and development (R&D) is programmed, financed, monitored and evaluated at the national level (European Commission, 2008 in OECD, 2012). In Europe, countries that developed joint programming for research used different strategies to address this problem of money crossing the border (Table 2.2). These different funding scenarios, such as a virtual or common pot, are important for a number of innovation policy instruments (Chapter 3).

Table 2.2. **Strategies for addressing border issues in scientific funding**

Financing approach	Advantage	Disadvantage
Money follows co-operation line	Stimulates cross-border funding	National legislation or administration rules might need modification
Money follows researchers	Allows better exploitation of individual expertise	Salary differentials and imbalances
Virtual common pot	Compatible with independent financial planning by funding bodies Funding only within national borders simplifies rules	Some proposals approved to be funded may be declined Potential conflict between the funding of "excellence" and available national contributions
Real common pot	Proposal selection always follows the ranking list Simpler selection procedure	Difficult to set up Cross-border funding might seem to clash with national interests Need for an agreed system to determine contributions, eligible costs, overheads, etc. Possible exclusion of some players on the grounds of national legislation
Balanced common pot	Proposal selection might follow ranking list, without the problems of a real common pot Topping off money could be made available by the EU ERA-NET Plus experience	Long-term commitment required Distorted exploitation of the system needs to be avoided

Sources: High-Level Group for Joint Programming (2010), "Voluntary Guidelines on Framework Conditions for Joint Programming in Research 2010", ERAC-GPC 1309/10, www.era.gv.at/attach/st01309en10_FC_041110.doc as cited in OECD (2012), *Meeting Global Challenges through Better Governance: International Co-operation in Science, Technology and Innovation*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264178700-en.

When there are exceptions to the rule, it is because there is an expectation that there will be benefits, even if more indirect, accruing to a national firm or other institution. For the cross-border cluster funding scheme in the TTR-ELAt, the Dutch Ministry of Economy contributed a much more significant amount of money (EUR 2 million) than the other regions, with the expectation that such an experiment will provide a return to Dutch firms and prove to others the value of such programmes (Chapter 3, Box 3.8). Denmark's regulations allow for foreign researchers to use funds in joint programming research, enabling, in theory if not in practice, the creation of real common pot instruments (OECD, 2012).

National political commitment can raise the profile of the cross-border collaboration, which is often easier to achieve when capital cities are involved. Danish national policy makers live at the core of a cross-border region, and therefore can feel daily many of the issues associated with the cross-border character of the area. The bi-national innovation policy efforts undertaken by InterTradeIreland are due to a unique political context that has prioritised collaboration for mutual economic benefit. The cross-border area of Helsinki-Tallinn, with two capitals, can more easily benefit from broader national level commitments for bilateral co-operation. For example, two iterations of "Wise Men" reports (Box 2.5) have focused on opportunities for greater co-operation between Finland and Estonia, particularly with a focus on education and research, which can provide a more policy-friendly context to the capital city collaborations. While not all the recommendations go forward, some, such as the Joint Estonian-Finnish Science, Technology and Development Council as well as joint projects on design and co-operation on business incubators, have been implemented. Several Swedish cross-border regions have noted challenges in garnering political attention to their barriers for cross-border collaboration in part because they are far from the capital.

Box 2.5. **"Wise Men" reports on Finnish-Estonian co-operation: A focus on research and education**

In efforts to promote greater co-operation between Estonia and Finland, two expert reports were commissioned in 2003 and 2008 by the respective Prime Ministers. The aim of the reports was to generate momentum and revive discussion on how Estonia and Finland can respond to global challenges by collaborating to support their economies and promote competitiveness. The Prime Ministers expressed particular interest in understanding potential for co-operation on the following topics: education, research and innovation, and energy. The 2008 report, for example, provided 55 recommendations and presented relevant background analysis. While not all the recommendations go forward, some, such as the Joint Estonian-Finnish Science, Technology and Development Council as well as joint projects on design and co-operation on business incubators have been implemented.

1. Recommendations from the Ollila and Jõerüüt report in 2003

- increase co-operation in post-graduate education
- increase co-operation in acquisition and utilisation of laboratories and other facilities
- increase the mobility of students and researchers
- increase co-operation in high-tech business development
- secure the possibilities for Finns to study in Estonia and for Estonians in Finland.

Box 2.5. **"Wise men" reports on Finnish-Estonian co-operation: A focus on research and education** (*cont.*)

2. Recommendations from the Blomberg and Okk report in 2008

Research and development

- establish a joint Estonian-Finnish Science, Technology and Development Council along with a permanent Finnish and Estonian secretariat and an independent Estonian-Finnish think-tank
- establish concrete forms of co-operation between Enterprise Estonia and Tekes on the one hand, and the Estonian Development Fund and the Finnish Innovation Fund Sitra on the other
- establish partnerships and co-operation networks between research institutions (Aalto University, Tallinn University of Technology and the Estonian Academy of Arts) and Estonian and Finnish design institutes in order to enhance co-operation in the field of creative work, commercialisation and marketing
- develop co-operation between Estonian and Finnish technology centres and enterprise incubators
- hold Estonian Science Days in Finland and Finnish Science Days in Estonia.

Education

- put procedures in place for Estonian and Finnish Ministries of Education to harmonise the training objectives and the use of resources of the two countries as well as to co-ordinate teaching programmes and the investments made in education
- establish a joint Estonian-Finnish institution named the Cross Gulf University with a focus on organising co-operation in postgraduate education
- establish a joint Estonian-Finnish training fund with public and private funds to support students and researchers, particularly those undergoing post-graduate training, with housing allowances and to facilitate exchange of students between Finland and Estonia
- consider the possibility of establishing a joint office for Estonian and Finnish universities in China or India
- promote teaching of Estonian in Finland and teaching of Finnish in Estonia.

Sources: Blomberg, J. and G. Okk (2008), "Opportunities for cooperation between Estonia and Finland 2008", Prime Minister's Publications, 10/200; Ollila, E. and J. Jõerüüt (2003), "Finland and Estonia in the European Union", Prime's Minister Publications, May.

European Territorial Co-operation funds are a critical cross-border funding source, with a few drawbacks

For regions located within the European Union (EU), the European Territorial Co-operation (ETC) programme is often the core or only funding source for cross-border regional innovation activities. The programme is commonly known as Interreg. Most of the ETC programme funds are dedicated to contiguous cross-border areas (Box 2.6). These EU funds have played a critical and catalytic role in developing cross-border relationships generally. They have also funded many valuable experimental instruments

for cross-border innovation initiatives. In many cross-border areas, ETC funds are the only resources available (along with co-financing requirements) to implement cross-border instruments.

Box 2.6. **European Territorial Co-operation: 20+ years of cross-border programmes**

The history of European Territorial Co-operation (commonly referred to as Interreg) begins in 1989 with the establishment of 14 cross-border pilot projects, for a total budget of ECU 21 million. This paved the way to the adoption of the first generation of Interreg shortly after. Cross-border co-operation within the European Union (EU), however, dates back to 1958 with the creation of the first "Euroregion" at the German-Dutch border. During the 1960s and 1970s, European cross-border co-operation developed along the Rhine River as well as in Nordic countries, with the aim to develop tangible and concrete actions across countries.

More structured cross-border initiatives began with the creation of the Interreg I programme, in the programming period 1991-93. Interreg I was a cross-border co-operation initiative that led to the implementation of 31 operational programmes and 1 500 projects. During Interreg I, co-operation was essentially driven by infrastructure development, tourism and environmental issues. Rural development and SME support were only marginally targeted and private sector involvement was very limited.

The second edition of Interreg (Interreg II, 1994-99) saw almost a doubling of cross-border programmes (Interreg IIA), from 31 to 59. During that time, dedicated Community financial instruments for cross-border co-operation were created. Interreg IIA also targeted new fields of intervention like education, health, media services and language training. It involved not only cross-border co-operation but also transnational co-operation (Interreg IIB), aiming in particular at integrating the energy network in Southern European countries. In 1997, the Interreg IIC was created to develop seven general transnational co-operation projects plus six others focusing on the prevention of floods and droughts. The evaluation of Interreg II highlighted that integrated management of projects was present at internal borders and/or borders with a long tradition of co-operation. Cross-border co-operation proved to be more successful in the fields of tourism, culture, media and environment. As in the previous generation, outcomes in the field of economic development were less positive and the involvement of the private sector was still marginal.

Interreg III (2000-06) saw an increased number of project partners, thanks to the enlargement of the EU in those years. Under Interreg III, the programmes ESPON (European Spatial Planning Observatory Network) and INTERACT (Interreg Animation, Co-operation and Transfer) were launched. ESPON (launched in 2002) has the task to study territorial dynamics within the European territory, focusing on territorial structures, trends, perspectives and policy impact. It also provides comparable information about regions and cities in Europe. INTERACT (launched in 2003-04) assists stakeholders in implementing programmes and acts as an exchange and network platform. The evaluation of the Interreg III revealed barriers in terms of complex legal frameworks and instruments, especially at external borders.

In the period 2007-13, Interreg changed its name to European Territorial Co-operation and it became one of the three pillars of the European Cohesion Policy agenda, together with the other traditional regional development programmes. The budget of EUR 8.7 billion for this objective accounts for 2.5% of the total 2007-13 allocation for Cohesion Policy. During this period, territorial cross-border co-operation has involved 75 border areas, 13 transnational programmes and 4 EU-wide programmes, dealing with transnational exchanges and integrated urban development. This new generation of policies has had the objective to make cross-border co-operation more visible and to integrate the legal basis with specific cross-border co-operation instruments (like the European Groupings of Territorial Co-operation). The focus has also shifted towards more cross-cutting themes linked to innovation and environmental issues.

Source: European Commission (2010), *Interact Newsletter*, September, http://ec.europa.eu/regional_policy.

The geographic areas of intervention financed by European Territorial Co-operation funds for cross-border activities are often defined with a logic based more on shared disadvantage than shared opportunity. One of the intents of the cross-border efforts, in addition to supporting European integration, is to help these areas overcome some form of peripherality in their national context. When these cross-border area definitions are applied for innovation support, challenges can arise. Relevant innovation actors may be outside the perimeter definition (Chapter 1). For example, the Euregio Meuse-Rhine co-operation (created in 1976 and institutionalised in 1991) does not include the cities of Leuven and Eindhoven, among other areas that were subsequently developed as part of the TTR-ELAt cross-border regional initiative. The area defined by ETC funds for Ireland-Northern Ireland (UK) is focused on the border; however, many of the most significant actors for innovation are located outside that ETC area, notably Belfast (which often participates using the portion of funds for entities outside eligible areas), or Dublin.

The project-based approach results in a lack of strategic, game-changing interventions. The motto of one ETC cross-border area, "Overcoming borders: Project by Project" highlights the project-based logic of this programme. In many of the in-depth case studies, the project partners did not continue a relationship after funding ended. This implies that in many of those cases either the instrument was poorly designed or the public share of the financing too high. The collection of projects does help build bottom-up cross-border connections, thus increasing functionality in the cross-border area. But this accumulation of projects does not always lead to the public goods that facilitate greater integration of the cross-border area more generally, be that data, policy intelligence, strategy development or other high-impact projects.

The administrative barriers and programme approaches associated with funds were noted as problematic for innovation projects. Some of these rules and procedures are set by the individual ETC cross-border programme, others by national auditors, and yet other rules come directly from European policy. In a couple of ETC cross-border areas, the requirement for complex forms and in multiple languages was deemed a problem for firms or scientists. Procurement requirements for even small amounts can be overwhelming. For innovation work, criteria based on excellence or evaluations requiring special expertise are needed. This is in contrast with the often more jurisdictional approach to committees that decide the use of the ETC cross-border funds. The GCS Cross-Border Cluster Stimulation Fund in the TTR-ELAt (Chapter 3, Box 3.8) sets up a unique structure of experts hailing from the different jurisdictions to pre-select and recommend the firm-based innovation projects to the formal committee as a way to bring in the relevant expertise in the decision-making process. The Science Offensive programme in the Upper Rhine Trinational Metropolitan Region also had to design more adapted forms and procedures to overcome barriers generally associated with ETC fund use and ensure the quality of project selection (Chapter 3, Box 3.4). Other cross-border projects include partners in all jurisdictions of an ETC cross-border area to increase the probability of selection, even when that does not necessarily make sense for the programme logic. Forcing cross-border co-operation was seen as a drawback of the early attempts to fund collaborative R&D partnerships in the Oresund (Oresund Contracts programme, Chapter 3, Box 3.5).

Beyond the dedicated funding of ETC programmes, there are also opportunities for using other Structural Funds as a tool to support regional innovation strategies that may span borders. Regions in the EU benefit from some form of Cohesion Policy funding beyond ETC programmes. None of the case study regions were making use of such other Cohesion Policy funds for cross-border efforts, albeit cross-border strategies are now

encouraged for effective use of those funds.[3] Furthermore, the associated ETC-defined cross-border areas did not match what was deemed locally as most relevant for innovation-driven development. Allowing use of these other EU Cohesion Policy funds when relevant is another form of "mainstreaming" the cross-border element.

Maximise the benefits and reduce the costs of collaboration

Favourable conditions within the region for innovation are likely to increase the benefits and reduce the costs of cross-border collaboration in innovation policy. Conditions that provide a more fertile ground for fruitful policy collaboration are related to those that determine the functionality of the area from an innovation perspective (Chapter 1). The discussions of the different forms of proximity for innovation also apply to the conception of collaboration more generally (Box 1.2). Favourable conditions also include proximity from the perspective of governance, in terms of the public administration's institutional styles, cultural issues for people working on cross-border collaboration and the constitutional frameworks.[4] There are ten conditions that are important to consider for cross-border collaboration (Table 0.2 and associated diagnostic questions in Annex I.1). Cultural differences merit special mention because while they can be an asset for innovation, they are also a cost for collaboration. Trust is an important component in innovation co-operation, and cultural barriers impede the development of trust-based relationships.

The calculus of the collaboration is particularly difficult for regional innovation support

Innovation policy, unlike other fields such as transport policy, does not allow for an easy calculation of inputs and outputs. A main challenge is that some of the benefits and costs from cross-border co-operation remain unknown. The innovation process is, by definition, fraught with uncertainty. Many research initiatives can be years away from marketable application and tangible returns in terms of jobs or tax revenue. So while the benefits are far from certain, the costs in terms of government efforts (notably in terms of time or political risk) are highly visible and immediate. The perception of the payoff to each party is therefore often unclear and skewed. And the role of innovation policies themselves, be they regional or cross-regional in scope, is precisely to try to alleviate those barriers by providing incentives or supporting part of the risks involved for those undertaking the innovation.

Public administrations may not collaborate even if the net cost of not collaborating is higher. There is a documented *status quo* bias in human behaviour that affects the interpretation of costs and benefits associated with any change. However, in many cases, the costs of spatially fragmented policies may be quite high. The problem is that rarely does a public administration conceive of this problem and attempt to quantify it.

The decision to collaborate for joint innovation support presumes a set of understood pay-offs (benefits minus costs) and an alignment of those incentives on all sides. Even if the payoffs were clear, there are not always incentives to collaborate around the same choice.[5] When considering the collaboration, it is a useful exercise to think about the incentives not only for oneself, but for the other party, today and in the future. In the context of cross-border collaboration for innovation policy, there may be examples whereby in some projects co-ordination has a recognised payoff, and in others it may not. Actions to promote co-operation will depend on the degree of alignment of objectives as represented by the payoffs recognised by all parties.

In some situations, both regions may have an incentive to collaborate, but they do not get the maximum benefits. For example, the case of Helsinki-Tallinn could be considered in this context. Both regions see an interest in collaborating. They have had some successes in accelerating the discussions on mutual interests in transport, but have not yet fully taken advantage of the opportunities for innovation collaboration that would produce the additional benefits for both parties. Ireland-Northern Ireland (UK) is perhaps another example where there may remain unexploited benefits, but there is nevertheless a high commitment and incentive to co-operate. In both of these cases, there are differences in commitment in the collaboration for historical reasons, reinforced by differences in size and level of economic development. Therefore, both sides recognise that benefits may not be equal between the two partners.

Another scenario is one where the incentives to collaborate are aligned, but depending on the overall approach, or the specifics of a particular issue, one side may benefit a bit more than the other. The case of the Oresund illustrates this point. From a purely income tax perspective, Denmark may gain given the higher number of commuters flowing in that direction, as people pay taxes where they work. For other assets, like the airport and access to a larger labour market, Southern Sweden residents may gain. With respect to the scientific facilities, Southern Sweden may appear to gain more directly since the facilities are located in its jurisdiction. However, in these different elements of the collaboration, there are often forms of compensating payments that help to make the benefits more even. This comes in the form of access to "beam time" by Danish researchers in Swedish facilities, or having a component of the facility be established on the Danish side (such as the data centre for the upcoming European Spallation Source – ESS). In addition, there are actual compensating payments to account for possible free-riding or other externalities, such as co-financing of an airport located on the other side of the border. These arrangements work because there is a long-term relationship and an understanding that perhaps there is an alternation when one side may simply have larger payoffs than the other, while both still benefit, but next time it will be the other side.

In a third scenario, there is a strong disincentive to collaborate since one could benefit more if the other side chooses to co-operate, but not oneself. In other words, there is a strong incentive to free-ride and let others contribute. Within the context of the TTR-ELAt region, the GCS Cross-Border Cluster Stimulation is an interesting illustration of this. The funding scenario by each contributing partner, beyond the common contribution of ETC funds, shows contribution differences ranging from EUR 2 million by the Dutch Ministry of Economic Affairs to EUR 9 000 from a participating sub-region. One explanation for this funding commitment can be due to a high perceived payoff for Dutch firms. Another possible (or partial) explanation is that the contribution is a pilot test to prove to the other partners that such a programme can work so that in a future programme or joint action, the (hopefully) highly positive results of the programme currently in progress will allow longer term co-operative behaviour to take hold.

In all of these scenarios, what is important is that the collaboration is a long-term situation which implies the building up of trust. In the case study examples, those most advanced were generally those that had over 20 years of experience already in some form of formal collaboration, such as the TTR-ELAt and the Oresund. The case of Ireland-Northern Ireland (UK) is perhaps different, in the sense that the high level of political commitment has led to a stronger institutionalisation than time alone would have implied. The costs of building the relationships and trust to work together may be higher upfront, but the expectation is that over time those costs decline, which, all else being equal, raises the net benefits for participating jurisdictions. Given that the upfront costs are more

visible, considering this long-term dimension is important. That investment is made through the dedication of professionals in their daily work.

Collaborations that focus on creating economic and social benefit may involve "co-optition" (co-operation for competition)

The concept of collaborative advantage as found for firms bears lessons for collaboration across public administrations that seek to support firms. For firms, collaborative advantages must yield benefits and open the doors to unforeseen opportunities. It is about collaboration (creating new value) and not mere exchange. And it is based on a dense set of interpersonal connections, not simply formal systems (Kanter, 1994, Box 2.7). Firms that compete may find value in successful business alliances, therefore, in this analogy, public administrations that compete may also have opportunities to gain by working together. The jurisdictions can engage in co-operative competition, or "co-optition" once they recognise that the real competition is not the neighbour, it is the rest of the world.

The arguments about *juste retour*, or getting back what one puts in, are often focused on the individual "deal", or in this case project. If collaboration requires considerable negotiations for an equal return on every project, the transaction costs are high for all. However, since many of the costs and benefits are perceived and/or realised to occur under different time horizons, the deal-based calculation instead of the long-term calculation becomes more cumbersome to manage, increasing collaboration costs. This longer time horizon can change the calculation of expected benefits since often there is a short-term focus on the returns.

Innovation policy has the potential for creating economic and social value through greater knowledge of opportunities across the border. Within the case study areas, one of the most commonly reported challenges is having information available on firms, research institutes, technology centres, etc. on the other side of the border. These opportunities for innovation system actors are therefore discovered over time and are likely to increase in the benefits, which consequently serves as greater justification for joint policies.

Science, technology and innovation policy is a field where complementary action can be taken over time to increase economic returns. For example, in the Oresund, two large scientific facilities are under construction. To get greater value for the regions with that facility, complementary programmes have been put in place. The Cluster for Accelerator Technology (CATE) is helping local firms develop skills for such advanced and specific knowledge so as to be qualified to participate in the building of the facility, starting with an existing market, CERN in Switzerland (Chapter 3, Box 3.7). This complementary action was therefore put in place jointly to increase the economic benefits locally (and on both sides of the border). Once the facility is built, other complementary actions will likely be considered to increase the value of this asset both within the region where it is located, but also in the neighbouring region across the border.

Box 2.7. **Collaborative advantage: The art of alliances**

Kanter (1994) conducted a study in the mid-1990s on the different ways business organisations form partnerships and alliances. The research was based on more than 500 interviews with leaders and staff of 37 companies located in 11 locations (Canada; France; Germany; Hong Kong, China; Indonesia; Japan; the Netherlands; the People's Republic of China; Turkey; the United Kingdom; the United States). Those interviewed covered large and small companies in both the manufacturing and service industries, involved in different kinds of partnerships and alliances. Several kinds of business relationships were covered: from those more than 20 years old to those formed more recently due to industrial and globalisation changes.

The research has shown that alliances between companies are a well-established feature of business organisation (already in the mid-1990s). Being a good and attractive partner has become an important corporate asset, which can be defined as **collaborative advantage.** With globalisation, companies' ability to establish and maintain fruitful collaborations is one of their strategic resources. Active collaboration takes place when companies develop mechanisms, structures and skills that allow the bridging of organisational and interpersonal differences between business organisations.

The author identified three fundamental aspects of successful business alliances:

- Alliances must bring benefits to partners, but they are more than just a deal. They change and evolve according to mutual possibilities, future and sometimes even unforeseen business opportunities.
- Alliances involve collaboration (i.e. creating new value together) rather than simple exchange. Partners benefit from the different complementary skills that each brings to the alliance.
- Alliances cannot be controlled in a formal way, but rather they require a dense and pervasive network of interpersonal contacts as well as internal infrastructure promoting mutual learning.

Successful alliances are also characterised by the "8 Is": individual excellence of both partners, importance of the partnership, interdependence (namely the mutual need for the alliance), investment (when both partners invest in the other company, not necessarily financially), information (mutual exchanges and open communication), integration (by developing linkages and common operations), institutionalisation (by giving a formal status to the collaboration), and integrity (mutual trust).

In addition, the author observed different behaviours according to business cultures in different geographical areas. North American companies have the tendency to adopt a narrow and opportunistic idea of business relationships, by emphasising the financial aspects of such partnerships. They hence tend to neglect the political, cultural, organisational and human aspects of the partnership. Asian companies tend to exploit and establish alliances having a broader meaning and European companies exhibit intermediate behaviours with respect to both the Asian and North American paradigm.

Source: Kanter, R. Moss (1994), "Collaborative advantage: The art of alliances", *Harvard Business Review*, pp. 96-108.

Adapt governance approaches to the institutional context

Cross-border areas can combine formal and informal governance arrangements

While there is no common model of cross-border governance, there are several elements to characterise them. There is likely a relationship between the breadth of the partnership and the level of authorities involved. Focused fields of intervention corresponding to the areas of work of local authorities would tend to be dominated by these authorities. Wider goals would need to rely on the involvement of regional, and even national authorities, be that in the governance structures or other vehicles for making them aware of the issues and engaged in the solutions.

Most cross-regional partnerships are governed by associations and committees established under voluntary agreements. Such entities provide a basis for developing and implementing cross-border strategies (Box 2.8). They have no regulatory power, but rather act as a platform for co-ordinating policies across the cross-border area, and defining common initiatives. Their stability and effectiveness depends on the availability of continuous funding sources, which is rarely the case (an exception is those structures funded by the Nordic Council of Ministers). They can be severely affected by political changes occurring in one or the other of the constituting regions. A comparative analysis of 11 cross-border co-operation committees in the Nordic countries revealed that the scope, size and organisational modes of these partnerships differ a lot according to the geographical conditions of the areas, the history of collaboration and the level of authorities involved (Nordregio, 2010). Another characteristic of these governance structures is the balance of power achieved between the various parties involved. An asymmetric partnership is likely to hinder the development of integrated cross-border areas, unless those are precisely based on an asymmetric model (such as in the Asian growth triangles).

Some form of secretariat is necessary to create the public goods for cross-border area governance to work. Somebody needs to have cross-border collaboration as their priority, whether through a formal secretariat (co-financed or with civil servants) or through a virtual secretariat with dedicated representatives that have sufficient time to provide the "backbone" work that is often of a public good nature for the whole cross-border area. In some cases, such as the Bothnian Arc Association, the staff is only a couple of people. In the case of the Oresund Committee, it is ten but there are other organisations that provide supporting research and analysis such as the initiative Orestat for cross-border statistics and the think-tank Oresund Institute. InterTradeIreland is a unique case with dedicated staff and significant analysis capacity. In other cases, such as the TTR-ELAt, regional representatives are required to support cross-border activities as part of their daily work, albeit often as only a small fraction of their time.

Formal institutions for cross-border innovation policy are the exception rather than the rule. There are a number of entities established in cross-border areas, such as the Euregions that focus on managing funding from EU programmes. Historically Euregions share three common characteristics. They are: *i)* driven by public sector initiative, represented by public agencies belonging to contiguous local authorities from two or more countries; *ii)* established under informal agreements, because local authorities are usually not allowed to enter into formal international agreements; and *iii)* focused on practical problem-solving issues, usually those under the responsibility of local authorities (Perkmann, 2003). In the TTR-ELAt region, the Euregio Meuse-Rhine

Box 2.8. **Examples of cross-border governance committees**

The **Oresund Committee** is the main governance body for the Oresund Region. It is a forum for voluntary political co-operation established in 1993 on the initiative of Swedish and Danish politicians on both sides of the border. It is a political interest organisation that promotes co-operation across the sound at all levels and safeguards the interest of the Oresund Region to the national parliaments of Sweden and Denmark. The Oresund Committee and its Secretariat of ten employees is financed through contributions from its members, the size of the contribution is calculated according to the number of inhabitants in the respective participating municipality or region. Additional funding is provided by the Nordic Council of Ministers and some other external sources.

Centrope, on the basis of the Kittsee Declaration of 2003, works jointly towards the creation of the Central European Region in this four-country quadrangle. Centrope is a joint initiative of three Austrian *Länder*, two regions in the Slovak Republic, one in the Czech Republic and two in Hungary, as well as several key cities. The Centrope Steering Committee and the Centrope Agency guide the development process and are responsible for its operative implementation. The Steering Committee is a forum for discussion regarding the goals of co-operation and the form these efforts should take. It is the central body of the Centrope initiative, maintaining close contacts with the political level. Its presidency rotates every six months between the four participating countries. Analyses of the Centrope region in the past have noted weak cross-border governance due to imbalances in partner abilities to lead, engage and finance cross-border projects.

The **Bothnian Arc Association** (two staff) plays a co-ordination and facilitator role. The main public stakeholders of the association are member municipalities, in part because the footprint of the area is often only a small part of the associated regions. National and regional authorities that hold decision-making power and budgets in innovation matters are not on the Board.

Sources: Lundquist, K.-J. and M. Trippl (2009), "Towards cross-border innovation spaces: A theoretical analysis and empirical comparison of Oresund region and the Centrope area", Institute for the Environment and Regional Development of the Vienna University of Economics and Business, *Discussion Paper*, No. 2009/5, www.centrope.org; Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Oresund (Denmark-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/21, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lk8knn-en; Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Bothnian Arc (Finland-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/17, OECD Publishing, Paris,http://dx.doi.org/10.1787/5k3xv0r6v26b-en.

has existed for many years, and some of the programmes relevant for the TTR-ELAt are initiatives of the Euregio. Helsinki-Tallinn also developed a small Euregio entity, but it was not the main entity responsible for spending cross-border ETC funds and the continuation of funding for the entity remains a concern. The Upper Rhine cross-border area across Germany, France and Switzerland has a long-lasting history of cross-border co-operation that has led to the establishment of a number of cross-border governing entities (Box 2.9).

Box 2.9. **Governance institutions in the Upper Rhine Trinational Metropolitan Region**

The Upper Rhine area, across Germany, France and Switzerland has long history of cross-border collaboration. The first cross-border co-operation treaty in the area dates back to the 19th century concerning trade and navigation along the Rhine River. Today, four main institutions are responsible for the cross-border co-operation in the Upper Rhine Trinational Metropolitan Region.

The Trinational Commission and the Upper Rhine Conference

In 1975 the Bonn inter-governmental agreement established three cross-border co-operation entities: the Inter-governmental Commission and two Regional Committees for the Southern and Northern parts of the region. It was the first time that the governments of Germany, Switzerland and France were creating official bodies in charge of cross-border co-operation. The areas targeted by those bodies were the departments of Lower and Upper Rhine in France, the Mittlerer Oberrhein, the Südlicher Oberrhein and Lorrach in the Baden-Württemberg *Land* and the Sudpfalz in the Rhine-Palatinate *Land* in Germany, and the Basel-City and Basel-Campagne cantons in Switzerland. The co-ordination bodies were organised in thematic working groups on environment, transport, tourism and economic development. The commission provides recommendations and suggests revisions of normative text to the governments of the three member states. The commission is composed of a delegation from each country, appointed by each government. Each delegation is supervised by the respective country's Minister of Foreign Affairs.

The Upper Rhine Conference was created in 1991 from the merger of the two pre-existing regional committees. The Upper Rhine Conference is now the central body of cross-border co-operation and information sharing in the cross-border area and it regularly reports to the inter-governmental Trinational Commission. The conference operates through a common Secretariat, established in 1996. The Secretariat is responsible for the co-ordination of the 12 thematic working groups (among which are economic and territorial development) and interacts on an on-going basis with other cross-border actors. In 2000, the geographical area targeted by the conference was enlarged to additional Swiss cantons (Argovie, Soleure and Jura) and German regions (Waldshut, Sudliche, Weinstrasse, Gemersheim, Landau in der Pfalz, Dahner Felsenland and Hauenstein).

The Upper Rhine Council

The Upper Rhine Council, created in 1997, is the "parliament" of the trinational cross-border Upper Rhine Region. The Upper Rhine Council is composed of 71 elected persons in the regions covering the cross-border area over the 3 countries. The council has the objective to promote dialogue and information sharing among elected representatives of the cross-border area. The different proposals and official statements are reported to the three national governments, regional assemblies and other relevant bodies. The council meets once or twice per year. The Council Presidency rotates each year to a different country. Its main objectives are: the development and the promotion of political cross-border co-operation exchanges, the support of cross-border development activities at regional and city level; the contribution to a coherent regional development strategy of the Upper Rhine and the cross-border engagement at political level.

The Upper Rhine Metropolitan Trinational Region (RMT)

The RMT was created in 2010, with the aim to co-ordinate the development of a tri-national region and facilitate the dialogue among the different cross-border institutions. The RMT's activities focus on the four key pillars identified as priorities for the cross-border economic development of the region: politics, economics, science and higher education, and civil society. Each theme is co-ordinated by a representative of the RMT Secretariat and benefits from the work of expert group meetings. The RMT promotes linkages and horizontal co-operation across different themes and refers to high-level political entities as well as citizens and local communities of stakeholders. The RMT has the objective to mobilise relevant cross-border actors by means of new forms of governance. The RMT has been created to simplify and bridge already existing structures, promote and facilitate networks and platforms, integrate different socio-economic pillars in the overarching strategy, and undertake actions to help the policy-making process like the development of statistics, analyses and mapping exercises.

Box 2.9. **Governance institutions in the Upper Rhine Trinational Metropolitan Region** (*cont.*)

The main goals of the science pillar are: *i)* intensify networks and connections among innovation actors (with a science week, French-German applied schools, good practice exchanges); *ii)* promote co-operation among universities and higher education institutions (joint programmes, mobility schemes, common research projects); *iii)* foster innovation spillovers towards the rest of the economy (with the creation of an Upper Rhine Innovation Observatory, an Upper Rhine Environment Institute, workshops and platforms); *iv)* branding the Upper Rhine region as a leading innovation and science area; and *v)* promoting specific scientific sectors (chemistry, life and health sciences, earth science and materials, etc.).

Sources: www.conference-rhin-sup.org; www.conseilrhenan.org; www.rmtmo.eu.

Among the case study areas, InterTradeIreland provides a unique example of a formal cross-border agency. InterTradeIreland provides data, policy intelligence and programmes focused on cross-border economic promotion (Box 2.10). The InterTradeIreland Board gathers relevant organisations related to cross-border, all-island economic co-operation, from representatives of national science and research agencies, political parties, trade unions and the business sector, including private companies. Representatives of Enterprise Ireland, the economic development agency of Ireland, and Invest Northern Ireland, its counterpart in Northern Ireland (UK), sit on programme steering committees. There are typically meetings every three or six months to discuss programme activities. In addition, the CEO and Chairs of InterTradeIreland, Enterprise Ireland and Invest Northern Ireland meet on an annual basis to discuss priorities.

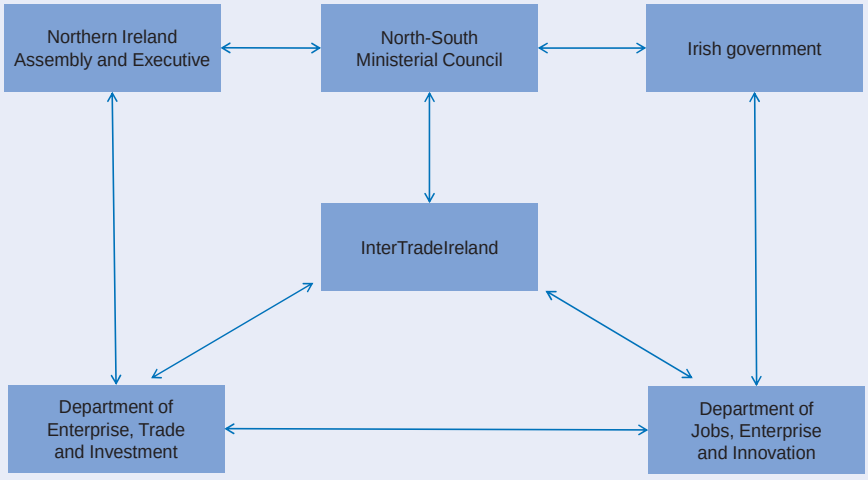
Box 2.10. **InterTradeIreland: A unique cross-border economic promotion agency**

The period since the 1998 Belfast/Good Friday Agreement between Ireland and Northern Ireland (UK) opened a new era of possibilities for developing cross-border linkages. Institutions and policies have been enacted jointly by Irish and British authorities, with support from the EU and the international community, to promote development of both sides of the island. These institutions serve to restore trust across the border in addition to economic ties. The willingness to "reap the benefits of peace", relying on mutually beneficial exchanges, is currently high on the political agenda.

Cross-border co-operation on an all-island basis is institutionalised through the bodies established by Ireland and the United Kingdom in 1999, such as the North-South Ministerial Council, InterTradeIreland and the Special EU Programmes Body (SEUPB). These institutions provide legitimacy and continuity with respect to cross-border co-operation. There are now seven cross-border bodies and hundreds of individuals working on a cross-border basis. Several of these cross-border entities have an economic development mandate. Among them, InterTradeIreland focuses on trade and innovation (figure below). This ensures stability and structural funding to the promotion of cross-border economic activities. It also helps to overcome paralysis due to "fair return" calculations of money invested on either side of the border. The SEUPB is another body established after the Belfast/Good Friday Agreement, with the mission to manage cross-border EU programmes.[1]

Box 2.10. **InterTradeIreland: A unique cross-border economic promotion agency** (*cont.*)

InterTradeIreland launched its activities in 1999, always focusing on SMEs, but has already evolved on several fronts. It focuses on SMEs in particular, and with a goal of developing networks and partnerships. A range of programmes has been developed and implemented over the years with demonstration of mutual benefit to both jurisdictions. It also has a unique role in providing policy research. The team of 40 does not use branch offices *per se*, but works with the responsible entities in each jurisdiction (Enterprise Ireland and Invest Northern Ireland), as well as other groups such as chambers of commerce, to reach firms and in the implementation of cross-border programmes. InterTradeIreland facilitates and promotes the mainstreaming of cross-border innovation efforts by operating in close contact with relevant national and regional entities. The organisation has since moved from being seen as a political entity to one that has a clear economic rationale for its activities. Another shift has been from a focus on trade to one on competitiveness more generally. Indeed, the current name is now somewhat of a misnomer, in the sense that many of its actions are focused on innovation. However, given the brand recognition it has built up, the name remains.



Note: 1. Other entities that also address economic development with an all-island remit include Tourism Ireland (since 2000) and SafeFood (since 1999).

Sources: InterTradeIreland (2013), "Ireland/NI background report for OECD study on cross-border regional innovation policies"; Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Ireland-Northern Ireland (United Kingdom) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/20, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0llxhmr-en.

Some cross-border areas, albeit not in the case studies, have established permanent legal structures using a new European instrument. The European Grouping of Territorial Co-operation (EGTC) instrument was adopted in 2006, providing a legal framework and more visibility for such territorial co-operation. The EGTC is a legal entity and as such, different from most other cross-border structures. The use of this legal instrument is increasingly popular. By end 2012, the number of established EGTCs was 32, driven by around 700 national, local and regional authorities in 17 EU member states. A further 17 EGTCs were in different phases of constitution (Committee of the Regions, 2013).[6] Hungary has been the most active user of this legal instrument, due both to the large number of country borders (seven) and the national government's support (Box 2.11).

However, the use of EGTCs includes many challenges (Box 2.12). The EGTCs' objectives cover areas as diverse as: health, civil defence, economic development, protection and promotion of natural resources, tourism, labour mobility and training, etc. With a few exceptions, innovation promotion does not take a prominent role in the EGTCs. In general, EGTCs have a broad mission covering most aspects of socio-economic regional development, those EGTCs with more narrowly defined objectives[7] being the exception rather than the rule (Committee of the Regions, 2012).

Box 2.11. **Hungary and the use of European Groupings of Territorial Co-operation**

Hungary borders seven countries (EU members: Austria, Croatia, Romania, Slovak Republic and Slovenia; and non-EU members: Serbia and Ukraine), therefore cross-border co-operations are a top priority for the Hungarian government. Hungary was the first EU member state to adopt a national law governing European Groupings of Territorial Co-operation (EGTCs) (Act XCIX of 2007). In order to help and facilitate the establishment of new EGTCs and the operation of the existing ones, the Hungarian government has been providing support from the central budget since 2011 for both purposes. In 2013, the total direct support was approximately EUR 400 000. There are currently 16 registered EGTCs with Hungarian members, 12 of which are registered in Hungary. The majority of actions appear to focus on infrastructure, culture and environmental considerations, but in some EGCTs actions are focused on regional growth, such as SME development. There are already several plans from EGTCs for Integrated Territorial Investments.

Source: Personal communication with the Hungarian Ministry of Public Administration and Justice (2013).

Box 2.12. **Hurdles associated with European Groupings of Territorial Co-operation (EGTC)**

Start-up phase:

- High number of partners often leading to long start-up periods.
- Striking the balance between visible actions in the short term and larger policy-making projects for a mid-term perspective.
- Overcoming local and sector interests, at least partially, and developing a set of cross-border projects.

Operation phase:

- Developing and implementing projects with a limited number of staff.
- Overcoming the risk that after the initial momentum during the constitution phase and after the first lengthy decision-making procedures, stakeholders' energy evaporates. In such cases, new approaches to facilitate the process have to be found. New ideas might come from joint study tours and on-site visits. It might also be helpful to define a set of concrete actions and operational targets during the constitution phase in order to avoid such difficult transition periods.
- High budgetary dependency (in particular for EGTCs in new member states) on the successful participation in European Territorial Co-operation programmes.

Source: Committee of the Regions (2012), *EGTC Monitoring Report 2011*, European Union, Brussels, September 2012.

Despite the need to garner greater national policy support, national policy makers are rarely invited to participate in formal governance arrangements. The Board of InterTradeIreland, which was appointed by a national government on one side and a UK

devolved administration on the other, is the exception among the six case studies. Even participation by national staff below the political level as observers could nevertheless raise awareness for specific cross-border needs for which the national government has a role. In some instances, a national political leader may be a relevant stakeholder to have on a political board. In other cases, perhaps a national agency may be more relevant because national agencies set some of the programme rules that concern the possible cross-border innovation instruments.

Multi-actor-governance: Wider stakeholder involvement is necessary for sustainability

In all of the case study regions but Ireland-Northern Ireland (UK), only public sector authorities are directly responsible for the governance of the cross-border area. A common characteristic is the lack of a wider involvement of stakeholders of the triple helix.[8] Entities like the Oresund Committee or the Bothnian Arc Association, for example, do not have representatives of the private sector or higher education institutions (HEIs) on their governing boards. An exception is InterTradeIreland, which gathers on its board representatives from business associations and private companies. In North America, there are examples of an active private sector engagement, such as the Borderplex Alliance covering the area of El Paso (Texas), Las Cruces (New Mexico) in the United States and Ciudad Juarez (Chihuahua) in Mexico. The privately funded entity seeks to promote the cross-border area to be an attractive location for business (Box 2.13). Some form of engagement of various types of innovation and knowledge institutions is necessary to achieve sustainable, fruitful and effective cross-border partnerships. Some form of inclusion of HEIs, firms and actors from civil society increases the acceptance and success of cross-border innovation policies.

Box 2.13. **The *Camino Real*: Largest US-Mexico cross-border metropolitan area**

This cross-border area of around 2.4 million inhabitants includes the urban centres of El Paso (Texas) and Las Cruces (New Mexico) in the United States and Ciudad Juarez (Chihuahua) in Mexico. This area is bi-lingual and bi-cultural, which is an asset as the United States Hispanic population is expected to grow considerably in the coming decades. There is daily cross-border commuting (five bridges between the twin cities of El Paso and Ciudad Juarez) and many cross-border firm interactions. Population growth and cross-border exchange in the area has been facilitated by the North American Free Trade Agreement (NAFTA). It is the second busiest/largest trade corridor between Mexico and the United States.

The strong manufacturing base is one of the region's distinctive features. The *maquiladora* sector in Ciudad Juarez (almost 350 *maquila* facilities owned and operated by more than 200 multinationals) constitutes the largest manufacturing region in North America, mainly contributing to the automotive and ICT sectors. The economy is more diversified on the US side with a much larger service sector. It is the public sector that has contributed to recent job growth, including through military installations such as Fort Bliss (Texas), White Sands Missile Range (New Mexico) and Holloman Air Force Base (New Mexico).

One of the area's biggest challenges is to increase its attractiveness on a global scale. This requires fixing the "damaged brand" of the region by addressing the fundamentals to attract and retain workers and their families. With several universities and 110 000 university students, the area trains, but then exports, many science and engineering graduates to locations with better job opportunities. Pockets of poverty remain a drag on competitiveness on both sides of the border. Tightened border controls on the US side and drug-related violence on the Mexican side further compromise cross-border integration and the area's competitiveness.

Box 2.13. **The *Camino Real*: Largest US-Mexico cross-border metro area** (*cont.*)

The Borderplex Alliance is a new private agency to promote the cross-border area for firm and investment attraction. In contrast to European models, this governance approach is private sector driven. The organisation fulfils a recommendation of a review of the El Paso Economic Development System to have a private sector entity with a remit that covers the cross-border area spanning the three states and two countries. The Center for Global Competitiveness of the University of Texas El Paso provides research for economic development efforts.

The Borderplex Alliance seeks to contribute to a change in the region's economic development approach to transition from a cost competitiveness approach to one focused on higher value added goods and services and a skilled workforce. It has been given the task of creating a strategic plan for bi-national economic development and promoting its realisation with federal, state and local authorities in both countries as well as the private and non-profit sectors. The area is characterised by low levels of innovation and R&D investment by firms (albeit other parts of New Mexico have considerable public R&D). Therefore, efforts to develop greater innovation-related collaboration among the region's firms, universities and other centres are required. This new approach also implies a shift away from the parochial approach to economic development of the constituent areas that often favour a "race-to-the-bottom" type of competition.

Sectors of priority in the cross-border area include: automotive; consumer electronics; renewable energy (particularly solar); tourism and the medical sector. The Medical Center of the Americas will contribute to the latter (for medical tourism, medical research and medical device manufacturing). Other areas identified for joint action are: *i)* border infrastructure; *ii)* military bases; and *iii)* workforce development.

Sources: OECD (2010), *Higher Education in Regional Development: Paso Del Norte Region, Mexico and the United States*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264088887-en; Feser, E. (2011), *El Paso Economic Development System Review and Recommendations*, prepared for the City of El Paso, Texas, 9 December; and personal communications with the Borderplex Alliance (July 2013).

If not through formal boards, the involvement of the private sector, HEIs and in some cases citizens may take place outside of formal governance bodies. This can take the form of an advisory role in the definition of the cross-border innovation strategy or on some of the mechanisms in place for cross-border co-operation. For example, private organisations and universities can provide feedback on initiatives and programmes in place, evaluating what worked successfully or not, or whether the right or wrong incentives were in place. Policy makers in charge of cross-border co-operation need to promote this consultation process to make the strategy work and keep all the relevant stakeholders engaged in cross-border innovation-related goals. InterTradeIreland, for example, promotes this kind of consultation by means of steering and working groups giving advice on the agency's cross-border programmes. Especially when cross-border efforts are at an early stage and the benefits of cross-border co-operation not yet understood by all of the relevant stakeholders, wider engagement is a key aspect for the sustainability of cross-border initiatives. If beneficiaries of programmes feel excluded from governance processes, the risk of fading interest with respect to those programmes is higher. Even worse, there is a risk that programmes are poorly conceived and therefore public funds wasted.

Often private entities are the first to see the potential for cross-border collaborations, driven by market opportunities that do not stop at administrative boundaries. In some cases, large companies began to take advantage of the functionality of a cross-border area, before the cross-border area was acknowledged at the political level. This is, for

example, what happened in the TTR-ELAt. For decades Philips established cross-border activities across the southern part of the Netherlands, Flanders (Belgium) and Germany. This collaboration is very clear in co-patenting statistics. Cross-border co-operation at the political level began years later. Many Finnish firms cross the border to establish headquarters in Tallinn, to benefit from cheaper locations but also the dynamic innovative ecosystem. Technopolis Ülemiste is an example of a business park located in Tallinn where many Finnish and Estonian companies share office spaces. Policy makers can learn from these kinds of private sector experiences to better target or design programmes. Especially when SMEs are involved, the private sector can bring its contribution to the discussion on cross-border strategies, through cluster and lobby associations of firms. In the Oresund area, for example, the Chambers of Commerce in both countries promote analysis, organising discussions and providing feedback on cross-border initiatives.

Special governance capacities are needed for cross-border efforts, particularly to support innovation

Capacity issues are of particular consideration for innovation and cross-border work by public authorities. There are two layers of complexity, one for supporting innovation and the other for supporting work across borders. Supporting innovation is difficult *per se*, given the needs for creative and cutting-edge solutions that must adapt to fast and unforeseen changes in technological sectors or knowledge-intensive services. In addition, when working at cross-border level, public administration staff needs to have or acquire additional skills concerning languages in use in different jurisdictions, the knowledge and awareness of different national and international programmes and regulations having an impact on the cross-border area. It also means they need to be exposed to different cultures and different ways of interacting (this can be different working hours, lunch habits, vacation periods, etc.). As a consequence, public administration officials successfully working on a cross-border basis often need to make use of creativity to make cross-border collaboration happen. Cross-border areas can promote and encourage *ad hoc* classes and training sessions for the staff working on cross-border issues. An interesting example is the Euro-Institute in Germany that serves the Upper Rhine Trinational Metropolitan Region (Box 2.14).

Box 2.14. **The Euro-Institutes: Building capacity for cross-border collaboration**

A network under the brand Euro-Institutes exists around Europe to provide training to civil servants relevant for cross-border efforts in a range of policy areas as well as administrative and legal issues. For example, the Euro-Institute in Kehl, Germany (across the river from Strasbourg, France) offers courses to civil servants on a set of topics ranging from local finance in the different jurisdictions to laws regarding children's rights to inter-cultural communications. One training session in 2013 was specifically dedicated to the innovation policies of actors in the cross-border area to reinforce the science pillar of the cross-border initiative of the Upper Rhine Trinational Metropolitan Region.

Source: www.euroinstitut.org.

One of the positive by-products of these collaborations is a capacity-building element. Policy makers can learn from different national and regional contexts and traditions, inspired by good practices across the border. This learning component may also have the indirect effect of the introduction of innovations in the public administrations jointly working to target the cross-border area.

Often personal contacts and relationships across public administration officials in different areas are important to maintain strong ties and build trust. Long-lasting personal contacts promote faster transfer of knowledge and relevant information, thanks in part to the fact that people feel more committed towards working together. Losing such social capital may be an obstacle towards further engagement in co-operation. The two cities of Helsinki and Tallinn, for example, have established connections on a wide range of topics. However, the retirement of many older Estonians in the public service in favour of a new generation with different work styles is making it harder to know the right contact. This also points to a possible need to institutionalise cross-border policies and complement social proximity by an institutional one.

One way to promote mutual learning and facilitate inter-personal contacts is to establish mobility schemes of the personnel in the different administrative bodies of the cross-border area. This can take the form of long- or short-term secondment periods and can be an opportunity to learn how institutions work in different places, gain personal contacts and acquire new language and cultural skills.

Conclusions and recommendations

Political commitment on all sides and at all levels is an important factor for kick-starting or securing long-term support for cross-border efforts. Generally, the local level has the strongest interest in collaboration because it feels the costs and benefits most directly, as evidenced by the engagement of many mayors in the case study examples. However, for innovation policy, a region is generally the more appropriate scale to include the range of firms, universities, workers and other innovation actors. Since much of the innovation spending is not with regions, many issues that help or hinder cross-border policy collaboration remain in the hands of national governments. One of the main challenges for joint efforts is that national money tends to stop at the border. Therefore national regulations and policies in a wide range of domains affecting the cross-border area, as well as very specific issues concerning innovation policy instruments, need to be brought to national attention.

Collaboration, if deemed relevant, depends on a clear understanding of the possible costs and benefits as well as the alignment, or not, of the incentives for both sides of the border. Favourable conditions within the region for innovation generally are likely to increase the benefits and reduce the costs of collaboration in innovation policy. However, it is a policy field that does not allow for an easy calculation of inputs and outputs given the high degree of uncertainty associated with many innovation investments. Public administrations may not collaborate even if the net cost of not collaborating is higher.

Collaborations that focus on creating economic and social value better enable each side to find mutual benefit. It is a long-term commitment, implemented in day-to-day work, year after year. The arguments about *juste retour*, or getting back what one puts in, are often focused on the individual "deal", not the relationship. Innovation policy has uncertain returns, but it also allows for creating greater benefits through greater knowledge of those cross-border opportunities. Science, technology and innovation policy is also a field where complementary action can be taken upfront and over time to increase returns.

Cross-border areas can combine formal and informal governance arrangements. Most cross-regional partnerships are governed by associations and committees established under voluntary agreements, with formal institutions being the exception. Some form of secretariat is necessary to create the public goods for cross-border area governance to work. Despite the need to garner greater national policy support, national policy makers are rarely invited to participate in formal governance arrangements. Wider stakeholder involvement is necessary for sustainability. Often private entities are the first to see the potential for cross-border collaborations, driven by market opportunities that do not stop at administrative boundaries. In all of the case studies, except in Ireland-Northern Ireland (UK), the governance arrangements included only public authorities. If not through formal boards, the involvement of the private sector, higher education institutions and in some cases citizens may take place outside through other consultation or working groups. Special capacities of public authorities are needed for cross-border regional innovation efforts.

Recommendations concerning the governance of cross-border collaboration include:

- **Give politicians a reason to care about the issue, understanding that their time horizon and motivations are generally short-term.** Sometimes they need a flagship project (tunnel/bridge/science infrastructure, etc.) to motivate that support, but there is a risk that this one project leads to disappointment. The pressing realities of the cross-border area may be enough to raise awareness. Large firms and other actors often seek cross-border opportunities, helping to show why it is relevant. The more citizens identify with the area, the easier it is for politicians to make such commitments. Nevertheless, the degree of political turnover in a cross-border area with multiple jurisdictions, as well as the short-term time horizon, means that there will also be a need to show how the cross-border actions fit with their agendas on an on-going basis.
- **Identify for national (supra-national) governments where they can help cross-border efforts.** While the local, sub-regional or regional level may be able to develop the strategy and the lines for collaboration, removing some of the particularly binding constraints may lie in the hands of national policy makers. Those constraints can be in the innovation policy field specifically, but may also involve regulations in other fields such as taxation or labour policy.
- **Understand the different costs and benefits, and the alignment of those across the border, for cultivating a long-term collaboration that builds trust.** While some initial experiments may be needed to test possibilities for collaboration, ultimately a focus on each project detracts from relationship building with a focus on increasing economic and social benefits. These opportunities may change over time and require supplementary action to get the most impact. Given the competition among jurisdictions within the cross-border area, a first step is to focus on location-specific attractiveness where all jurisdictions see the direct benefit.
- **Engage non-public actors in governance, with some form of secretariat to underpin the work of the official, even if informal, governance body.** All the relevant stakeholders from the public, private, academic/research and civil society spheres are generally not on governance bodies. However, they may be mobilised in consultation bodies or working groups to define the vision and strategy, including through their participation in stakeholder networks (such as a

cross-border association of universities or firms). These stakeholders may also support cross-border efforts because they see how the programmes do serve their needs, or they have participated in research that helps define the programmes in the first place. A co-funded secretariat may be centralised in one organisation or virtual through in-kind contributions of participating jurisdictions, but somebody needs to make cross-border efforts a priority.

Notes

1. The San Diego Association of Governments has had a long-standing relationship with its counterparts across the border for regional planning purposes.
2. For a full list of these issues, see Nauwelaers et al. (2013e).
3. The European "smart specialisation" concept incorporates a cross-border dimension: "Smart specialisation strategies can ensure a more effective use of public funds and can stimulate private investment. They can help regions to concentrate resources on few key priorities rather than spreading investment thinly across areas and business sectors. They can also be a key element in developing multi-level governance for integrated innovation policies. Moreover they have to be closely linked with other policy domains and require an understanding of regional strengths relative to other regions and of the possible gain for **inter-regional and trans-national cooperation**." (European Commission, 2012, emphasis added).
4. For example, Trippl (2010) lists a range of favourable conditions for collaboration concerning the innovation system and its governance. Such conditions include: *i)* a strong knowledge infrastructure that is engaged with the needs of the regional economy; *ii)* "high road" development models; *iii)* complementarities in industrial structures and knowledge bases; *iv)* balanced cross-border relationships; *v)* similar cultural and institutional backgrounds; *vi)* similar national innovation system structures; and *vii)* stabilised and regionalised/federal political systems.
5. In that sense, game theory offers an interesting framework for understanding the incentives for inter-regional collaboration. See, for example, Bartolini (2013).
6. A register of EGTC is available online at the Committee of the Regions, providing information on these groupings. The Committee of the Regions also provides a regular monitoring of the development of EGTCs.
7. For example, joint management of a natural park or a trans-border hospital.
8. The so-called triple helix refers to the private sector, public sector and knowledge institutions, that are part of the innovation system. The term quadruple helix has been coined to add the civil society to the list. See, for example, Leydesdorff and Etzkowitz (1996).

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Chapter 3

Making cross-border instruments work

Cross-border instruments that contribute to an overall strategy are more likely to have economic impact than if they are simply a collection of different projects. Data, mapping exercises and other forms of policy intelligence can best inform how to prioritise action. Sometimes cross-border policy instruments are experimental: they can serve as test cases before mainstreaming, whereby cross-border actors can participate in traditional innovation programmes. Flexibility in instruments on both sides of the border can be an alternative. Instruments that seek to force actors to collaborate when they have disincentives to do so, due to financial reasons, regulations or lack of a quality innovation partner, will simply not be sustainable. International examples of policy instruments implemented on a cross-border basis have shown different degrees of success.

Developing strategic joint collaborations is an opportunity to get the most out of the different innovation instruments in the cross-border area. Often such instruments are marginal, however, and only a collection of individual projects. National frameworks may be more or less open to mainstreaming cross-border opportunities, thereby raising the level of cross-border collaboration in policy terms. There are examples of specific projects or instruments that have been tried on a cross-border basis with varying degrees of success. It is therefore important to understand the conditions that help increase the chances of success, learning from the lessons in other cross-border areas. This chapter considers:

- the nature of the innovation policy approach for cross-border areas
- which innovation policy instruments appear to work well, or not, and why.

Embed policy instruments in an innovation strategy

Developing a strategy for cross-border innovation is an important step. Cross-border projects usually begin on a bottom-up basis without data and preliminary analysis regarding the most fruitful areas for collaboration. When cross-border innovation instruments are implemented, it is useful to gather evidence to assess the merits of nurturing further private and public initiatives. The case studies reveal a wide range of progress in the different elements of the policy approach for regional innovation support on a cross-border basis. This includes exchange of data and information, experimenting with some one-off programmes, opening programmes to allow collaboration with firms or universities located across the border, or developing a more comprehensive strategic innovation policy approach for the cross-border area (Table 3.1).

Table 3.1. **Cross-border regional innovation policy approach**

Element of policy mix	Definition
Information	Mutual exchange of data, actor mappings and policy information
Experimentation	*Ad hoc* and temporary common initiatives without joint funding
Alignment	Mutual opening of programmes or structures across borders – no joint funding
Joint actions (narrow)	Limited cross-border measures, structures and actions with joint funding by actors from several regions
Joint actions (broad)	Multiple joint instruments co-funded by the constituting regions
Strategic policy mix	Joint common strategy adopted at the level of the cross-border area, translated into a common policy mix co-funded by all constituting regions

The development of a strategic policy mix with jointly funded programmes, the most intense form of collaboration, may not be possible in some areas. Often the complexity of governance arrangements renders it so costly to develop that less formalised approaches are required. This may be due to a difference in innovation policy competences (one region has power to make the decision, the other region does not), or the sheer number of public partners. The variable geometry associated with the different innovation needs, such as by sector or technology, can also make this strategic policy mix simply not relevant for all sub-areas to engage in to the same degree.

However, some mechanism for informing each other's respective strategies can help embed the different actions into a strategic framework. For example, the TTR-ELAt region has focused its joint efforts on the three fields of strength throughout the

cross-border area (to different degrees). The upcoming regional innovation strategy for the Nord-Pas de Calais Region of France explicitly acknowledges the importance of linkages with its neighbours in Belgium. At the national level, the Department of the Taoiseach in Ireland and the Department for Business, Innovation & Skills in the United Kingdom sets out current and future opportunities for collaboration between the two countries. The report makes specific recommendations in the area of R&D and innovation, recognising the important Ireland-Northern Ireland dimension given the geographical proximity of institutions and their research communities (PA Consulting, 2013).

Opening eligibility of programmes to cross-border actors is a way to "mainstream" the cross-border element into existing instruments. Such a mainstreamed approach has several advantages. First, it means that cross-border efforts are valued and not simply part of a special side project. Second, it can potentially increase considerably the funding for developing these cross-border relationships. Often the cross-border efforts are restricted to a limited budget for experimentation, but this is only a small fraction of the amounts devoted to innovation policy instruments more generally. Such a mainstreaming approach also reduces the proliferation of public programmes that can be confusing for firms to navigate, as well as reducing the unnecessary duplication of public investments.

There are a wide range of instruments to support innovation in cross-border areas. A broad approach to innovation implies that such instruments should go beyond the science and technology policy domain. Instruments to promote innovation in knowledge-intensive business services are often related to framework conditions and the presence of skilled workers. Several cluster efforts are also trying to better engage service firms in the context of more open and user-driven innovation approaches. Many common innovation policy instruments can include a cross-border element (Table 3.2). Each instrument has certain advantages, but also barriers (Table 3A1.1 provides a summary by instrument).

Facilitate strategy and policy development

Several support instruments are useful for strategy and policy development. Mappings of clusters, areas of technical expertise or institutions, as well as common foresight exercises are all valuable. Benchmarking and policy learning can provide both useful knowledge for the strategy development as well as information on the specific policies on each side of the border. Joint branding of the area, when accompanied by relevant data and identification of assets for global marketing, is yet another instrument that many regions seek to use in their cross-border activities.

Table 3.2. **Overview of cross-border innovation policy instruments**

Instruments
Strategy and policy development
Analytical exercises and mappings (mapping of clusters or value chains, technology foresight exercises)
Benchmarking and policy learning
Joint branding of the cross-border area
R&D support
Joint public research programmes
Joint research infrastructure, shared access to research facilities
Cross-border private R&D funding programmes (generic and thematic)
Technology transfer and innovation support
Cross-border innovation advisory services (vouchers, intermediaries)
Advisory services to spin-off and knowledge-intensive start-ups
Other technology transfer centres and extension programmes
Science and technology parks and innovation networks
Cross-border science and technology parks
Cluster or network initiatives
Educated and skilled workers
Scholarships/student exchanges
Joint university or other higher education programmes
Talent attraction and retention or mobility schemes
Cross-border labour market measures
Other instruments
Financing (venture capital funds or business angel networks)
Public procurement/border as a source of innovation/innovation awards

Analytical exercises and mappings help define the area and targets for action

Table 3.3. **Analytical exercises and mappings: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – provides common evidence for discussion, policy decisions and evaluation – facilitates knowledge sharing among authorities in different jurisdictions – helps define geometry of the (potentially) functional cross-border area – reveals socio-economic patterns in the cross-border areas (critical mass, density of activities, presence or absence of clusters, etc.) – identifies innovation actors that could be relevant for cross-border partners Barriers: – lack of indicators measuring cross-border flows in general – difficulty in collecting indicators on innovation dynamics in the cross-border area – lack of harmonised data and statistics on the different sides of the border	– Oresund Integration Index, Orestat database, Oresund Institute studies – Ireland-Northern Ireland ARIO database – BAK Basel studies for the TTR-ELAt mapping technology competencies – InterTradeIreland programme evaluations and business surveys to cross-border actors – *Helsinki-Tallinn: On the Move* study

Analytical exercises help to define the cross-border area and its functionality, including with respect to cross-border flows. A prerequisite for such studies is the collection of relevant cross-border indicators, which are notoriously difficult to produce (Chapter 1). The Helsinki-Tallinn area collected an extensive amount of data on commuting, transport and economic linkages to produce the publication *Helsinki-Tallinn: On the Move*. This publication also contains a foresight analysis on the common

development of Helsinki and Tallinn as twin cities, albeit not with respect to innovation flows and potential explicitly. A statistical portal for the Oresund area, Orestat,[1] contains a database with statistics on the cross-border area (notably commuting patterns and population-related variables). The website contains analytical reports and publications on the cross-border area. An index of integration on several parameters is also produced for the Oresund Region (Chapter 1, Figure 1.5). In Ireland and Northern Ireland (United Kingdom), the All-Island Research Observatory (AIRO)[2] collects data, produces analyses and provides evidence on an all-island scale. AIRO regularly conducts mapping exercises, develops data analyses and visualisation tools, and publishes research reports on cross-border flows.

Other forms of studies serve to identify areas of sectoral and technological expertise as a basis for joint action. Based on studies by BAK-Basel Economics, the TTR-ELAt mapped out its strengths in specific technological domains among the constituent provinces (Chapter 1, Figure 1.6). InterTradeIreland conducts business surveys and regularly produces analyses on the cross-border economy, containing relevant indicators on cross-border business activity such as trade statistics and innovation practices. Sectors with potential for collaboration in research are evidenced by actual collaboration through joint participation in the EU Framework Programme, information that is regularly updated and available on the agency's website. InterTradeIreland studies have shown the research centres with a strong potential for collaboration are in the fields of agri-food, ICT, bio-medical and environment sectors. A study mapping the potential for cross-border collaboration involving research and technology centres yielded valuable information for policy efforts about the sectors and other areas of potential collaboration, as well as the barriers preventing that collaboration (Box 3.1).

Box 3.1. **Cross-border relationships with research and technology centres: Ireland-Northern Ireland (United Kingdom)**

A study conducted in 2008 by InterTradeIreland mapped the extent of cross-border relationships among research and technological development centres on the island of Ireland. A total of 96 centres responded to the study, 41 from Northern Ireland and 55 from Ireland. Only a share of those centres is engaged in commercial activity: two-thirds report engagement with the private sector, half of them are holding patents and one quarter have created spin-out companies from their work. Centres collaborate mainly with local companies (43%), and cross-border collaborations represent only 6.5% of all collaborations with industries. Collaborations with public bodies (mostly academia) have a cross-border nature in only 8% of the cases.

The study examined potential for cross-border collaboration with centres by looking at staff and budget levels, track records for collaboration and research activity outputs, and found that 36 centres have the highest potential for cross-border collaboration and 23 others have some potential to be exploited. These centres were equally distributed between the North and the South of the island. The areas where synergies were reported more likely to occur are: agri-food, ICT, bio-medicine and environment technologies.

The main factors explaining the low levels of cross-border co-operation relate to a lack of knowledge on opportunities and potential on the other side of the border and a lack of incentives available to support cross-border relationships. An interesting result is that, when incentives have been used, the relationships tended to stop after the project funding period.

Source: InterTradeIreland (2008), *Mapping Study of Research & Technological Development Centres on the Island of Ireland*, InterTradeIreland.

Other mapping exercises or databases serve to identify possible partners in the cross-border innovation system. ADIRA (the economic development agency of the Upper Rhine area in France) developed a detailed mapping exercise of the innovation actors located in the cross-border area. The mapping effort not only resulted in a list of relevant science, research and innovation actors (universities, research centres, firms, etc.) but also in classes of comparable innovation institutions across the three countries, notably in the public research domain. The "centrope_tt" initiative has developed a database including more than 2 500 R&D providers to make the area's research capacity more transparent and to help firms and other actors find adequate partners for collaboration. In addition, information about funding systems for R&D co-operation has been provided.[3] The TTR-ELAt is in the first steps of drafting what they call an "encyclopaedia" of relevant actors to have a database of potential innovation partners throughout the cross-border area.

Benchmarking and policy learning are goals and by-products of cross-border work

Table 3.4. **Benchmarking and policy learning: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – reveals the positioning of a cross-border area compared to other regions – provides a more global outlook to cross-border efforts – supports policy decision and selection of priority areas Barriers: – difficult to have benchmarking information for a suitable peer group – costly to design a rigorous evaluation (qualitative or quantitative)	– BAK Basel studies for the TTR-ELAt benchmarking performance with other regions; TTR-ELAt working group exchanges – Regular meetings between Alsace (France) and Baden-Württemberg (Germany) on smart specialisation issues

Benchmarking and policy learning activities are inherent to the process of cross-border collaboration. The aforementioned BAK Basel Economics reports (in 2008 and again in 2012) also benchmarked the TTR-ELAt's performance against other S&T-intensive European regions in the same technology fields. InterTradeIreland works closely with the agencies in each jurisdiction responsible for the delivery of enterprise and innovation services. Such regular contact allows for opportunities to share policy experiences while discussing the proposed programme portfolio for the cross-border efforts. The TTR-ELAt has a working group of practitioners that meets regularly regarding their different policy programmes. In the Oresund, the Capital Region (Denmark) and Skåne (Sweden) are discussing the designation of observers in the working groups in charge of respective regional development strategies. This would facilitate information sharing and mutual learning in the two regional administrations. Regional representatives of Alsace (France) and Baden-Württemberg (Germany) regularly hold meetings to be informed on the latest developments of respective regional development and "smart specialisation" strategies in order to design or implement integrated actions if relevant. They also share information on innovative practices on the other side of the border to facilitate knowledge sharing and policy learning, especially on topics such as green innovation and standards.

Joint branding of the cross-border area benefits all stakeholders

Table 3.5. **Joint branding: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – increasing national and international visibility for the cross-border area – increasing awareness of cross-border initiatives among local innovation actors – attracting foreign direct investment (FDI), skilled workers, innovation actors – reinforcing a cross-border identity for residents Barriers: – competition among jurisdictions within the cross-border area – political challenges in accepting certain brands (particularly when it involves designating the name of a lead city) – language differences – lack of interest from private sector and/or the civil society	– Medicon Valley and its joint ambassadors from the Oresund – Common tourism label for – Hedmark-Dalarna and Ireland-Northern Ireland – *Oresund Magazine; JOBØMAGT* – Talsinki website

Supporting a sense of common identity for the cross-border area provides a more fertile ground for matchmaking efforts among firms and other innovation system actors. Such common branding helps to raise awareness of ongoing activity and potential for collaboration among innovation actors and institutions. It can also be helpful to communicate "good stories" of cross-border integration to civil society, so as to engage citizens in cross-border initiatives and business opportunities. Some cross-border areas make regular use of articles in newspapers, which the Bothnian Arc pursues when possible, albeit coverage of innovation-related issues on the other side of the border tends to be underdeveloped.[4] The Oresund Institute, a non-profit Danish-Swedish association founded with the purpose of encouraging integration within the Oresund Region, produces two magazines. The *Oresund Magazine* in English contains information on general socio-economic trends, articles on cross-border infrastructure connections, cross-border businesses, and media and cultural events related to the cross-border life (TV series, concerts, exhibitions and so on). A second regular publication, *JOBØMAGT*, provides data and articles on social, political and economic affairs, alternating between Danish and Swedish language depending on the article.[5] Oresund House in Copenhagen serves as a host to several Oresund-related initiatives. Estonia House in Finland is one of a network of houses to support the Estonian Diaspora and culture. Talsinki is the website created by the two cities of Helsinki and Tallinn. Arte (the *Association relative à la télévision européenne*) is an example of a cross-border TV network, jointly headquartered in Germany (Baden-Baden, Baden-Württemberg) and France (Strasbourg, Alsace). The network focuses on cultural and art programmes for a German- and French-speaking audience on subjects from both sides of the border. The language of programming alternates between the two languages.

External branding efforts are one of the core rationales for cross-border collaboration. Tourism is one of the sectors where this common label is promoted, such as in Ireland-Northern Ireland and Hedmark-Dalarna. Medicon Valley has been one of the most successful cross-border branding efforts for the Oresund and its life science cluster. The cluster initiative also promotes a joint ambassadors programme for cross-border representation abroad.

However, joint branding issues can be held up by political considerations. For example, the Oresund is an identity within the region, but some suggest that the branding build on the name of the main city, Copenhagen, for external audiences. Branding names

raised have included "Copenhagen-Malmö", the "Copenhagen greater region", the "Scandinavian Bay area" or the "Copenhagen Circle City". The branding for the TTR-ELAt has been particularly challenging because it combines successively developed cross-border identities (beyond the Euregio Meuse-Rhine that has a somewhat different geographic scope). There is internal debate regarding the current name that has three cities (Eindhoven, Leuven and Aachen), but not that of Liège, which would make the ELAt triangle more of a square.

Support research and development (R&D)

One of the most common innovation instruments used by cross-border areas is collaborative research, among public actors or between public and private actors. Such instruments often target the common areas of scientific and industrial strength within the cross-border area to increase critical mass in the field or capitalise on complementary expertise. While the primary goal of these schemes is to promote cross-border high-quality research, often a secondary but non-negligible outcome is the establishment of wider networks and platforms for scientific research over the long term.

Joint public research programmes are used in many cross-border areas

Table 3.6. **Joint public research programmes: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – increase critical mass of researchers – joint laboratories and international teams of researchers and students – greater visibility of research outcomes and results – faster information sharing and knowledge transfer – greater competitiveness in research competitions (i.e. EU framework programmes) Barriers: – different national approaches to intellectual property rights (IPR) – competition among research institutions for financing – differences in the management rules and practices of institutions – insufficient excellence of cross-border partners – funding stops at the border, complicating joint research efforts – non-alignment of administrative rules for use of research funds	– Science Offensive (Upper Rhine Trinational Metropolitan Region) – Wood Materials Science and Engineering Sweden-Finland – US-Ireland R&D Partnership programme – Oresund Contracts

Cross-border public research may occur through a combined financing "common pot" or alignment of respective funding sources "virtual common pot" (Table 2.2). The eligible participants may be universities or other research and technology centres. For example, the Swedish and Finnish research and innovation agencies (Vinnova and Tekes respectively) signed a bilateral agreement to promote joint research between the two countries targeting specific disciplines (Box 3.2). The US-Ireland Research and Development Partnership is a research funding programme launched in 2006 involving funding agencies from three different jurisdictions: the United States, Ireland and Northern Ireland (UK). All proposals submitted must involve institutions and researchers from all three jurisdictions in prioritised sectors. This initiative, facilitated by InterTradeIreland, is also an interesting example of targeting a cross-border area while at the same time promoting global networks with partners in the United States of research excellence. InterTradeIreland has set up an EU Framework Programme (FP) preparation support that provides for research institutions located throughout the cross-border area

advice, information and funds for preparatory steps to join FP programmes. Applications for this funding source require at least three different countries, and applications with Ireland and Northern Ireland (UK) participants have a strong success rate. The Irish Marine Institute has launched calls for research proposals on an all-island basis. In the North of Portugal-Galicia (Spain) cross-border area, a network of universities on both sides is supported by a foundation to strengthen academic collaboration and research in priority areas, among other goals (Box 3.3).

Box 3.2. **Joint Finnish-Swedish research programme in wood materials science and engineering**

The Wood Material Science and Engineering (WMS) Research Programme (2003-07) was a joint Swedish-Finnish programme with the aim to improve the competitiveness and sustainability of European forestry and forest-based industry. The programme is a first attempt to align several national public funding sources from the two countries. In Finland, the projects were funded by the Ministry of Agriculture and Forestry, the Academy of Finland and Tekes. In Sweden, the financers were Vinnova and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning. The budget of the WMS Programme was EUR 19.7 million and it involved 317 researchers from 29 research units and more than 70 partner organisations in the 2 countries. The WMS Programme funding was organised as a "virtual common pot" in which one programme virtually combines different existing funding mechanisms. The benefit of this approach is in its flexibility at the programme level, but at the same time, the decisions and management of individual projects remain in the hands of each funding organisation. To a large extent, the WMS projects were curiosity-driven rather than mission-oriented.

The programme was successfully concluded and had valuable impact, particularly with regard to the following aspects:

- The programme scope definition was systematic and project selection ambitious. The programme managed to advance top-level research in fields that were considered relevant within academia, the five funding organisations and industry. In these areas, scientific output was extensive (articles, degrees), particularly in relation to the rather limited duration and funding volume.
- There has been a positive contribution in bringing Swedish and Finnish researchers closer together. Several excellent research projects would not have started without the WMS Programme. The transnational research collaboration continues in many projects after the programme, but rather at the individual level than at institutional or research group level. Existing networks have continued and have been strengthened and some new cross-border collaborations have emerged. Researchers and industry value getting to know new partners for potential future collaboration.
- The competence and readiness of the five research funding agencies to organise transnational research programmes has significantly improved through the joint learning process of the WMS Programme. This has had immediate positive implications.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Bothnian Arc (Finland-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/17, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k3xv0r6v26b-en; Halme, K., S. Kanninen, K. Viljamaa, E. Arnold, T. Åström and T. Jansson (2008), "Creating cross-border competence: Impact evaluation of the Wood Material Science and Engineering Research Programme", *Tekes Programme Report*, No. 2.

Box 3.3. **Centre for Euroregional Studies of Galicia-North of Portugal (CEER)**

The Center for Euroregional Studies for Galicia and the North of Portugal (CEER) was established as a Foundation in 2002 by its member universities, the Galicia Autonomous Community (Spain) and the Galicia-North of Portugal *Comunidade de Trabalho/Traballo*. Member universities include the University of Santiago, the University of Coruña, the University of Vigo (in Galicia), and the University of Porto, the University of Minho and the University of Trás-os-Montes Alto Douro (in the North of Portugal). CEER promotes synergies and complementarities across universities and academic disciplines and relations between the universities and regional and local institutions. Its main objectives, according to its foundational mission and the strategic document approved by the executive body presided by the Rector of the University of Minho, include:

- to promote, motivate and develop inter-university research
- to promote academic exchange of teachers and students among CEER universities
- to prepare and co-ordinate a common educational offer
- to help regional and local institutions through policy-relevant research
- to organise databases, references and documentation on the Galicia-North of Portugal "Euroregion"
- to organise seminars, debates, congresses and scientific meetings
- to organise and co-operate in the production of scientific and informational publications.

Source: www.fceer.org.

Other case study examples of collaboration across universities were funded by EU programmes targeted either at research excellence or cross-border efforts. The universities of the Bothnian Arc collaborate on a cross-border basis in several public funded research programmes. These programmes involve both the leading universities of the area (Luleå University of Technology and Oulu University) and a series of other higher education institutions (HEIs) located outside the two main urban centres. Most projects concern scientific and research co-operation in specific domains (bio-energy, raw material processing, particle analysis on oil, etc.). The Science Offensive programme of the Upper Rhine Trinational Metropolitan Region has received an overwhelming response to its call for proposals among leading cross-border scientific actors, albeit given competition among these actors, collaboration is not always straightforward. Considerable efforts were made to ensure the quality of the selection process (Box 3.4).

Barriers in cross-border public research programmes may arise due to many causes. They include: non-alignment of project calls or programme rules; systems in evaluating the proposals; intellectual property (IP) regulation and rights; technology transfer management; institutional management and the organisation of academic studies. A common position from the funders and agencies on both sides of the border with respect to IP policy and process is an essential prerequisite to increased collaboration through joint research. The Oresund Contracts were part of a joint Danish-Swedish public R&D programme that experienced several obstacles to achieving its desired impact (Box 3.5).

Box 3.4. **The Science Offensive of the Upper Rhine Trinational Metropolitan Region**

The Science Offensive was launched by the *Länder* of Baden-Württemberg and Rhineland-Palatinate (both in Germany) as well as the Regional Council of Alsace (France) in the framework of an initiative of the Pillar of Sciences of the Upper Rhine Trinational Metropolitan Region. It provides financial and technical support to outstanding cross-border projects in the Upper Rhine region during the development and implementation of European Territorial Co-operation (Interreg) proposals in the field of research and innovation. The Upper Rhine region's Science Offensive is a unique joint-programming initiative in Europe.

By bringing together key scientific players on both sides of the Rhine, the Science Offensive not only actively promotes innovation and research but also cross-border technology transfer. This directly contributes to achieving the goals of the European Union and the Upper Rhine region to become a "Region of Excellence".

The first call for projects in October 2011 attracted considerable interest from the key scientific players in the Upper Rhine region. A total of 36 project proposals were submitted that were presented to a transnational committee of experts. At the end of the selection process, seven projects were admitted for funding through the programme Interreg IV Upper Rhine in the framework of the Science Offensive.

Source: Coordination de la Région Métropolitaine Trinational du Rhin Supérieur (2012), "Offensive Sciences", Kehl, Germany, 5 July, www.rmtmo.eu/fr/science/actualites/news-reader/items/offensive-sciences.html.

Box 3.5. **Evaluation of the Oresund Contracts, a joint Swedish-Danish R&D programme**

The Oresund Contracts were launched as a joint Danish-Swedish initiative in 2000 for the 2001-04 period, with the aim to support the development of the Oresund Region. It funded six pre-competitive pilot R&D co-operation projects between companies, universities and research institutes from both sides of the cross-border region. It relied on the Danish instrument Centerkontrakt, now called Innovation Consortia, and extended it over the national border. The Danish Centerkontrakt was launched in 1995 to better link the institutes both with user needs and with universities. The administration of the programme was shared between the two national agencies, which were each managing three of the six projects.

The evaluation concluded that initiatives of this kind have a potential to contribute to the joint development of the region, though both programme logic and implementation need to be better adapted to the context. The Oresund Contracts, or at least those which have functioned well, reduced uncertainty and, for some, entry barriers for co-operation. But for a more visible effect, several elements need to be addressed:

- There was a lack of strategic management of the programme. More specifically, a common relevant problem definition, a common vision at the level of operationally responsible agencies, a common programming document and some long-term financial commitment to reach the long-term objectives involved, were all largely missing.

Box 3.5. **Evaluation of the Oresund Contracts, a joint Swedish-Danish R&D programme** (*cont.*)

- The absence of a strong research institute sector in Sweden, comparable to the GTS in Denmark, was a barrier to develop the projects which placed the institutes at the core of the intended partnerships.
- The requirement for balanced geographic composition of the consortia often came at the expense of their quality and the search for real complementarities and synergies. The requirement for a "*juste retour*" principle on individual projects was difficult to satisfy, since the regions involved were, respectively, a central region in Denmark and a more peripheral region with fewer knowledge institutes in Sweden.
- The procedures of the Oresund Contracts did not allow significantly new networks to be built. More account should have been taken of the need for a first feasibility (getting-to-know each other) phase for these relatively complex cross-border projects.
- The partnerships behind the projects worked largely at a personal level rather than through structured agreements between organisations, which raises the question of their sustainability. Extending and widening existing networks seems to be one way of sustaining the effects of the projects.
- Effects in terms of penetration of the Swedish market by the Danish GTS institutes seem limited, due notably to non-matching specialisations. There is some evidence that institutes from the two sides have begun to operate more closely together but without a financial incentive to continue doing so it is unlikely this will be sustainable.
- At the time of the evaluation, the exploitation of research results by the partner companies was still inconclusive and dissemination to other companies potentially interested by the technological applications was restricted to conferences, workshops and publications. Attempts to develop supplier groups or involve users did not seem to have borne fruit.
- This outcome raises the issue of whether the research focus of the programme was optimal with respect to regional needs. A number of stakeholders and participants were of the opinion that the projects were driven more by national participants (e.g. projects clearly pulled together by institutes on both sides), instead of focusing on technologies or sectors which could have a broader impact on the region. The risk is that the effects are limited to a small group of niche technology firms involved in each project. In short, the projects seem too narrow and engage a too small number of people to make a real difference in terms of contributing to the integration of the Oresund regional innovation system.

Following this experiment, national authorities have not yet succeeded in establishing the Oresund Contracts as a part of the regional support portfolio of instruments.

Source: Faugert, S., E. Arnold, A. Reid, A. Erikson, T. Jansson, and R. Zaman (2004), "Evaluation of the Oresund contracts for cross-border R&D cooperation between Denmark and Sweden", VINNOVA Rapport 12.

Joint research infrastructure or shared access provides economies of scale

Table 3.7. **Joint research infrastructure or shared access: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – share investment costs – ability to develop more specialised or cutting-edge infrastructure – faster knowledge transfer and innovation spillovers promoted by researchers with different backgrounds and expertise Barriers: – competition for location of investment – legal impediments to shared use of the facility, international staff – issues related to intellectual property rights (IPR)	– Holst Centre and forthcoming Biomaterials research centre in the TTR-ELAt – MAX IV and ESS in the Oresund

For economies of scale, cross-border regions may have an interest in jointly funding and operating research facilities. The construction of high-end research facilities is very expensive and not always affordable by only one regional (and in some cases even national) funding government. This is a classic case whereby indivisibilities justify joint investment. In addition, co-sponsored facilities are accessible to a broader number of actors, so that the investments made by one region can be maximised and risks associated with the construction and the usage of the facility shared among multiple actors. Joint research facilities have the benefit of bringing together researchers and scientists with different experiences and backgrounds from different institutions. In addition, in some cases, skilled personnel from both the public research and the business community meet, thus facilitating the creation of cross-border inter-personal networks for innovation.

The Holst Centre in the TTR-ELAt illustrates a creative financing solution that builds on complementary expertise and know-how from two countries (Box 3.6). Both the Netherlands and Flanders (Belgium) have strong research traditions in nanotechnology and advanced materials. In the Netherlands, the High-Tech Campus in Eindhoven provides a fertile location for joint research with firms. IMEC, a research centre in Flanders, has a longstanding relationship with many multinationals and the experience in developing contracts and procedures for promoting such joint research activities with multiple firms that also compete with each other. Given challenges with contract and funding flows, any given project is actually managed by one or the other of the constituent research entities (IMEC in Flanders or TNO in the Netherlands) in a "virtual common pot" funding arrangement. Researchers can commute to the facility for specific projects. Firm partners from around the world send their researchers for short-term stays to the centre, who then can benefit from the innovation ecosystem around the High-Tech Campus as well.

The Oresund cross-border area is mobilised on both sides around the construction of two new large-scale scientific facilities (Box 3.7). The scale of investment for the European Spallation Source (ESS) (a big research facility that will be located in Lund, Sweden), almost EUR 2 billion in construction costs, implies a multi-country financing partnership. Many of those contributions are in kind, in other words countries have pledged a certain contribution but that will be "paid" through a competitive contracting process where entities in the respective countries receive contracts directly from their national governments. Denmark has agreed to finance the centre to manage the data generated by the new facility. There are also efforts to help firms on both sides of the border build capacity to help in the construction of the facility itself as well as its

development and maintenance in the decades to come. Outreach efforts by the ESS are helping firms to identify possible applications of research using the facility in a wide range of fields.

Box 3.6. **The Holst Centre (Eindhoven): A creative solution for cross-border research centres**

A noteworthy initiative in the framework of the TTR-ELAt is the cross-border Holst Centre, which was set up in 2005 by IMEC (Flanders, Belgium) and TNO (the Netherlands) with the support of the Dutch Ministry of Economic Affairs and the government of Flanders. It is named after Gilles Holst, the first Director of Philips Research.

The Holst Centre is an independent, open innovation R&D centre that develops generic technologies for wireless autonomous sensor technologies and flexible electronics. A key feature of the Holst Centre is its partnership model with industry and academia, based around shared roadmaps and programmes.

This jointly funded "cross-border" institute is situated on the High Tech Campus Eindhoven and has grown to over 180 employees with 28 nationalities, and a commitment from almost 40 industrial partners. To co-ordinate the activities at the Holst Centre, IMEC set up a separate legal entity, the Stichting Imec Nederland (imec-nl). Strong links with parent organisations have been key to the rapid growth of the Holst Centre and still help to successfully attract talent and establish research partnerships. While most of the programmes co-ordinated by the Holst Centre are executed at the High Tech Campus in Eindhoven, a number of projects rely on close collaboration with IMEC groups in Leuven, India or Chinese Taipei and with TNO groups in various locations in the Netherlands.

The Dutch Ministry of Economic Affairs supported the Holst Centre during its start-up period from 2005 to 2012. The total amount of public funding required to enable further growth of the Holst Centre in the coming four years was estimated at EUR 72 million. This budget was made available in 2012, combining efforts by several governments and organisations.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013f), "The case of the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/22, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lg3hf5-en; TTR-ELAt (2013), "Background report to OECD study: Cross-border regional innovation policies", March.

Box 3.7. **ESS + MAX IV in Lund, Sweden: Maximising economic impact for the Oresund**

MAX-lab is a national laboratory operated jointly by the Swedish Research Council and Lund University. The fourth generation of this infrastructure is under construction in Lund. MAX-lab supports distinct research areas: accelerator physics research based on the use of synchrotron radiation and nuclear physics using energetic electrons. Time at the facility will be shared between groups working within these fields. The laboratory is an international forum: nearly half of the scientists working at the laboratory will be from foreign countries. The MAX IV project was agreed in 2009 and the construction started at the site in 2010. Its budget amounts to EUR 330 million, and it will host around 2 000 researchers when in full operation.

The **European Spallation Source (ESS)** is a Partnership of 17 European countries committed to the goal of collectively building and operating the world's leading facility for research using neutrons. The ESS will produce neutrons that will be used in parallel experiments to foster major advances from ageing and health, materials technology for sustainable and renewable energy, to experiments in quantum physics, biomaterials and nano-science. The ESS will be located in Lund, the data management facility will be located in the Copenhagen area, and it will be funded and operated by the 17 partner European countries. More than 300 researchers from 11 countries have taken part in the 15-year planning process. The ESS is expected to become operational in 2019. Its construction budget is EUR 1.5 billion and it is designed to host 4 000 researchers.

The two research facilities will provide complementary research opportunities at the intersection of several scientific domains (material science, physics, medicine, chemistry, biology and engineering) having a wide range of applications, thus constituting a unique asset for research and innovation development of the Oresund Region.

Box 3.7. **ESS + MAX IV in Lund, Sweden: Maximising economic impact for the Oresund** (*cont.*)

Several projects aim at connecting these facilities to regional development goals:

The 2010-2012 **TITA** project (carried out by the Swedish side) aimed to enhance the regional impacts of ESS/MAX IV through various activities. They included: relocation support; marketing; meeting point; foresight; ESS and MAX IV as an innovation catalyst for trade and industry; ESS and MAX IV, a growth factor for local and regional businesses; urban planning and transport infrastructure; land availability register; and the pilot study for competence supply needs. It was decided at the end of the project to appoint an Industrial Liaison Officer to support business opportunities with the ESS and MAX IV. A similar project focusing on gains on both sides of the sound is under preparation for the next European Territorial Co-operation (ETC) programming period, and the Danish Växtmotor project is aiming at a similar goal.

Växtmotor (ESS and MAX IV as growth engines for the Capital Region of Denmark) is a project co-funded by the EU Regional Development Fund and the Capital Region of Denmark. It is designed to help the capital region of Denmark to exploit the growth potential related to the establishment of the ESS and MAX IV in Lund and the XFEL in Hamburg. The project will use the facilities as growth engines to strengthen the research and innovation capacity at universities and companies and to increase the region's ability to attract international labour and R&D departments. Specifically, the project aims to: 1) establish a joint research and contact data base to facilitate foreign researcher employment in the capital region and highlight the barriers for living in and working on opposite sides of the Oresund; 2) develop information packages about the Capital Region as a research destination for researchers and companies; 3) analyse which physical facilities should be offered to foreign companies that might locate in relation to the ESS and MAX IV; 4) build networks between companies, research institutions and the research facilities; 5) develop teaching packages to high schools and study programmes at universities; and 6) help Danish companies win commercial contracts for the construction and operation of the facilities.

The 2011-13 ETC (Interreg IV) project **Cluster for Accelerator Technology** (CATE**)** aims to enhance the benefits of the construction of those infrastructures and facilitate knowledge transfer and spillovers in the region. Its footprint extends to other parts of Sweden, the whole of Denmark and Norway. The project is led by universities and aims to develop the competences in the field of accelerator technology in order to give companies the necessary capacities to win contracts for the construction and maintenance of research facilities that demand advanced accelerator technology equipment. A motivation for the project was to acquire contracts with CERN in the short term, and to the ESS in the future. In this project, Oresund universities invite existing companies in the region to participate in *ad hoc* seminars or courses and competence development programmes in the field of accelerator technology.

The **Oresund Materials Innovation Community** (OMIC) is another ETC (Interreg IV) project, aiming at developing the system of innovation in materials science to create the conditions for making the region a world-leading material science centre, based on the exploitation of opportunities offered by the ESS and MAX IV. The project is mainly targeted at academia, with a major focus on education planning. The project includes: community building; regional branding; mapping of competences; the provision of network seminars for the affiliated companies in the science parks; etc.

Science Link aims to foster the use of these new facilities, as well as large research infrastructure in Germany, by industries in the wider Baltic Sea region (and is part-funded by the Baltic Sea programme). The project designs a model to upgrade the participation of industry in scientific infrastructure, which is jointly funded by the participating regions. The model is tested on companies and results in proposals for a financing scheme of the infrastructure.

The Big Science Secretariat in Denmark has been established to support Danish companies and research institutions to reap the benefits of the Danish public contribution to big science infrastructure such as the ESS and MAX IV.

Source: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Oresund (Denmark-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/21, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lk8knn-en.

Private R&D funding can be challenging to finance through cross-border public support

Table 3.8. **Cross-border private R&D funding: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – complementarities and critical mass in research and innovation projects – a wider range of actors to work with, particularly for SMEs who cannot as easily search globally – may help build longer term cross-border innovation networks Barriers: – hesitancy of public authorities to finance private entities in a foreign country – cumbersome rules and regulations for the private sector to manage – difficult to design and implement rigorous evaluation criteria	– Innova: partnerships for innovation in Ireland-Northern Ireland (UK) – GCS: Cross-border Cluster Stimulation project, for joint R&D by SMEs (TTR-ELAt)

Collaborative innovation programmes targeting firms are less common than public research programmes, given the hesitancy of public authorities to help firms across the border. These programmes may be generic (not targeting specific disciplines or actors) or thematic (if some sectors are prioritised or they focus on certain categories of firms, for example SMEs). Other funding options include joint platforms among private organisations from respective jurisdictions. InterTradeIreland's Innova programme supports innovation partnerships between Ireland and Northern Ireland aiming to develop new products, processes or services as well as to build on already existing innovations in the same sector or complementary disciplines. To be eligible, the partnerships must demonstrate commercial potential. In 2013, projects in the following sectors were prioritised: life and health sciences, agri-food, advanced engineering, telecoms, environment and ICT. Within the TTR-ELAt region, the GCS Cross-border Cluster Stimulation project stands out for a number of its distinctive programme features (Box 3.8). This project, along with the Top Technology Cluster project, constitute a strategic approach to supporting firms using a truly cross-border "common pot" funding structure.

Box 3.8. **GCS Cross-Border Cluster Stimulation Fund in the TTR-ELAt**

The Cross-Border Cluster Stimulation Fund (GCS) is a scheme providing grants for cross-border R&D projects in SMEs in the TTR-ELAt region. It is a joint fund led by the Dutch Province of Limburg (managed by LIOF, the regional development agency) that aims at stimulating cross-border co-operation in the larger Euregio Meuse-Rhine (EMR) area. The GCS provides funds as an extension of another programme for Top Technology Clusters, which operates at an earlier stage of firm collaboration. The GCS funds cross-border SME-based R&D projects with the following parameters: *i)* two SMEs on two sides of national borders (including SMEs and at least one in the EMR area) must be partners in the project, but large companies and universities may join as well; *ii)* funding per business case is between EUR 100 000 and EUR 250 000 for up to 18 months. In the first wave (end 2012), eight projects were supported, for a total budget of EUR 5.6 million. A second selection round in mid-2013 resulted in 14 additional R&D projects. In total, the GCS will foster 22 SME-based cross-border innovation projects with a funding amount (directly for the individual co-operation consortia) of EUR 4.7 million.

Box 3.8. **GCS Cross-Border Cluster Stimulation Fund in the TTR-ELAt** (*cont.*)

Several characteristics of this programme are noteworthy:

- This is the first time that the EMR funds firms directly after decades of supporting projects. Applications are ranked using the following categories: technological and scientific strengths (10%); innovation level (20%); potential market success (40%); European co-operation (maximum 15%); and personal contribution funding (maximum 15%).
- While the European Territorial Co-operation (Interreg) Steering Committee makes the final decision, it is based on the recommendations of external experts (four from each of the four regions) who rank the proposals using the above criteria.
- The Dutch Ministry of Economy has made an exceptional financial commitment so as to test such a model and show others its success. The total public funding (which is then matched by private funding) is around EUR 5.5 million, of which EUR 2.29 million comes from Interreg, EUR 2 million from the ministry and the rest are contributions ranging from EUR 9 000 to EUR 200 000 by the various sub-regions of the area.

Source: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013f), "The case of the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/22, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lg3hf5-en.

Offer technology transfer and innovation support

Cross-border innovation advisory services (vouchers, intermediaries) appear to work well in several regions

Table 3.9. **Cross-border innovation advisory services: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – wider pool of possible providers – critical mass to provide more specialised services – raises awareness of other innovation actors across the border – chance for SMEs to collaborate with foreign public and private entities Barriers: – differing financial support rules based or distribution requirements based on the nationality of beneficiaries – advertising the programme and its delivery mechanisms – cumbersome rules and regulations, particularly for SMEs – stimulating private sector demand	– Innovation vouchers in the TTR-ELAt and Ireland-Northern Ireland (UK) – Nordic Business Links in the Bothnian Arc – FUSION in Ireland-Northern Ireland (UK)

Cross-border innovation advisory services build greater functional linkages across the border as well as enable firms to benefit from more specialised innovation support. Innovation advisory services assist companies (generally SMEs) by providing advice and counselling for knowledge transfer and absorption. Placing skilled graduates in SMEs is another form of innovation advisory. These kinds of services may be implemented on a cross-border basis to facilitate knowledge transfer across national borders in sectors where particular expertise can be found in other jurisdictions. Connecting the more

innovation-mature SMEs with multinational enterprises and research and technology development centres across the border can help develop innovation-oriented public-private initiatives. Equally, co-operation between research, technology and development (RTD) centres can help address issues of critical mass and capitalise on complementarities in skills and infrastructure. Several advisory and knowledge transfer programmes operating between Ireland and Northern Ireland are in place, such as InterTradeIreleand's FUSION programme (Box 3.9).

Box 3.9. **FUSION: Linking firms and skilled graduates in Ireland and Northern Ireland (United Kingdom)**

Through FUSION, support packages are available for a business in one jurisdiction to partner with a third-level institution on the other side of the border with the specialist expertise needed and a high-calibre science, engineering or technology graduate. The graduate is employed and based in the firm for a 12- or 18-month period with mentoring from the academic partner and a consultant from InterTradeIreland. The funding packages are worth up to GBP 44 250/EUR 52 800 in the area of new product/service development or a 12-month project worth GBP 31 000/EUR 37 000 in the area of process improvement.

The rationale behind the programme was that the border meant that knowledge or technology transfer programmes ran only within the two jurisdictions respectively and that businesses and academics were unable to work with a cohort across the border, creating a barrier to knowledge spillovers. The programme was developed as one of InterTradeIreland's first initiatives in 2000 and is currently in its fourth phase. The key actors involved in the FUSION programme are firms, HEIs and graduates. The programme is jointly run and funded by InterTradeIreland, Invest Northern Ireland and Enterprise Ireland for a total amount of approximately EUR 3 million per annum. On average, each company taking part in the FUSION programme benefits from over GBP 1 million worth of sales or efficiency savings in the three years following the project.

Source: InterTradeIreland (2013), "Background report to OECD study: Cross-border regional innovation policies, Ireland and Northern Ireland", January.

One of the instruments often applied in a cross-border situation is the innovation voucher. These publicly financed vouchers can be used to buy innovation services from knowledge providers (public research institutions or other firms depending on the definition of the scheme). They are often targeted to SMEs so that they build a first relationship with a knowledge institution (like a local university or technology centre) so that in the future, the SME will seek such collaboration opportunities on its own to innovate (OECD, 2011). The TTR-ELAt uses these vouchers in the context of efforts to support their Top Technology Clusters. The hope is that some of these arrangements will result in a "graduation" to the GCS Cross-Border Cluster Stimulation Programme. The Ireland-Northern Ireland (UK) example illustrates a mainstreaming approach whereby the business development agencies on both sides of the border have aligned their programmes to create a "virtual common pot" (Box 3.10).

Box 3.10. **Innovation vouchers: An instrument easy to apply on a cross-border basis**

The **TTR-ELAt** cross-border innovation vouchers have been developed especially to promote co-operation among SMEs within the region. The reason for establishing this instrument was the acknowledgment that to address even relatively minor problems for SMEs (such as IPR protection, legal support), it is important to provide companies with some kind of incentive. The innovation vouchers (part of the Top Technology Cluster-TTC project) has been particularly important in the early stage of the development of cross-border SME consortia. The voucher grants free research/advice from a knowledge provider within the area up to an amount of EUR 5 000 per business case (non-repayable grant). Activities that are eligible for funding include industrial research and experimental development (e.g. feasibility studies, patent research, use of laboratories and state-of-the-art equipment, or prototyping and testing). A necessary condition for granting a voucher is the presence of at least two SMEs located in two different cross-border jurisdictions in the list of beneficiaries. The two or more SMEs can use the voucher not only to share R&D collaboration but also to co-operate with third institutions like large companies, universities and research centres. The domains for which the vouchers have typically been granted are: energy, life sciences and high-tech systems. Decisions on voucher applications are taken by an *ad hoc* group of TTC partners. In total, 35 vouchers have been made available, 13 of which were issued during the second half of 2012. Thus far, the grants have been used in similar shares by consortia led by German, Dutch and Belgian SMEs.

Ireland and Northern Ireland jointly manage a cross-border innovation vouchers scheme, through the business development agencies Enterprise Ireland and Invest Northern Ireland. The two administrations provide joint funding for a unique scheme, accessible in both areas (EUR 4.1 million annual budget). Each voucher is worth EUR 5 000 and can be used by the enterprises to employ a knowledge provider (such as a higher education institution) to overcome a technical problem. The firms and knowledge providers can be located either in Ireland or Northern Ireland. This joint cross-border publicly funded programme is therefore a "virtual" common pot.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Ireland-Northern Ireland (United Kingdom) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/20, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0llxhmr-en; Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/22, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lg3hf5-en.

Advisory services to spin-off and knowledge intensive start-up firms reinforces a dynamic ecosystem

Table 3.10. **Advisory services to spin-off and start-up firms: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – broader network of advisers, partners and investors for entrepreneurs – build on peer experiences from other countries – greater specialisation of advisory services (e.g. by sector) Barriers: – lack of alignment of activities of similar organisations across the border – difficulties in identifying coaches or entrepreneurs	– Start-Smart, Cross-Border Small Business Environment, Start-up Sauna in Helsinki-Tallinn – TwinEnterpreneurs in Centrope

Instruments specifically targeting start-ups and spin-offs appear less widely used on a cross-border basis, one exception being in the Helsinki-Tallinn cross-border area (Box 3.11). Both cities are characterised by a dynamic ecosystem of young and

Box 3.11. **Promoting start-ups: Examples from the Helsinki-Tallinn cross-border area**

Start-Smart is a co-operative cross-border project financed by the Interreg IV A Programme 2007-13, Southern Finland-Estonia. The partners are: the Estonian Development Fund (lead partner), the Small Business Center of Aalto University in Finland, BDA Consulting OÜ, Enterprise Estonia, and AS Technopolis Ülemiste in Estonia. The aim is to support entrepreneurial attitudes in both countries and accelerate the emergence of innovative enterprises. Activities include: workshops and seminars in Estonia and Finland with international speakers; start-up demo pitching nights; a mapping of the Estonian and Finnish start-up ecosystem; a start-up database; one-to-one mentoring; one-to-one consultancy (for business plan development, business modelling or marketing) and awareness raising via social media channels.

The **Cross-Border Small Business Environment** project established a network between southern Finnish and Estonian business incubators, with the goal to develop business activities and competitiveness of the Finnish and Estonian companies participating in the project in three main activities:

- network development of Finnish (southern Finland) and Estonian business incubators
- the development of a training programme for the managers of business incubators and technology parks, which include a best practice exchange and implementation
- the provision of support and information services for Finnish and Estonian companies in developing their business activities and competitiveness.

The project has provided market surveys, consulting, training services and thematic seminars for southern Finnish and Estonian SMEs. Participants in the project gained new business partners and customers, as well as knowledge about the Finnish-Estonian business environment and cross-border business opportunities.

Startup Sauna, founded in 2010, is a non-profit organisation for start-ups and aspiring entrepreneurs in northern and Eastern Europe and the Russian Federation. Its aim is to implement a blooming start-up ecosystem and a pay-it-forward culture into the region in order to make it the best place to be a start-up. Startup Sauna is physically located on Aalto University's campus in Espoo, Finland (Helsinki metropolitan area). Run by its own foundation, Startup Sauna is funded by Aalto University, Teknologiateollisuus, Sitra and Tekes, among others. In practice, Startup Sauna consists of three different operations:

1. An internship programme for aspiring entrepreneurs to work at high-growth companies in Helsinki and Silicon Valley. More than 60 interns have been matched to date through the programme.
2. An accelerator programme for early-stage start-ups from northern Europe and the Russian Federation, where the companies are coached by experienced serial entrepreneurs and investors in an intense one-month programme in Helsinki. Ninety companies have graduated from the programme since 2010, with more than USD 25 million of funding raised.
3. The Slush conference, which brings together the early-stage start-up ecosystem in the region to meet top-tier venture capitalists and media from around the world.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013c), "The case of Helsinki-Tallinn (Finland-Estonia) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/19, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lrt1r6-en.

promising start-ups, especially in the ICT sector. The successful e-service field and favourable tax regime on the Estonian side and the start-up friendly environment in the Helsinki area (especially in the gaming and cell phone applications industries) make

start-up assets an area for common cross-border promotion. The FINEST Startup programme (also known as Start-Smart) is a joint programme to promote entrepreneurship in the Helsinki-Tallinn cross-border area, co-funded by the European Territorial Co-operation (Interreg) programme. The main objective of Start-Smart is to promote entrepreneurial activities and attitudes in Estonia and Finland and to support the birth of new internationally competitive innovative companies. In the framework of the programme, thematic and practical workshops, conferences and other types of events are organised with the aim to coach entrepreneurs to develop new ideas. Other examples of cross-border co-operation targeting start-ups are knowledge and practice exchanges between Helsinki and Tallinn with respect to business accelerators in the gaming industry (the Gamefounders and Startup Sauna programmes). In the Centrope cross-border area, the TwinEntrepreneurs initiative is a cross-border co-operative project launched by the Vienna Business Agency, the Young Entrepreneurs Association of Slovakia and National Agency for Development of Small and Medium Enterprises. The partners provide joint support (workshops, coaching, networking events) for start-ups and SMEs in the Vienna-Bratislava region. Encouragement and support for young firms to extend their activities across the border is another important goal.

Use science and technology parks and innovation networks

Cross-border science and technology parks and incubators benefit from an international scale

Table 3.11. **Cross-border science, technology parks and incubators: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – facilities can be more profitable with a larger pool of possible tenants – avoids duplication of investments across the border – facilitating knowledge sharing, spillovers and networking across jurisdictions Barriers: – competition for location and firm attraction – administrative rules for foreign firms locating in park on other side of the border	– Joint incubator work in Helsinki-Tallinn; Technopolis park established in Estonia and Finland – Chemelot business park and Avantis technology park in the TTR-ELAt

Different characteristics could make a particular science and technology or industrial park cross-border. It could be funded by cross-border public or private authorities. The park may be physically accessible by a broad range of firms and organisations located in different jurisdictions, or the staff of an S&T park or an incubator may be a representative of the cross-border area. Often these facilities have strong ties with academic and research institutions. Chemelot Business Park in the Limburg Province of the Netherlands is one example (Box 3.12). In another cross-border region, a technology park provider has developed its own commercial interests throughout the cross-border area. The Technopolis majority-owned Ülemiste City Technology Park, located next to the Tallinn Airport, provides office space and services to companies. As customers of Technopolis Ülemiste, companies are a part of the Technopolis network that spans from Tallinn and St. Petersburg to eight cities in Finland.

Box 3.12. **Chemelot Business Park: A cross-border asset for the Netherlands and Germany**

In the TTR-ELAt, the Chemelot Business Park is a cross-border industrial park developed in co-operation with Maastricht University and other institutes for higher education, including the German RWTH Aachen University. The park has a long history of activities, but has been recently renovated in 2012, thanks to sizable investments from the triple helix stakeholders in the Province of Limburg (Netherlands). There are more than 100 companies on the site. Many of these firms are global leaders in their product market and currently employ 6 000 people. The Chemelot Innovation and Learning Laboratories (CHILL) offer an "open laboratory" where students as well as start-up firms have opportunities to do research, as well as linking up with other companies at the campus. In collaboration, Maastricht University and RWTH Aachen have established a new institute in bio-based materials. Maastricht University and Eindhoven University of Technology, together with the firm DSM, are currently considering establishing the Chemelot Institute for Science and Technology, which will focus research on bio-based and biomedical materials. The goal of the campus is accelerated business growth through a unique chemistry and materials community. The target is to grow by 1 000 FTE in R&D and R&D support activities, in addition to the 1 100 in 2012, and increase the number of students by 500 (intermediate and higher vocational level and university level). To accomplish this, the triple helix partners have committed themselves to a joint investment of EUR 35 million in business development over ten years. In addition, there will be EUR 155 million invested in research infrastructure, and to support this growth, venture capital of EUR 50 million has been raised.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/22, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lg3hf5-en; TTR-ELAt (2013), "Background report to OECD study: Cross-border regional innovation policies, TTR-ELAt", March.

Clusters or networks initiatives are common to many cross-border efforts

Table 3.12. **Clusters or network initiatives: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – offers a framework for targeting many cross-border instruments – greater visibility of the cross-border area (due to greater critical mass) – greater knowledge of cross-border innovation actors – creation of firm networks throughout the cross-border area Barriers: – different levels of innovation development on different sides of the border – different national regulations in specific sectors (i.e. energy, health and medical technologies and devices, etc.) – eligibility constraints for funding recipients in different countries – imbalanced engagement of the private or public sector on different sides of the border	– Oresund cross-border clusters like Medicon Valley – Top Technology Clusters in the TTR-ELAt – Creative industry cluster MIDAS in Ireland-Northern Ireland – Tourism cluster in Hedmark-Dalarna

Clusters and other firm networks often span national borders, and supporting them is a way for the cross-border area to build greater critical mass for global excellence in select fields. Cross-border clusters generally organise the same kinds of activities that traditional clusters and networks of firms do, but they do so on a cross-border basis. The drivers for the creation of cross-border clusters are typically critical mass, external visibility and branding. Cluster associations tend to be successful when there is a clear

engagement of firms that recognise the benefits of the cross-border collaboration. Other important success factors are true complementarities among cross-border actors and a balance in terms of the level of innovation development on both sides, or it not strong supplier linkages. It has been observed that cross-border clusters in highly nationally regulated sectors (like health sciences or energy) may face additional barriers in cross-border co-operation.[6] Cross-border clusters may vary in terms of sectors, international visibility and size. In some cases, cross-border clusters are driven by big companies active in more than one jurisdiction, thus facilitating cross-border networks. Philips in the TTR-ELAt, pharmaceutical firms in the Oresund and the winter sport company SkiStar in Hedmark and Dalarna have all played that role. Among the six case study regions, the most advanced examples of cross-border clusters can be found in the TTR-ELAt and the Oresund (Box 3.13). MIDAS in Ireland-Northern Ireland stands out for working with the creative industry (Box 3.14).

Box 3.13. **Cross-border cluster initiatives: Examples from case studies**

In the **TTR-ELAt, the Top Technology Clusters (TTC)** project aims to stimulate innovation-oriented co-operation of companies by creating cross-border, SME-based co-operation consortia in four fields of cross-border area strength: ICT, energy, advanced materials, life sciences. The EUR 5 million programme is led by AGIT (the Aachen Regional Development Agency) and run by 19 partners (regional development, innovation agencies, cluster organisations, universities) across the sub-regions of the TTR-ELAt. It uses three instruments with cross-border characteristics:

- networking events (socialising, B2B, brokerage) across the TTR-ELAt area
- business development support managers and activities
- innovation vouchers for studying the feasibility of joint cross-border innovation projects: free research advice from a knowledge provider within the Greater Euregio Meuse-Rhine area up to an amount of EUR 5 000 to stimulate cross-border SME-based co-operation consortia.

In addition to the TTC, the TTR-ELAt hosts strong business networks throughout the cross-border area in high-tech systems, especially in the automotive sub-field (Flanders Drive, Automotive NL, car e.V.) and ICT (DSP Valley VZW, Stichting DSP Valley, REGINA e.V.). The broad life science area, with its sub-fields of medical imaging, bio-monitoring and bio-control, e-health, bio-electronics, drug development, cardiovascular diseases, nutrition and health, is also subject to many cross-border industry-science co-operations as well as joint research and education programmes (Executive Master in medical imagery Jülich-Maastricht, Biomaterials Research Centre, etc.). A relatively new domain to be further explored is the field of energy (e.g. the Energy Hills Network, and Solliance).

Box 3.13. **Cross-border cluster initiatives: Examples from case studies** (*cont.*)

In the **Oresund,** cross-border clusters have been promoted, but with varying degrees of longevity and success. The most well-known is the **Medicon Valley**, one of Europe's strongest life science clusters with a high number of life science companies and research institutions located within a limited geographical area. The cluster association is called the Medicon Valley Alliance (MVA) and was created with the aim to promote a coherent Swedish-Danish strategy for the life sciences across the Oresund. Members are equally distributed over Denmark and Sweden; however, the Danish members include most of the largest companies in the region, accounting for about 70% of the total income from membership fees. The organisation is committed to raising the international recognition of the Medicon Valley with the aim of attracting labour, investments and partners. However, some of the barriers to more effective cross-border elements include: the closing of AstraZeneca in Southern Sweden, difficulty engaging firms with universities, and the public healthcare sector on both sides, due to barriers in regulation and legislations. Other barriers include a lack of strong political commitment in the cross-border co-operation dimension and the absence of a clear, long-term strategy for the cluster with precise tangible goals, to be measured and evaluated. **Oresund IT**, focusing on the ICT sector, was active in international branding, match-making events and fundraising. At the end of a public financing cycle, the cluster was only continued on the Swedish side under the branding **Cluster 55°**. The **Oresund Food Cluster** gathers both large companies and SMEs and is one of the biggest European food clusters in terms of employment (more than 184 000 people across Sweden and Denmark, albeit on the Danish side most are not in the Oresund area but rather in other regions of Denmark). **Energi Oresund**, a cross-border strategic energy planning initiative between Danish and Swedish municipalities, energy companies and universities, focuses on sustainable economic growth and development, and aims to make the Oresund the first carbon neutral region in Europe. Opportunities to link cross-border the respective clean-tech clusters on each side is under consideration.

The cross-border region of **Hedmark-Dalarna (Norway, Sweden)** has a concentration of actors in the mountain tourism sector. SkiStar, a big Scandinavian company in the field of winter sports, has played a leading role in the development of the cross-border cluster. Business associations on both sides are exploring possibilities to advertise and sell cross-border tourism holidays and to brand the destination internationally. Given the differences in salaries (higher in Norway than in Sweden), there are flows of cross-border workers, albeit limited by distance and infrastructure barriers.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/22, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lg3hf5-en; Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Hedmark-Dalarna (Norway-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/18, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0r36gls-en; Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013e), "The case of Oresund (Denmark-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/21, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lk8knn-en.

Box 3.14. **The MIDAS project: Cross-border cluster of creative industries in Ireland-Northern Ireland (United Kingdom)**

The MIDAS project is a 2004-06 Interreg project with the aim to increase opportunities for technology transfer, innovation and new product development for SMEs in creative and digital media industries, in the eastern part of the eligible cross-border area of Ireland-Northern Ireland (UK). The budget for the project was EUR 2.3 million, funded mainly by Interreg (75%) and co-funded by the International Fund for Ireland and private sector organisations (25%). The lead partner of the project was the Dundalk Institute of Technology in Ireland; partners were Ulster University, the East Border local authority and private firms on both sides of the border. It was selected as a good practice in the *ex post* evaluation of the Interreg III A programme.

The project focused on five sectors: interactive leisure software (computer games), film and broadcast, design, animation, and music technology. The project funded the development of both "hard" physical infrastructure – a Bright Room High Definition Post Production Facility at the Dundalk Technology Institute – and "soft" support activities – the identification of existing market sectors and new opportunities and guidance to SMEs in the development of their company strategies. The project deployed enterprise development and co-operation promotion activities (R&D support, technology transfer, business support, sales and marketing activities, workshops, cross-border and international trade events) for companies on both sides of the border.

Project results included: development of 14 new products, the creation of 55 new and mainly high-skilled jobs, and an average 35% increase in export sales for participating SMEs. The project continues after the public funding period: Midas MultiMedia Limited Ltd. has been created by eight of the SMEs that participated in the project. It operates as a shared services organisation or umbrella body that brings all members together and helps enter into joint bids. By 2009, it had secured a number of contracts from large and small public and private organisations (e.g. BBC, Microsoft, Tourism Ireland, RTE, and Bandbridge District Council). The project promoted lasting co-operation practices both among firms and academic institutions on both sides of the border.

Source: Panteia and Partners (2008), *Ex-Post Evaluation – Interreg III 2000-2006 – PROGRAMME: INTERREG III A Ireland-Northern Ireland*, report to the European Commission.

Educate and cultivate skilled workers

Broad-based efforts to promote cross-border student exchanges at undergraduate level have had mixed results. Examples show that they have been hindered by education credential differences, student financing opportunities, student preferences, academic requirements and visa issues. For example, student mobility between Ireland and Northern Ireland, despite the proximity and absence of language barriers, remains very low. There is a different organisation of studies in the two jurisdictions, including a different number of years of study. Technological institutes are poorly valorised in the UK context and thus students are not encouraged to attend, even if there is one just a few kilometres across the border. Differences in funding schemes for studies also drive student choices that work against cross-border enrolment. Student preferences for more distant locations, as opposed to the neighbour, likely explain the low level of student mobility between HEIs in the Bothnian Arc area. A comprehensive proposal for a Bothnian Academy did not receive funding and enthusiasm waned for a grand cross-border initiative. The Oresund Academy was initially funded for several years. It ceased as a formal programme when one partner pulled out, resulting in a domino effect of

funding withdrawals. Student financing issues, semester calendars and grading differences were among the many challenges.

Graduate students and academic researchers often choose the visiting institution on the basis of excellence in research rather than geographical proximity. It has been highlighted in several cases that students and researchers prefer to connect with researchers farther away in order to benefit from a higher degree of diversity in research networks and for better opportunities throughout their academic career.

Joint university or other higher education programmes often hindered by national frameworks for education

Table 3.13. **Joint university or other higher education programmes: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – capitalise on proximity, complementarity of competences and education programmes across higher education institutions – critical mass of students, can jointly develop more specialised programmes – creation of networks of students and professors (as well as professionals in the case of lifelong learning initiatives) over multiple countries – cross-border education can facilitate cross-border labour markets Barriers: – competition among universities for attracting students – national funding schemes give negative incentives for working cross-border – language barriers – national regulation of secondary and tertiary education systems creating obstacles to the mobility of students (i.e. eligibility for grants, length of university programmes, different grading systems, visas, etc.) – student decisions based on global excellence rather than geographical proximity	– Transnational University Limburg in the TTR-ELAt – Nordic Mining School in the Bothnian Arc – Joint entrepreneurship courses at Ireland-Northern Ireland (HEIs) and in the TTR-ELAt (lifelong learning courses) and in the Bothnian Arc (Innopreneurship, targeting HEI teachers)

Joint university and higher education programmes have shown successes and disappointments in cross-border areas. The same challenges listed above for student mobility are also true for joint university programmes. In addition, systems that allocate national funding resources to universities in a given country generate incentives for competition rather than co-operation, particularly for attracting students, albeit the cross-border area can also be a new market for some. Nevertheless, joint higher education programmes can promote cross-border networks of skilled workers as well as a more integrated labour market. They can also be helpful in reaching the critical mass to open specific education programmes of interest for the cross-border innovation actors, such as programmes related to a specific workforce demand by firms.

Several lasting examples of joint university programmes exist. On example is in the Upper Rhine Trinational Metropolitan Region (across France, Germany and Switzerland). In this area, more than 30 bi- and trinational higher education programmes give students the opportunity to get a diploma from universities belonging to at least two countries, with a single programme of study. The main universities of the area also created the EUCOR network to facilitate joint programmes and activities (Box 3.15). The joint Nordic Mining School in the Bothnian Arc and the Transnational University in the TTR-ELAt are good examples of a cross-border partnership, as they combine scientific competences in universities to meet the training and research needs of industry in both locations (Boxes 3.16 and 3.17). The CEER in Galicia (Spain) and North of Portugal is another example of a university network promoting student exchange (prior Box 3.3)

Box 3.15. **Eucor, the Upper Rhine University**

Eucor is a network of leading universities founded in 1989 in the Upper Rhine area across France, Germany and Switzerland, including the University of Freiburg (Germany), the Karlsruhe Institute of Technology (Germany), the University of Strasbourg, the University of Haute-Alsace (France) and the University of Basel (Switzerland).

The Rectors of the five universities and the President of Eucor meet twice per year to define strategic priorities for the network of institutions. The presidency of Eucor is assigned to a different university every year. In addition, Eucor has a management team composed of a member of each of the five universities that meets four/five times per year to promote information sharing related to the establishment of new projects, current project advancement and to take common decisions. The Eucor network has also established a co-ordination office with the responsibility to organise thematic bi- or trinational meetings around cross-border issues like language university policies, doctoral studies, extension to students of Eucor universities to cultural events and inter-university transport. Since 2009, Eucor established a cross-border university Student Council, with the aim to promote Eucor mobility programmes among students.

Eucor promotes and creates thematic networks and projects of researchers and students, focusing on similar topics in the five universities of the cross-border region. Eucor shares collections and resources of the five universities' libraries, providing digital and physical access to all students and researchers affiliated to Eucor's universities.

Source: www.eucor-uni.org.eu.

Box 3.16. **Transnational University Limburg in the TTR-ELAt**

The Maastricht University (UM) in Dutch Limburg was established in 1976, and is the youngest of the 13 public universities in the Netherlands. With approximately 16 000 students (2012) and, together with UMC+, about 9 000 staff members and a turnover of about EUR 800 million, it is a major driving force for the region. The university's profile consists of three unique elements: *i)* problem-based learning (PBL) and innovation in education; *ii)* an international orientation based on firm roots in the Netherlands, Limburg and the Euroregion; and *iii)* an integrated, multidisciplinary and interdisciplinary approach to research and education with a focus on three themes: *a)* quality of life; *b)* Europe and a globalising world; and *c)* learning and innovation.

The Hasselt University in Belgian Limburg is also a young university established in 1971 that organises undergraduate and post-graduate programmes in the fields of medicine, dentistry, sciences, law and applied economics.

In 2001, the Flemish and Dutch Ministers of Education signed an international treaty which founded the Transnational University Limburg. Academic staff from Hasselt University (Flanders) and nearby Maastricht University (in the Dutch Province of Limburg) now jointly undertake research and offer degree programmes in the life sciences and computer sciences.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/22, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lg3hf5-en; TTR-ELAt (2013), "Background report to OECD study: Cross-border regional innovation policies, TTR-ELAt", March.

Many other examples of joint programmes are found to support the cross-border area priorities. The Automotive Cluster Centrope, several joint study programmes in specific areas have been developed: a transnational master programme ("Professional MBA Automotive Industry" at the Technical University Vienna and Technical University Bratislava) and a qualification platform (Automotive Academy). The Automotive Cluster Centrope II aims at extending the collaboration to Hungary and to establish a joint degree programme in the field of e-mobility. Another example of a cross-border higher education programme has been recently implemented across Belgium and France (involving the regions of Nord-Pas de Calais, Flanders and Wallonia), launched in 2011. The programme involves several universities and higher education schools (*grandes écoles*) in the three regions. The programme fosters the mobility of students and research staff and creates common internships and bi-national diploma opportunities. The programme is not open to all students, but it selects 30 to 40 students per year on the basis of excellence. The selected students follow classes in the three regions and need to develop multi-lingual skills. The programme is funded by EU Structural Funds (50%) as well as by the funding bodies for HEIs located in the regions.

Box 3.17. **The Nordic Mining School: Complementarity and critical mass in education and research**

The University of Oulu and the Luleå University of Technology have jointly established the Nordic Mining School (NMS). The NMS offers a new degree programme in the field of mining industry. The aims of the NMS are to:

- bring the students at masters level in both universities together to reach critical mass
- build the best graduate school in mining-related education in Europe
- strengthen the research co-operation in mining, exploration and environmental engineering, mineral processing, metallurgy and process engineering.

The initiative, which received funding by the European Union Interreg IVA Nord programme in the period 2008-11, offers students master's degrees in both universities. Students enrol in a relevant master's programme at either of the universities and spend at least six months of their studies at the other university and qualify for a double degree from the Nordic Mining School. The course offering includes geology, mineral technology, mining technology and metallurgy. A joint professorship in "mineral entrepreneurship" was established to give students knowledge of the economics to start and run businesses in the mining and exploration industry.

Sources: Launonen, M., K. Launonen, H. Sundvall and M. Lindqvist (2013), "Background report for OECD study on cross-border regional innovation policies: Bothnian Arc", Bothnian Arc, January; www.nordicminingschool.eu.

Cross-border entrepreneurship classes are another joint opportunity to support innovation. The TTR-ELAt has developed a cross-border lifelong learning programme to foster entrepreneurship in the region, the ELAt Master Classes. The programme consists of an intense three-day master class in high-tech entrepreneurship.[7] During the master programme, a team from each of the three regions in the TTR-ELAt shares ideas and experiences and receives feedback from experts in high-tech fields. Participants also attend lectures and seminars from leading entrepreneurs and meet seed and early stage venture capital investors and legal coaches as well as managers of university spin-off programmes. In Ireland-Northern Ireland (UK), the Innovation Academy is a joint initiative of Trinity College Dublin, University College Dublin and Queen's University Belfast to provide doctoral researchers with the skills for a wider range of professional

opportunities beyond teaching upon graduation. Working across three universities helps to ensure a critical mass of students for each session as well as access to complementary expertise housed in each university.

Cross-border labour market measures and other talent schemes bring benefits of a bigger labour market

Table 3.14. **Cross-border talent and labour market measures: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – critical mass for better international visibility/attractiveness for workers and firms – better match between demand and offer in the labour market – "brain" circulation favouring innovation Barriers: – highly skilled workers are also mobile and may prefer other global locations – labour markets subject to many related regulations/programmes (pension schemes, medical insurance, taxes, etc.) – need to co-ordinate at national (supra-national) level to solve labour market issues	– Information services for cross-border workers in Helsinki-Tallinn, the Oresund and the Upper Rhine

An integrated cross-border labour market is an essential component of a functional innovation cross-border area, but often the main challenges can only be addressed at the national level. Skilled workers are attracted by access to a wider pool of possible jobs. However, if the barriers in place to working across the border are not addressed, the region loses this critical advantage for building on possible cross-border strengths. When geographic distance and accessibility are not a barrier, other barriers may discourage cross-border job-seeking (differences in national tax systems, pension portability schemes, social security and medical insurance). However, the solutions to issues related to national regulations go beyond the responsibilities of regional and local authorities that need to lobby for a resolution of such problems with the relevant national authorities.

Regional and local authorities can, however, provide information services to help cross-border workers. They should provide clear information on labour market regulations both to employees and to companies as well as guidance on how to solve the most common practical issues related to the barriers mentioned above. In the Oresund Region, for example, public authorities have created an Internet site containing all of the relevant practical information to work on both sides of the border. There are also one-stop shops (one in Copenhagen and one in Malmö) where companies and workers can seek further information and clarifications. Similar information points have been established in the Upper Rhine Trinational Metropolitan Region (France, Germany and Switzerland) as well as on Internet portals (Infobest),[8] providing cross-border workers with relevant information concerning different labour legislations in the three countries. In the Helsinki-Tallinn area, information sessions for cross-border workers are advertised on the ferry connecting the two cities. The sessions seek to help workers with information on their rights and responsibilities, notably with respect to work contracts and taxation. Other actions promoting and facilitating the creation of a cross-border labour market include activities aiming to brand and advertise the region both internally and externally, by publishing job openings in magazines and newspapers on both sides of the border.

Create other policy instruments

Many financing tools work better with a larger pool of potential investments

Table 3.15. **Financing tools: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – larger deal flow to attract investors – possibility to develop specialised funds and expertise according to specific technological and or innovative sectors – proximity favouring a climate of trust and network building Barriers: – different national rules, tax regimes and regulations concerning investments – insufficient critical mass of investment-ready firms	– HALO Business Angels in Ireland-Northern Ireland – Euregional Business Angels Network in the TTR-ELAt

Finding the right financing sources is a crucial step in entrepreneurial activity. Venture capital funds and business angel networks invest need a sufficient level of deal flow to function well. In addition, they often operate in very specific sectors and technological domains. The combinations of those two aspects make a critical mass of firms and innovation activities in particular fields, essential for the development of such funding entities. In addition, business angel and venture capital investors often prefer to operate on a local basis where they can meet and visit the companies they invest in, thus helping build trust and establish relationships while allowing investors to mentor firms and monitor their performance.

For these reasons, the creation of networks of investors is particularly relevant for cross-border functional innovation areas with strong specialisations. Examples were found in Ireland-Northern Ireland and in the TTR-ELAt. The HALO/HBAN Business Angel programme is based on business angel syndicates throughout the island of Ireland (Box 3.18). Practical guides on taxes and other regulations to facilitate investments on both sides of the border have also been developed. In the TTR-ELAt, the Euregional Business Angel Network (EuBAN) was established in 2004, in the framework of the Euregio Meuse-Rhine, with support from Interreg funding. EuBan is a cross-border business angel network, established jointly by several cross border partners.[9] The project was launched also thanks to the Interreg IIIA and the Region of Wallonia (Belgium). EuBAN helps to establish contacts between private investors and young entrepreneurs on a broader cross-border basis.

Box 3.18. **HALO Business Angel Network (HBAN): Ireland-Northern Ireland**

Although in its early stages, this cross-border policy instrument is unique for its emphasis on an under-represented area in innovation policy, financing support through business angel capital. HBAN is an all-island umbrella platform for business angel investors launched in 2011. This network aims to:

- stimulate angel investments
- empower angel investors to build and maintain an investment portfolio
- streamline the funding process for firms.

HBAN works on a regional basis, by establishing partnerships with Business Innovation Centres in Dublin, Cork, Waterford and Galway as well as with Halo Northern Ireland. Each of these centres runs local angel networks at a smaller scale. Trust and local social networks are crucial conditions for the well-functioning of syndicates, but at the same time gaining a sufficient critical mass is important to diversify investments. It has a network of seven investor syndicates as well as a large pool of private investors that operate on a cross-border basis. It also collects data on investors and has a database of about 150 private investors ready to meet early phase entrepreneurs. It aims to establish an all-island syndicate of investors in the near future. HBAN organises match-making events between investors and entrepreneurs and it has recently launched a guide for entrepreneurs called *Raising Business Angel Investment. Insights for Entrepreneurs*.

Sources: Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013d), "The case of Ireland-Northern Ireland (United Kingdom) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/20, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0llxhmr-en.

The border can be used as a source of innovation

Table 3.16. **The border as a source of innovation: Benefits and barriers**

Benefits and barriers	Examples
Benefits: – unique opportunities for new innovations – natural test bed for innovation projects – first step to accessing a wider global market Barriers: – some sectors highly regulated, rendering innovation collaboration more complex (e.g. healthcare, electricity) – regulations for testing in different markets	– ICT and e-service collaboration in Helsinki-Tallinn – Clinical Translational Research and Innovation Centre (C-TRIC) in Ireland-Northern Ireland (UK)

The border can itself be a source of innovation, an opportunity generally under-developed in the case studies. Sometimes national borders create the necessity and the demand for technologies and services to overcome practical and technical border barriers. As a consequence, cross-border regions should promote incentives to use the border as an opportunity to experiment or test technologies and services on a cross-border basis. In the TTR-ELAt, experiments and analysis for cross-border energy grid standards, transmission and solutions have been suggested. The cities of Helsinki and Tallinn are beginning to dialogue for the future development of an integrated transport system benefitting from the advanced e-services and ICT technologies on both sides. The future adoption in Finland of a data exchange layer of e-services, akin to the Estonian X-Road,

will create further cross-border opportunities. In the cross-border area between San Diego, California (United States) and Baja California (Mexico), border crossing wait times can be up to three hours and at considerable economic cost to the cross-border region.[10] The need to develop procedures and products to reduce the times associated with security checks has been raised as one opportunity for the region. Similarly, Estonian firms are researching e-identity card identification procedures over the border with Finland in order to speed up security lines and make checks faster and more secure. In Ireland-Northern Ireland, the Clinical Translational Research and Innovation Centre (C-TRIC) highlights that one of the cross-border benefits for collaboration is due to the border, as clinical testing trials can involve new populations as well provide opportunities to access the UK health system.

Innovation awards reinforce a culture of innovation and cross-border identity

Table 3.17. **Innovation awards: Benefits and barriers**

Benefits and barriers	Examples
Benefits:	– Estonia-Finland Design Challenge
– reinforces overall culture of innovation	– *Irish Times* InterTradeIreland Innovation Awards
– raises awareness of possible cross-border innovation partners	
– contributes to cross-border regional identity	
Barriers:	
– finding candidates	
– only marginal impact or awareness	

Innovation awards serve multiple purposes. They raise awareness of the importance of innovation, in its various forms, to a wider audience. They can also help make actors more familiar with each other on both sides of the border. For example, in the TANDEM project in a cross-border area between Belgium and France, an event was held where the agreements for new cross-border projects were publically signed as recognition of the project potential. In Ireland-Northern Ireland, InterTradeIreland has entered the fifth year of a public-private partnership with the *Irish Times* to deliver the *Irish Times* InterTradeIreland Innovation Awards.[11] In Estonia and Finland, a Design Challenge was used to raise awareness about design generally, areas for collaboration and the development of actual products (Box 3.19).

Box 3.19. **Estonian and Finnish Design Challenge**

The 2006-07 project "Estonian and Finnish Design Challenge", funded under Interreg III A, aimed to develop new products, activity models and networks through co-operation between Finnish and Estonian designers and companies. The lead partner was Baltic Design & Interior Network from Finland, and the other partners were Estonian: the Business and Development Centre of Pärnu County, the Vocational Centre of Pärnu and TEHNOPOL.

During the project, ideas and solutions for furbishing public rooms were developed. The results were displayed at an exhibition, "Smart Hotel", which took place in Tallinn and Helsinki. The project also targeted the markets of St. Petersburg. The project resulted in new innovative schedules and prototypes, co-operative networks between Estonian and Finnish designers and companies, a pilot model of "Design Start" and increased knowledge in design.

Source: www.baldesign.net.

Conclusions and recommendations

The success of making the cross-border instruments work is likely to be greater when they contribute to some form of a broader strategy or action plan. It helps if this strategy is supported by data, mapping exercises of relevant actors and other forms of policy intelligence. Sometimes cross-border policy instruments are experimental but can serve as test cases for mainstreaming, whereby cross-border actors can participate in traditional innovation programmes. Instruments that seek to force actors to collaborate when they have disincentives to do so will not be sustainable and therefore raise the question of whether they should be financed in the first place.

Policy instruments have shown different degrees of success in the case study areas. Instruments that tended to work include those supporting linkages between firms and knowledge institutions across the border, cluster-related efforts to support competencies in common areas and shared access to certain science facilities. Innovation vouchers and joint research were also used. Innovation projects in highly regulated sectors (including related to health systems or energy provision), as well as common branding efforts which raise political sensibilities, were generally more difficult to implement. Mixed results were observed for broad university collaborations; however, arrangements that focus on specific areas of complementary expertise were easier to implement. Other cross-border instruments are being explored, such as with respect to financing and public procurement.

Recommendations to make cross-border instruments work include:

- **Devote more efforts to strategy development and policy intelligence.** Case studies reveal that greater attention is needed to identify opportunities where collaboration would create a true and significant value added, as well as opportunities for complementarities across different fields of expertise. The incentive structures for different actors to collaborate should also be taken into account. Developing a common understanding of why certain previous cross-border initiatives did not succeed can serve to avoid repeating similar mistakes. Benchmarking with other cross-border areas may help define more efficient cross-border initiatives or instruments.
- **Mainstream the cross-border element in innovation instruments, align programme rules or allow for greater programme flexibility.** Allowing cross-border actors to participate in programmes in the neighbouring country, subject to the demonstration of co-operation benefits, is a powerful means to stimulate and support cross-border collaboration. An alternative is to align programmes on the various sides of the border, so that actors can benefit from simultaneous and co-ordinated support from their respective jurisdictions. Such alignment can achieve impact without an increase of budgets dedicated towards cross-border activities. It allows the creation of "virtual common pots" for joint efforts whereby funds may still stop at the border, but meet funds on the other side.
- **Make greater use of opportunities created by the border.** While in many areas the border is a burden, there are cases where it can be an opportunity. Working across the border may allow firms to then gain easier access to another national market, including the public sector of a neighbouring country. The neighbouring country can serve as a test bed for products before wider international marketing. There are several examples of problems that are created by the border that can be the source of inspiration for a solution marketable elsewhere.

- **Publicise success stories of cross-border instruments.** Given the challenge of trying to convince politicians and cross-border residents that such efforts are worthwhile, some concrete and successful projects can inspire. The examples can serve to engender greater willingness on behalf of constituent jurisdictions to support cross-border collaboration. Such success stories should focus on the unique contribution of the cross-border dimension.

Notes

1. For more information, see www.orestat.se.
2. For more information, see www.airo.ie.
3. For more information, see www.centrope-tt.info.
4. As reported by a local media representative.
5. http://jobomagt.org.
6. As reported in two of the case studies, with respect to credentials of employees working in those sectors, public procurement issues and competition rules, among others.
7. It is a joint initiative of KU Leuven Research & Development, the Eindhoven University of Technology and AGIT (the regional development agency of the Aachen region, Germany).
8. For more information see www.infobest.eu.
9. They include: AGIT (the development agency of the Aachen region, Germany), the Industrial Bank of the Dutch Limburg Province, the business angel network of the Flemish Limburg Province, Socran (the European Research and Innovation Center) of the Province of Liège (Belgium) and WFG Ostbelgien (the economic development agency of Eastern Belgium, in the German-speaking part of the Province of Liège).
10. A study estimated that the economic loss due to wait times was already over USD 2 billion several years ago, when those border crossings were much quicker than they are today. For more information, see San Diego Association of Governments California Department of Transportation, District 11 (2006).
11. The *Irish Times* is a daily broadsheet newspaper that is circulated in Ireland and Northern Ireland (UK).

Annex 3.A1
Benefits and barriers to different cross-border innovation instruments

Table 3.A1.1. **Benefits and barriers to different cross-border innovation instruments**

Instruments	Examples	Benefits and barriers
	Strategy and policy development	
Analytical exercise (like mapping of clusters or value chains, technology foresight exercises)	– Oresund Integration Index, Orestat database, Oresund Institute studies – Ireland-Northern Ireland ARIO database – BAK Basel studies for the TTR-ELAt mapping technology competencies – InterTradeIreland programme evaluations and business surveys to cross-border actors – *Helsinki-Tallinn: On the Move* study	Benefits: – provides common evidence for discussion, policy decisions and evaluation – facilitates knowledge sharing among authorities in different jurisdictions – helps define geometry of the (potentially) functional cross-border area – reveals socio-economic patterns in the cross-border areas (critical mass, density of activities, presence or absence of clusters, etc.) – identifies innovation actors that could be relevant for cross-border partners Barriers: – lack of indicators measuring cross-border flows in general – difficulty in collecting indicators on innovation dynamics in the cross-border area – lack of harmonised data and statistics on the different sides of the border
Benchmarking and policy learning	– BAK Basel studies for the TTR-ELAt benchmarking performance with other regions; TTR-ELAt working group exchanges – Regular meetings between Alsace (France) and Baden-Württemberg (Germany) on smart specialisation issues	Benefits: – reveals the positioning of a cross-border area compared to other regions – provides a more global outlook to cross-border efforts – supports policy decision and selection of priority areas Barriers: – difficult to have benchmarking information for a suitable peer group – costly to design a rigorous evaluation (qualitative or quantitative)

Table 3.A1.1. **Benefits and barriers to different cross-border innovation instruments** (*cont.*)

Instruments	Examples	Benefits and barriers
Joint branding of cross-border area	– Medicon Valley and the joint ambassadors of the Oresund – Common tourism label for Hedmark-Dalarna and Ireland-Northern Ireland (UK) – *Oresund Magazine*; *JOBØMAGT* – Talsinki website	Benefits: – increases national and international visibility for the cross-border area – increases awareness of cross-border initiatives among local innovation actors – attracts foreign direct investment (FDI), skilled workers, innovation actors – reinforces a cross-border identity for residents Barriers: – competition among jurisdictions within the cross-border area – political challenges in accepting certain brands (particularly when it involves designating the name of a lead city) – language differences – lack of interest from private sector and/or the civil society
		R&D support
Joint public research programmes	– Science Offensive (Upper Rhine Trinational Metropolitan Region) – Wood Materials Science and Engineering Sweden-Finland – US-Ireland R&D Partnership programme – Oresund Contracts	Benefits: – increases critical mass of researchers – joint laboratories and international teams of researchers and students – greater visibility of research outcomes and results – faster information sharing and knowledge transfer – greater competitiveness in research competitions (ex. EU framework programmes) Barriers: – different national approaches to intellectual property rights (IPR) – competition among research institutions for financing – differences in the management rules and practices of institutions – insufficient excellence of cross-border partners – funding stops at the border, complicating joint research efforts – non-alignment of administrative rules for use of research funds
Joint research infrastructure, shared access to research facilities	– Holst Centre and forthcoming Biomaterials research centre in the TTR-ELAt – MAX IV and ESS in the Oresund	Benefits: – shares investment costs – ability to develop more specialised or cutting-edge infrastructure – faster knowledge transfer and innovation spillovers promoted by researchers with different backgrounds and expertise Barriers: – competition for location of investment – legal impediments to shared use of the facility, hiring staff of different nationalities – issues related to intellectual property rights (IPR)

Table 3.A1.1. **Benefits and barriers to different cross-border innovation instruments** (*cont.*)

Instruments	Examples	Benefits and barriers
Cross-border private R&D funding programmes	– Innova: partnerships for innovation in Ireland-Northern Ireland – GCS: Cross-border Cluster Stimulation project, for joint R&D projects by SMEs (TTR-ELAt)	Benefits: – complementarities and critical mass in research and innovation projects – a wider range of actors to work with, particularly for SMEs who cannot as easily search globally – may help build longer term cross-border innovation networks Barriers: – hesitancy of public authorities to finance private entities in a foreign country – cumbersome rules and regulations for the private sector to manage – difficult to design and implement rigorous evaluation criteria
Technology transfer and innovation support		
Cross-border innovation advisory services (vouchers, intermediaries)	– Innovation vouchers in the TTR-ELAt and Ireland-Northern Ireland (UK) – Nordic Business Links in the Bothnian Arc – FUSION in Ireland-Northern Ireland	Benefits: – wider pool of possible providers – critical mass to provide more specialised services – raises awareness of other innovation actors across the border – chance for SMEs to collaborate with foreign public and private entities Barriers: – differing financial support rules based or distribution requirements based on the nationality of beneficiaries – advertising the programme and its delivery mechanisms – cumbersome rules and regulations, particularly for SMEs – stimulating private sector demand
Advisory services to spin-off and knowledge-intensive start-ups	– Start-Smart, Cross-Border Small Business Environment, Start-up Sauna in Helsinki-Tallinn – TwinEnterpreneurs in Centrope	Benefits: – broader network of advisers, partners and investors for entrepreneurs – build on peer experiences from other countries – greater specialisation of advisory services (e.g. by sector) Barriers: – lack of alignment of activities of similar organisations across the border – difficulties in identifying coaches or entrepreneurs

Table 3.A1.1. **Benefits and barriers to different cross-border innovation instruments** (*cont.*)

Instruments	Examples	Benefits and barriers
		S&T parks and innovation networks
Cross-border science, technology parks and incubators	– Joint incubator work in Helsinki-Tallinn; Technopolis park established in Estonia and Finland – Chemelot Business Park and Avantis Technology Park in the TTR-ELAt	Benefits: – facilities can be more profitable with a larger pool of possible tenants – avoids duplication of investments across the border – facilitates knowledge sharing, spillovers and networking across jurisdictions Barriers: – competition for location and firm attraction – administrative rules for foreign firms locating in park on other side of the border
Cluster or network initiatives	– Oresund cross-border clusters like Medicon Valley – Top Technology Clusters in the TTR-ELAt – Creative industry cluster MIDAS in Ireland-Northern Ireland – Tourism cluster in Hedmark-Dalarna	Benefits: – offers a framework for targeting many cross-border instruments – greater visibility of the cross-border area (due to greater critical mass) – greater knowledge of cross-border innovation actors – creation of firm networks throughout the cross-border area Barriers: – different levels of innovation development on different sides of the border – different national regulations in specific sectors (i.e. energy, health and medical technologies and devices, etc.) – eligibility constraints for funding recipients in different countries – imbalanced engagement of the private or public sector on different sides of the border
		Human capital
Joint university or other higher education programmes	–– Transnational University Limburg in the TTR-ELAt – Nordic Mining School in the Bothnian Arc – Joint entrepreneurship courses at Ireland-Northern Ireland (HEIs) and in the TTR-ELAt (lifelong learning courses) and in the Bothnian Arc (Innopreneurship, targeting HEI teachers)	Benefits: – capitalise on proximity, complementarity of competences and education programmes across higher education institutions – critical mass of students, can jointly develop more specialised programmes – creation of networks of students and professors (as well as professionals in the case of lifelong learning initiatives) over multiple countries – cross-border education can facilitate cross-border labour markets Barriers: – competition among universities for attracting students – national funding schemes give negative incentives for working cross-border – language barriers – national regulation of secondary and tertiary education systems creating obstacles to the mobility of students (i.e. eligibility for grants, length of university programmes, different grading systems, visas, etc.) – student decisions based on global excellence rather than geographical proximity

Table 3.A1.1. **Benefits and barriers to different cross-border innovation instruments** (*cont.*)

Instruments	Examples	Benefits and barriers
Talent attraction, retention or mobility scheme; cross-border labour market assistance	– Information services for cross-border workers in Helsinki-Tallinn, the Oresund and the Upper Rhine	Benefits: – critical mass for better international visibility/attractiveness for workers and firms – better match between demand and offer in the labour market – "brain" circulation favouring innovation Barriers: – highly skilled workers are also mobile and may prefer other global locations – labour markets subject to many related regulations/programmes (pension schemes, medical insurance, taxes, etc.)
		Other instruments
Financing (venture capital funds or business angel networks)	– HALO Business Angels in Ireland-Northern Ireland – Euregional Business Angels Network in the TTR-ELAt	Benefits: – larger deal flow to attract investors – possibility to develop specialised funds and expertise according to specific technological and or innovative sectors – proximity favouring a climate of trust and network building Barriers: – different national rules, tax regimes and regulations concerning investments – insufficient critical mass of investment-ready firms
Border as a source of innovation/ public procurement	– ICT and e-service collaboration in Helsinki-Tallinn – Clinical Translational Research and Innovation Centre (C-TRIC) in Ireland-Northern Ireland (UK)	Benefits: – unique opportunities for new innovations – natural test bed for innovation projects – first step to accessing a wider global market Barriers: – some sectors highly regulated, rendering innovation collaboration more complex (e.g. healthcare, electricity) – regulations for testing in different markets
Innovation awards	– Estonia-Finland Design Challenge – *Irish Times* InterTradeIreland Innovation Awards	Benefits: – reinforces overall culture of innovation – raises awareness of possible cross-border innovation partners – contributes to cross-border regional identity Barriers: – finding candidates – only marginal impact or awareness

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Annex I.1
Assessing cross-border opportunities

Table I1.1. **Potential value added for cross-border regional innovation policies**

Economic concept	Driver	Explanation	Strong	Moderate	Weak	Not present or relevant
Economies of scale	Critical mass	Larger labour markets or access to wider business and knowledge networks to increase critical mass, characteristics associated with agglomeration economies	☐	☐	☐	☐
	Political power	Increase the recognition of areas of strength (or special needs) in regions that are far from capitals to better compete for resources from higher levels of government	☐	☐	☐	☐
	Specialised services	Innovation support services can be more specialised and thus of higher quality	☐	☐	☐	☐
Economies of scope	Complementarities	Build on a diversity of assets in terms of research, technology and economic base, known also as "related variety", as well as supply chain linkages; in some cases, complementarity may also be due to differences in price levels, cost structures or functions	☐	☐	☐	☐
Public and club goods	Regional identity	Increase internal recognition of the cross-border area for greater integration and social capital (including knowledge of the partners on the other side of the border)	☐	☐	☐	☐
	Regional branding	Attractiveness and recognition of the area to firms and skilled labour both within the cross-border area and beyond	☐	☐	☐	☐
	Specialised infrastructure	Shared science and technology facilities reduce financial costs and risks for the regions or countries involved, and allow access to a greater number of researchers	☐	☐	☐	☐
Externalities	Border issues	Address the day-to-day issues associated with flows of people, goods and services (including public services) across the border for both positive and negative spillovers	☐	☐	☐	☐

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration**

1. Geographic accessibility (internal and external accessibility of the cross-border area)					
Diagnostic questions	Categories				Comments
	Metropolitan area (one hub)	Metropolitan area (twin cities)	Network of small and medium-sized cities	Sparsely populated with small cities/towns	There is no one ideal settlement pattern for cross-border collaboration, but a greater density of people, firms and knowledge institutions and the presence of metropolitan hubs are more likely to be accompanied by greater accessibility and opportunities.
What is the general settlement pattern of the area?	☐	☐	☐	☐	
	1 hour (strong)	2 hours (intermediate)	3 hours (weak)	4 or more hours (very weak)	Depending on the configuration of the cross-border area, some parts may be more remote and therefore less able to effectively engage in cross-border interactions to the same extent as those in a more central location.
How long does it take to travel from one end of the cross-border area to another (one way)… by car?	☐	☐	☐	☐	
by public transport?	☐	☐	☐	☐	
	1 hour (strong)	2 hours (intermediate)	3 hours (weak)	4 or more hours (very weak)	Depending on the configuration of the cross-border area, many of the interactions may be focused on hub-to-hub interactions, therefore this measure may serve to assess accessibility of the core areas.
How long does it take to travel between the main hubs of the cross-border area to another (one way)… by car?	☐	☐	☐	☐	
by public transport?	☐	☐	☐	☐	
	Free	Minor cost	Intermediate cost	High cost	Pricing policy for crossing the border (fees for using bridge, tunnel, highway or cost of transport such as ferry, train, plane) influences accessibility.
How costly is it to travel across the cross-border area?	☐	☐	☐	☐	
	Very accessible	Somewhat accessible	Not very accessible	Distant	This is hard to directly quantify, but a large number of daily international flights or a well-connected train network to relevant hubs outside the cross-border area, as well as their price, are relevant indicators.
How accessible is the cross-border area to other international hubs?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

2. Socio-cultural proximity (in terms of language, culture, practices and values as well as some sense of shared identity)					
Diagnostic questions	Categories				Comments
	All population	Majority of the population	Half of the population	Less than half of the population or unbalanced	Many information networks are language based. Even if some languages are similar so that one can understand the other language, actual language fluency can facilitate exchanges. Many cross-border areas report a decline in the fluency in the neighbour's language in recent years.
What share of the population speaks or easily understands the language of the other side?	☐	☐	☐	☐	
	Many residents	Some residents	Few residents	Very few residents	Cultural exchange is one source of greater understanding of the other side of the border. Knowledge of neighbouring sports teams, or mutual support of the same team, can be another element of mutual appreciation or common identify.
Do cross-border residents attend cultural, leisure or sports events on the other side of the border?	☐	☐	☐	☐	
	Both directions, balanced	Both directions, somewhat unbalanced	Mainly unbalanced	Limited flows	The more balanced the flows, the greater the contribution to mutual understanding.
Are flows balanced?	☐	☐	☐	☐	
	High, balanced	High, unbalanced	Low, balanced	Low, unbalanced	Tourism by residents of one side of the border to another opportunity for greater socio-cultural proximity across the border. The more balanced the flows, the greater their potential contribution to social-cultural proximity
What is the volume and direction of tourism flows across the border?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

	Very similar	Somewhat similar	Somewhat different	Very different	This assessment is generally subjective. Some cross-border areas may perceive large differences but on an international scale such differences may be relatively minor. However, even if minor, some recognition of these differences is still required. In some countries, social surveys may be used to measure proximity in values.
How different are resident values from the various sides of the borders (relative to that of other countries)?	☐	☐	☐	☐	
	High	Rather high	Rather low	Low	A high sense of joint identity is a positive pre-condition for the development of cross-border linkages. Surveys to residents are perhaps the best way to measure a common sense of identity.
Do cross-border residents feel a sense of identity of belonging to the cross-border area?	☐	☐	☐	☐	
	Balanced	Somewhat balanced	Somewhat unbalanced	Unbalanced	In some cross-border areas, those in the part of the cross-border area that is more "dependent" on the other side may feel a greater sense of belonging to the cross-border area.
How evenly shared is this sense of identity on each side of the border?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

3. Institutional context (level and degree of similarity in regional competences for economic development and in laws, regulations, tax systems, etc.)					
Diagnostic questions	Categories				Comments
	Balanced, strong	Balanced, weak	Somewhat unbalanced	Very unbalanced	The stronger the degree of regional autonomy for innovation policy making, the easier it is to implement cross-border strategies and instruments. A lack of balance in competencies on each side, however, can result in difficulties with collaboration.
What is the degree of decision-making freedom in economic development matters at regional level?	☐	☐	☐	☐	
	High, balanced	Low, balanced	Somewhat unbalanced	Very unbalanced	High budgets for economic development under regional control on all sides of the border is a favourable condition for developing an integrated policy for the cross-border area.
How high are the budgetary means for economic development matters at regional level?	☐	☐	☐	☐	
	High	Medium high	Medium low	Low	Large regulatory and legal barriers for people mobility affect negatively the potential for developing integrated cross-border areas (social insurance regimes such as for pension, unemployment or healthcare; validation of educational qualifications, etc.).
What is the level of legal and regulatory barriers affecting labour mobility across the area?	☐	☐	☐	☐	
	Yes	Likely	Not likely	No	Differences in (company, property, etc.) taxation regimes induce flows that may distort opportunities for cross-border innovation co-operation.
Are differences in tax regimes creating tax competition across the area?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

4. Cross-border integration (flows of workers, goods, foreign direct investment, etc. across the area as well as harmonisation of price levels)					
Diagnostic questions	Categories				Comments
	High	Medium high	Medium low	Low	A high share of cross-border commuters reflects labour market integration, a traditional measure for a functional area.
What is the share of cross-border commuters in the cross-border area's labour market?	☐	☐	☐	☐	
	Some residents, balanced	Some residents, unbalanced	Few residents, balanced	Few residents, unbalanced	Cross-border shifts in residency indicate the importance of cross-border issues to area residents, favours personal and economic interlinkages and helps create a sense of shared identity.
What is the share of residents originating from across the border?	☐	☐	☐	☐	
	Similar	Somewhat similar	Somewhat dissimilar	Dissimilar	There is no specific benchmark metric, but the degree of similarity in housing price level differentials is an indicator of housing market integration. Changes over time in price differentials are helpful as an indicator of integration trends.
How similar are housing price levels?	☐	☐	☐	☐	
	Similar	Somewhat similar	Somewhat dissimilar	Dissimilar	Similarity in wage levels is an indicator of labour market integration. Changes over time in wage differentials are helpful as an indicator of integration trends.
How similar are wage levels?	☐	☐	☐	☐	
	High	Relatively High	Moderate	Low	Freight flows or other movements can be an indication of trade relationships. It also implies a need for policies to address the relationships given possible issues of congestion and environmental impacts that require cross-border efforts.
What are the trends for flows of freight or other measures of goods transit across the border?	☐	☐	☐	☐	
	High	Relatively High	Moderate	Low	The presence of foreign direct investment (greenfield or takeover) across the border is an indication of economic integration.
What are the trends for flows of foreign direct investment from across the border?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

5. Economic specialisation (proximity and complementarity both in industrial structures and knowledge bases: also known as "related variety" and "proximate diversity")					
Diagnostic questions	Categories				Comments
	Sector 1	Sector 2	Sector 3	Sector 4	Some regions may have performed mapping studies of specialisation, using location quotients based on employment in different industrial sectors. While this information is imperfect, it provides a basis to assess cross-border potential based on shared sectors.
What economic sectors or activity domains with innovation potential are shared across borders?					
--What share of employment do these sectors represent on each side?					Response for each region part of the cross-border area
--What share of the gross value added do these areas represent on each side?					Response for each region part of the cross-border area
	Technology 1	Technology 2	Technology 3	Technology 4	Beyond employment and industrial codes, patenting data are a source of information mapping the same or related technologies on various sides of the border.
What technologies with innovation potential are shared across borders?					
--Any measures of their relative importance in the cross-border area (e.g. share of patents)?					Response for each region part of the cross-border area
	Identified opportunities	Potential opportunities	Little opportunities	No opportunities	"Related variety" implies technological connections between different industries (sharing knowledge bases and involving mobility of skilled personnel). Such opportunities can be identified by observing cross-sector innovations and talent mobility. Some advanced clusters can also be a locus for favouring such cross-sector innovation.
What opportunities emerge for linkages between different industries through joint use of technologies (related variety)?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

	High, balanced	High, unbalanced	Low, balanced	Low, unbalanced	High and balanced presence of key innovation actors in the different parts of the cross-border area raises its potential as a functional area for innovation, and augments the probability of finding partners for developing innovative combinations
Which are key actors present in the cross-border area: leading innovative firms, knowledge centres, universities, etc.?	☐	☐	☐	☐	
	Same	Similar with complemen-tarities	Somewhat similar	Different	Similar structures with complementarities implies a greater opportunity for unique cross-border collaborations. The same structure also implies opportunities but with perhaps lower opportunities for innovative combinations. Different industrial structures and knowledge bases imply a much more difficult environment for trying to develop joint innovations.
Overall assessment of the industrial and knowledge bases in the cross-border area	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

6. Business innovation model (innovation-based business strategies with open innovation practices, as opposed to low-cost competition strategies)					
Diagnostic questions	Categories				Comments
	Significantly above international/ peer averages	Above international/ peer averages	Below international/ peer averages	Significantly below international/ peer averages	The presence of knowledge-intensive companies involved in innovation co-operation is a pre-condition for turning the cross-border area into a functional region for innovation. The higher and the more similar the innovation intensity rates are across the border, the more favourable is the situation, although competition also remains strong.
What is the rate of business enterprise expenditure on research and development as a share of GDP?					Response for each region part of the cross-border area.
What is the rate of patent applications per 1 000 inhabitants?					Response for each region part of the cross-border area.
What is the share of manufacturing employment in medium-high-tech and high-tech manufacturing?					Response for each region part of the cross-border area.
What is the share of service sector employment in knowledge intensive services?					Response for each region part of the cross-border area.
What is the share of firms that are innovating on each side of the border?					Response for each region part of the cross-border area.
What is the share of innovating firms that collaborate for innovation?					Response for each region part of the cross-border area.
	Yes, a lot	Yes, some	Very few	None	"Hidden" innovation can also be present outside of R&D and S&T activities, and hence not captured by the above types of indicators. Any empirical evidence of such type of innovation cross border can nurture the potential for a functional cross-border area.
Is there evidence of potential for innovation in more traditional sectors and in non-S&T-driven innovation?	☐	☐	☐	☐	
	Yes, many	Yes, some	Very few	None	The greater the level of interest by firms in cross-border collaboration, the more likely any public efforts will support a true demand rather than create temporary collaborations that end with the public financing cycle.
Are there privately funded or initiated cross-border innovation initiatives or interactions?	☐	☐	☐	☐	
	Balanced, strong	Balanced, weak	Somewhat unbalanced	Very Unbalanced	The more balanced the business innovation approach, the greater the opportunities for the different parts of the cross-border area to have aligned incentives. The higher the level of development, the greater the potential for innovation-driven cross-border collaboration.
Overall assessment of the business innovation approach in the cross-border area	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

7. Knowledge infrastructure (quality of research and educational organisations and their engagement with the regional economy)					
Diagnostic questions	Categories				Comments
	High	Relatively high	Moderate	Low	A prerequisite for this assessment is a mapping of the key knowledge infrastructure institutions in the cross-border area. Measures to determine quality include international university rankings, presence of highly ranked professors in national or international designations, etc. In some systems, educational institutions may not have the status of a university but are very relevant knowledge providers, such as a polytechnic schools. Technology centres should also be considered.
What is the quality of higher education and research institutions on each side of the border?					Response for each region part of the cross-border area.
	Balanced, strong	Balanced, weak	Somewhat unbalanced	Very Unbalanced	Measures of this engagement may include the share of research funds coming from the private sector, the number of research contracts (with large firms and with SMEs), the number of spin-offs, license revenues, etc.
How strong is the "third mission" among higher education institutions for engagement with the regional economy on each side of the border?	☐	☐	☐	☐	
	Balanced, strong	Balanced, weak	Somewhat unbalanced	Very unbalanced	Assessment of this effectiveness should be based on studies or enquiries, involving feedback from beneficiaries.
How effective are technology transfer and innovation support agencies in the promotion of innovation in the area?	☐	☐	☐	☐	
	High	Relatively high	Moderate	Low	Such parks and campuses can provide a fertile environment for knowledge infrastructure and firms to connect in what is termed the "triple helix".
What is the quality/effectiveness of the science parks, knowledge-intensive industrial parks and other campuses in the cross-border area?					Several responses for each region part of the cross-border area.
	Scientific field 1	Scientific field 2	Scientific field 3	Scientific field 4	One proxy for scientific knowledge is the score of scientific publications in quality academic journals. Another proxy is achievements in national and international competitions for public research funding.
What fields of scientific knowledge are strongly represented in both areas?					

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

8. Innovation system interactions (high density and balanced cross-border interactions across innovation system actors)					
Diagnostic questions	Categories				Comments
	Balanced, strong	Balanced, weak	Somewhat unbalanced	Very unbalanced	Assessment of these flows should be based on existing indicators or specific studies or enquiries. The more intense, the more numerous and the more balanced these flows are, the higher the cross-border area potential for innovation linkages.
What is the importance and balance in the following knowledge-related flows across the area?	☐	☐	☐	☐	
Students	☐	☐	☐	☐	
Highly skilled workers	☐	☐	☐	☐	
R&D personnel	☐	☐	☐	☐	
Co-patents	☐	☐	☐	☐	
Co-publications	☐	☐	☐	☐	
Scientific collaboration	☐	☐	☐	☐	
Industry-science co-operation	☐	☐	☐	☐	
Business collaboration (innovation links between firms)	☐	☐	☐	☐	
Venture capital investments	☐	☐	☐	☐	
	Strongly integrated	Moderately integrated	Weakly integrated	Weakly or not integrated	A strongly integrated system is one where the international border provides few or no obstacles for innovation linkages. A weakly or not integrated system is one where there are virtually no innovation-oriented interactions across the border.
Overall, how integrated is the cross-border regional innovation system?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

9. Governance (degree, longevity and institutionalisation of political and financial commitment to cross-border collaboration)					
Diagnostic questions	Categories				Comments
	Balanced, strong	Balanced, weak	Somewhat unbalanced	Very unbalanced	The ability to promote the innovation dimension of cross-border collaboration depends in part on the actual presence of innovation-oriented collaboration, but also on more general political commitment to cross-border collaboration, based on other dimensions. In some cases, there may be formal agreements but not considerable action in practice.
How strong and balanced is the political commitment towards cross-border interactions ----at local level?	☐	☐	☐	☐	
----at regional level?	☐	☐	☐	☐	
----at national level?	☐	☐	☐	☐	
	Very effective	Effective	Less effective	Not effective	
How effective are the following cross-border institutions or initiatives for the development of the cross-border area? Institution or Initiative 1	☐	☐	☐	☐	Often there are several cross-border initiatives or institutions that cover part or all of the territory. Some may be very local collaborations, others much larger scale collaborations that include part or all of the cross-border area considered for innovation policy. Their general aim is to foster cross-border linkages and synergies and as such they can contribute to the evolution of the area as a functional region for innovation.
Institution or Initiative 2	☐	☐	☐	☐	
Institution or Initiative 3	☐	☐	☐	☐	
Institution or Initiative 4	☐	☐	☐	☐	
Institution or Initiative 5	☐	☐	☐	☐	
	Joint institution with budget	Formal consultation bodies	Informal but active consultation bodies	*Ad hoc* meetings or initiatives	There may be both formal and informal collaborations that co-exist, therefore the focus here is on the strongest platform.
How formalised is the most significant cross-border collaboration platform?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

9. Governance (degree, longevity and institutionalisation of political and financial commitment to cross-border collaboration)					
Diagnostic questions	Categories				Comments
	Primary focus	Important element	Minor element	Not present	Often cross-border platforms have multiple priority areas: innovation can be explicitly or implicitly amongst these priorities: the assessment of this importance can be based on an analysis of actual action plans and initiatives supported by the platform.
How important is innovation in this cross-border engagement?	☐	☐	☐	☐	
	30+ years	20-30 years	10-20 years	Less than 10 years	The ability to work cross-border takes many years to develop. The longer the collaboration, the deeper the knowledge of the partner and the larger the opportunities to build trust. However, political commitment can also wane over time.
How long is the history of cross-border co-operation?	☐	☐	☐	☐	
	High	Moderate	Low	None	The sustainability and relevance of the cross-border efforts is likely to be stronger if actors beyond government agencies are involved in the governance.
How active are the following parts of the "triple helix", beyond public authorities, in the cross-border governance? Private sector	☐	☐	☐	☐	
Higher education/public research	☐	☐	☐	☐	
Civil society	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

10. Policy mix (orientation of innovation policy as well as the cross-border policy instruments)					
Diagnostic questions	Categories				Comments
	Very similar	Somewhat similar	Different	Very different	The main thrust of innovation policies across the cross-border area can be similar or divergent (focus on S&T-based versus practice innovation, etc.). It is easier to develop aligned or joint policies when the orientations are more similar. Depending on the degree of decentralisation, regional innovation policy approaches may be tied to, or diverge from, national innovation policies.
How similar are innovation policy approaches throughout the cross-border area	☐	☐	☐	☐	
	Strong	Moderate	Weak	Not present	Information exchange provides the relevant inputs for designing effective instruments and strategies.
Is there exchange of data, actor mappings or policy information across regions in the cross-border area?	☐	☐	☐	☐	
	Strong	Moderate	Weak	Not present	A good way to test the waters is to start with experimental cross-border initiatives. Over time, however, a collection of experiments needs to contribute to a wider strategy.
Are there experiments such as *ad hoc* or temporary cross-border initiatives (not necessarily involving joint funding)?	☐	☐	☐	☐	
	Strong	Moderate	Weak	Not present	As many national and regional policies do not allow funding to leave their respective jurisdictions, flexibility in programme rules or some form of alignment in eligibility and timeframes can greatly facilitate cross-border collaborations.
Are there efforts to align policies so that collaborators can work together with funding from their respective jurisdictions?	☐	☐	☐	☐	
	Strong	Moderate	Weak	Not present	While rare, mainstreaming the cross-border element into existing programmes (allowing partners from other jurisdictions to be financed) is one option to create genuine joint policies.
Are there programmes "mainstreaming" the cross-border element allowing actors from one side to participate in projects and receive funding from the other?	☐	☐	☐	☐	

Table I1.2. **Diagnostic questions for ten conditions relevant to cross-border innovation collaboration** (*cont.*)

10. Policy mix (orientation of innovation policy as well as the cross-border policy instruments)					
Diagnostic questions	Categories				Comments
	Strong	Moderate	Weak	Not present	The development of a portfolio of joint actions with some form of joint funding, whether through alignment of policies, mainstreaming, a virtual common pot of funding, or a real common pot all show a more intensive cross-border engagement.
Are there joint actions that involve initiatives or structures with joint funding?	☐	☐	☐	☐	
	Strong	Moderate	Weak	Not present	A sound strategy is necessary to help align the many initiatives on different sides of the border towards common goals that strengthen the cross-border area.
Is there a functioning cross-border strategy?	☐	☐	☐	☐	
	Strong	Moderate	Weak	Not present	A strategy is only that if it is not translated into a concrete action plan along with clear responsibilities and budgets for implementation.
Is there an action plan to accompany the cross-border strategy?	☐	☐	☐	☐	
	Strong	Moderate	Weak	Not present	A sound strategy includes monitoring and evaluation components to ensure effectiveness and provide a basis for adapting the strategy and the actions accordingly.
Are there appropriate policy follow-up and evaluation mechanisms associated to the strategy and cross-border initiatives?	☐	☐	☐	☐	

Part II

Summaries of case studies on cross-border areas

Chapter 4

Bothnian Arc (Finland-Sweden)*

The Bothnian Arc is a cross-border area on the border of Finland and Sweden that covers the most populated areas along the upper Bothnian Bay, spanning 800 kilometres. It has a population of around 710 000, across 55 000 km² with an economic output of USD 31 billion. The Bothnian Arc collaboration was initiated by local authorities, with strong commitment of the mayors of the cities of Oulu and Luleå (300 kilometres apart) to such collaboration. Despite a peripheral location in all respects, some parts of the Bothnian Arc have shown a remarkable vitality, notably Oulu (Finland), driven by an innovation ecosystem that builds on the heritage of Nokia and the contribution of Oulu University. Luleå (Sweden) has recently attracted the European Facebook data centre. The area is looking to go beyond ad hoc *projects for a more strategic approach to innovation-driven collaboration to be the dynamic hub of the north.*

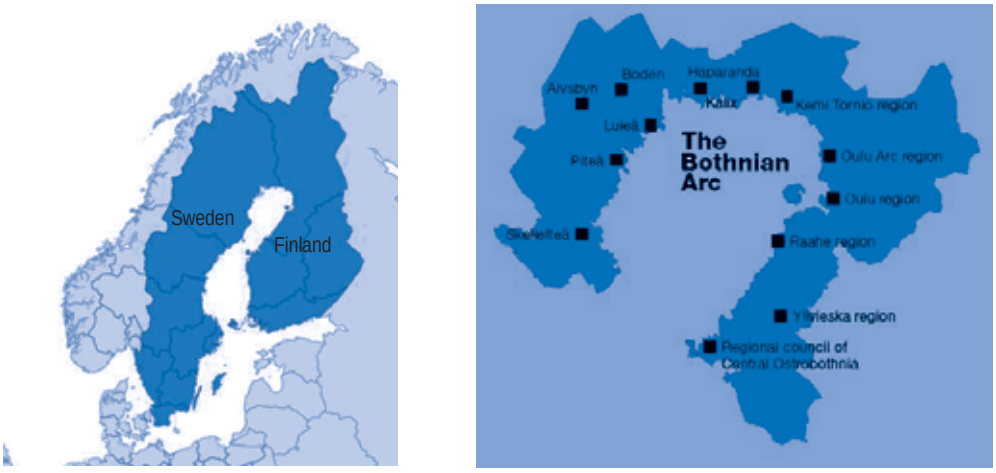
* This chapter is an excerpt of Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Bothnian Arc (Finland-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/17, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k3xv0r6v26b-en.

Introduction

The Bothnian Arc is a Swedish-Finnish cross-border area initiated by local authorities to support the peripheral region in becoming a dynamic hub in the north of Europe. This goal is expected to be achieved both through a macro perspective of the region as a "corridor" between larger economic areas with high economic potential, and a more micro approach – developing synergies through the exploitation of business and innovation opportunities across the knowledge-intensive cross-border region. Global warming brings the perspective of opening an arctic sea route that could change the context for the Bothnian Arc. The construction of an Arctic railway, connecting the Bothnian Arc with the northern shores of the Barents Sea, is under study. Huge investments in mining and energy are planned in the region. This creates new potential for the Gulf of Bothnia, at the interface between the Baltic Sea region and the Barents Sea.

The Bothnian Arc Association seeks to foster co-operation between actors on both sides of the border in the coastal zone at the northern end of the Gulf of Bothnia. Such co-operation concerns new business development, innovation, education, training and R&D. The association was founded in 2002. As this is relatively recent for promoting cross-border innovation activities, the task of developing strong, knowledge-based linkages across the cross-border area is still under development.

Figure 4.1. **The Bothnian Arc cross-border area**



Note: This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Sources: OECD (2013), OECD eXplorer, www.oecd.org/gov/regional-policy/oecdexplorer.htm (accessed 15 October 2013); and www.bothnianarc.net (right).

The profile and relevance of the Bothnian Arc cross-border area for innovation

The Bothnian Arc gathers the most relevant areas in Northern Finland and Sweden for innovation potential, anchored by the two cities of Oulu and Luleå, respectively. The region is seeking to diversify from the traditional mining, forestry and metal sectors, and reduce dependence on the large companies. The "Oulu exception" – a high-tech hub – provides credibility to the possibility of "success in the north", contributing to the stronger innovation performance on the Finnish side that has nevertheless been

challenged by Nokia's downsizing. The arrival of Facebook in Luleå may signal new opportunities on the Swedish side. The knowledge potential linked to universities, applied research institutes and governmental research centres, as well as the presence of R&D-intensive companies in new sectors, provides a great opportunity to deepen this diversification process and maintain attractiveness and a skilled labour force.

Table 4.1. **Socio-economic overview: Bothnian Arc cross-border area**

Variable	Bothnian Arc	Finland area	Sweden area
Population (2011)	710 000	460 000	250 000
Surface (km²)	55 000	29 000	26 000
Population density (inhabitants/km²)	12.9	15.8	9.6
Main cities		137 000 (Oulu)	74 426 (Luleå)
Unemployment rate (2011)	7.0	8.3	4.0
GDP per capita (2009) (USD PPP constant prices 2005)	--	Pohjois-Suomi 25 264 Finland 30 574	Övre Norrland 28 474 Sweden 32 322

Sources: OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en; Launonen, M., K. Launonen, H. Sundvall and M. Lindqvist (2013), "Background report for OECD study on cross-border regional innovation policies: Bothnian Arc", Bothnian Arc, January.

Table 4.2. **Strengths, weaknesses, opportunities and threats for cross-border innovation policy: Bothnian Arc**

Strengths and assets	Weaknesses and barriers
– Strong innovation assets and performance – "Oulu miracle" supporting the attractiveness of the area – Existing experimentations on joint projects to feed the cross-border innovation agenda – Important mobilisation of main higher education institutions around cross-border research and innovation – Climate of trust favourable for co-operation – Common areas of specialisation and opportunities for complementary expertise (example of ICT and big data, reinforced by the new Facebook data centre in Luleå and the ICT cluster in Oulu)	– Geographical scale and accessibility issues within the area – Distance from large urban centres – Lack of information for actors on innovation potential over the border – Mainly driven by local authorities with limited innovation policy instruments – Insufficient involvement of firms in developing the cross-border vision and financing its actions – Lack of data to understand the potential and barriers for cross-border co-operation
Opportunities	**Threats**
– Increasing geostrategic importance of the location given global warming – Developing an internationally recognised brand as the technology hub of the north – Raising awareness and funding from regional and national sources not currently involved in the cross-border efforts	– Greater attractiveness of other national and international locations for high-skilled talent – Mature industries unable to upgrade quickly enough – Declining relative competitiveness of high-tech sectors

The area cannot yet be considered functional with respect to innovation policy, but has clear potential. There is a lack of evidence on cross-border flows beyond border crossings at Haparanda-Tornio. Anecdotal evidence points towards some cross-border linkages in the higher education and business worlds, but there is no measure of the density and relative strengths of these links. While geographical, regulatory and cultural barriers do exist within the area, they do not seem to constitute insurmountable obstacles. Internal accessibility remains a challenge for reaping the benefits of proximity.

Table 4.3. **Innovation overview: Bothnian Arc**

Variable	Finland	Pohjois-Suomi (FIN)	Övre Norrland (SWE)	Sweden	OECD peer average: Knowledge and tech hubs	OECD peer average: Service and natural resource in knowledge-intensive countries
Tertiary educational attainment (2008) (as a % of labour force)	40.0	32.2	28.5	34.2	30.8	29.8
R&D personnel (2009) (as a % of total employment)	3.3	3.7	2.7	2.6	2.7	2.0
Share of employment in high-tech manufacturing (2008) (%)	39.9	26.2	37.6	42.9	49.2	32.4
Share of employment in knowledge-intensive services (2008) (%)	58.5	60.0	64.6	62.8	56.7	57.6
Total R&D expenditure as a % of GDP (2009)	3.78	6.58	2.82	3.37	3.91	1.79
Business R&D expenditure as a % of GDP (2009)	2.81	5.31	0.67	2.53	--	--
Share of R&D by private sector (%)	74	80	23	75	--	--
PCT patents per million inhabitants (2008-10 average)	281	251	159	310	260	103

Note: Peer regions' average: average of the clusters "Knowledge and technology hubs" and "Service and natural resources in knowledge-intensive countries". For further information see Ajmone Marsan and Maguire (2011). Data are missing for Canada and Korea for tertiary education attainment; some data are missing for Korean and some US regions for HTM/KIS. Data are missing for France for R&D personnel.

Source: Eurostat; OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en.

Table 4.4. **Snapshot of the functional region for innovation: Bothnian Arc**

(Bothnian Arc in bold)

Characteristic	Specification	Comments
Region settlement patterns	Metropolitan area Network of small and medium-sized cities **Sparsely populated with small cites/towns**	The Bothnian Arc is composed of predominantly rural areas, with two main medium/small cities: Oulu (Finland) and Luleå (Sweden).
Internal accessibility and flows	Strong Moderate **Weak**	The Bothnian Arc region spans over a large territorial scale with limited infrastructure connections (the main cities are more than 3 hours away by motorway, 800 kilometres from tip to tip).
Industrial and knowledge specialisations	Similar with complementarities **Same** Different	Both sides of the border are specialised in the following sectors: forestry/wood and pulp, mining and ICT. There are opportunities to seek complementarities in these fields.
Socio-cultural context	Very similar **Somewhat similar** Different	Cultural and language barriers seem limited on both sides, but increase with distance from the border. Swedish is an official language in Finland, even if it is not spoken by everyone.
Innovation system interactions	Pervasive **Hub-to-hub** On the border	Some business-related interactions occur at the border (Haparanda-Tornio). The main potential for innovation linkages is between the two main cities of Luleå and Oulu.
Level of innovation development across border	**Balanced, strong** Balanced, weak Unbalanced	Both sides of the Bothnian Arc are relatively advanced regions in terms of innovation performance. The Finnish side appears to be slightly more advanced thanks mainly to assets around Oulu.

Driving force and key actors for the Bothnian Arc cross-border area

Economies of scale and complementarity are two levers for this cross-border region, but a greater involvement of firms in particular, as well as knowledge institutions, is needed to reap such benefits. The driving force for the definition of a cross-border region is to be a dynamic competitive region in the northern periphery of Europe. This is a real challenge for a large area with only 710 000 inhabitants in times where agglomeration in cities is seen as a key ingredient to economic growth and competitiveness. Expanding Oulu's success by capitalising on a larger and proximate pool of assets including the Swedish knowledge and business actors is a priority for the actors driving the Bothnian Arc. The Bothnian Arc Association has a relatively young history, but can rely on a longer tradition of Nordic co-operation. While universities are important players, and companies active followers, they are not in the driving seat for developing collaboration at present.

Table 4.5. **Snapshot of the rationale and relevance for cross-border collaboration: Bothnian Arc**

Driver	Explanation	Relevance for cross-border co-operation (strong, moderate, weak, not present)
Economies of scale	Combine resources for efficiency of investment, larger labour markets or access to wider business and knowledge networks to increase critical mass	Strong
Political influence	Develop greater political power for more financial resources and better dialogue with higher levels of government	Strong
Complementarities	Build on diversity of assets in terms of research, technology and economic base, as well as supply chain linkages	Moderate
Branding	Increase internal recognition of the cross-border area as well as its external attractiveness to firms and skilled labour	Strong
Border challenges	Address the day-to-day challenges associated with flows of people, goods and services (including public services) across the border	Weak

Note: The assessment of relevance relates to the actual relevance in current cross-border collaboration, not necessarily to the potential relevance.

Governance of the Bothnian Arc cross-border area

The governance of the Bothnian Arc area rests on the shoulders of the small Bothnian Arc Association which plays a limited co-ordination and facilitator role. The association's main public stakeholders are municipalities. National and regional authorities, holding decision-making power and budgets in innovation matters, are not involved in the governance of the cross-border area. National and regional policy documents include generic interest in the cross-border dimension, but this interest is not translated into joint or aligned policy instruments. Knowledge institutions and firms are only involved in the Bothnian Arc initiative through concrete projects, but do not explicitly contribute to the vision or to the strategic plans for the cross-border area. This is especially problematic for small and medium-sized enterprises (SMEs), which can be considered as the main engines for the industrial renewal towards new and marketable activities responding to societal challenges.

Some amount of public funding is necessary to pursue the area's strategic goals and develop the cross-border region institutionally, but there is also a lack of private funding. Structural funding for the association is supported in part by the Nordic Council of Ministers. However, the foreseen decline of this source in the near future calls for alternative structural funding sources to complement the limited allocations from municipalities. The major source of public money for cross-border projects is EU Territorial Co-operation funding (Interreg A), which has proven instrumental for raising the awareness of the potential for cross-border co-operation, mostly for universities and large firms. This source is, however, fraught with a number of weaknesses, notably that it tends to fund a collection of projects without much strategic capitalisation linked to regional development goals. Attracting more private funding into cross-border innovation projects is needed, in view of the fact that most of the initiatives implemented under the Bothnian Arc seem to be unsustainable beyond the period of public funding. Availability of private funds is the best way to ensure a good match with market needs for innovation projects.

Table 4.6. **Snapshot of governance characteristics: Bothnian Arc**

(Bothnian Arc in bold)

Characteristic	Specification	Comments
National political capitals	Yes, each side Yes, at least one **None**	The two main cities on both sides, Luleå (SWE) and Oulu (FIN), are distant from their respective capitals, Stockholm and Helsinki.
Longevity of public co-operation	>20 years **10-20 years** <10 years	The Bothnian Arc Association was established in 2002. A 1996 strategy laid some of the foundations for this more recent initiative.
Innovation policy competencies	Balanced, strong **Balanced, weak** Unbalanced	On both the Swedish and Finnish sides of the border, innovation policies are somewhat centralised; however, sub-national entities (regions in Sweden, municipalities in Finland) have some innovation and business development mandates.
Political commitment	Balanced, strong **Balanced, weak** Unbalanced	Commitment for cross-border innovation co-operation in the Bothnian Arc is relatively strong at the municipal level (notably Oulu and Luleå) but weak at regional and national level.
Institutionalisation and legitimacy	Present, strong **Present, weak** Not present	The Bothnian Arc Association is a small entity (two staff) and has limited visibility beyond the mainly municipal public board members.
Actors in governance	**Public sector** University/research actors Firms Mix of actors (triple helix)	Universities, intermediaries and firms are not active partners in efforts to support a vision, strategy or implementation, albeit universities appear more active than firms.
Funding sources	**Mainly public** Mixed public/private Mainly private	The Bothnian Arc Association is funded by member public authorities and the Nordic Council of Ministers. Projects are funded mainly by the EU Territorial Co-operation programme (Interreg A) with some minor private co-financing.

The Bothnian Arc cross-border innovation policy mix

There are interesting cross-border policy experiments but there is a need for more strategic and structural policy instruments to fulfil a common vision for the area's development. Cross-border co-operation in innovation in the Bothnian Arc evolves thanks

to the promotional efforts of the Bothnian Arc Association and from a collection of EU Territorial Co-operation (Interreg A) funded projects. There are no dedicated policy instruments corresponding to the vision of the Bothnian Arc, but rather interesting experiments based on grassroots initiatives from key actors – mainly higher education institutions (HEIs) and local authorities. A main issue concerns the possibility to learn from these initiatives to drive the cross-border partnership in fruitful directions and address the barriers revealed by these projects. The key question faced today by actors of the Bothnian Arc is how to evolve from a situation of mutual exchange of information and a collection of externally funded projects towards aligned projects with joint funding from the countries and regions involved, and ultimately, the development of a joint strategy for the cross-border area.

Table 4.7. **Cross-border policy instruments: Bothnian Arc**

Instruments	Presence in the Bothnian Arc
Strategy and policy development	
Benchmarking and policy learning	
Analytical exercise (i.e. mapping of clusters or value chains, technology foresight exercises)	
Joint branding of the cross-border area	Mayoral collaboration between Oulu and Luleå
R&D support	
Joint public research programmes	Finnish-Swedish collaboration in the wood sector High Bio project Vision System Research Platform Oil Research Prolas (laser-wielding technology) Nordic Interaction and Mobility Research Platform Mätä Jämt 2 (integrated equality and diversity in the workplace)
Joint research infrastructure, shared access to research facilities	
Cross-border private R&D funding programmes (generic and thematic)	Increasing Energy Efficiency in Buildings (public-private) SensorBand in Real Life Environment (public-private)
Technology transfer and innovation support	
Cross-border innovation advisory services (vouchers, intermediaries)	Nordic Business Links
Advisory to spin-off and knowledge-intensive start-ups	Forum for the Industrial Future e-maintenance for industry and SMEs
Other technology transfer centres and extension programmes	
S&T parks and innovation networks	
Cross-border science, technology parks and incubators	
Cluster or network initiatives	Bothnian Arc Steel and Metal Industry project (research) Filmarc (film industry support; training in creative industries)
Human capital investment	
Scholarships/student exchanges	
Joint university or other higher education programmes	Nordic Mining School InnoPreneurship Other joint activities (University of Oulu and University of Luleå)
Talent attraction, retention or mobility schemes and support initiatives (i.e. cross-border placement or information for cross-border commuters)	
Other	

Note: Some of these projects extend beyond the Bothnian Arc area into the wider European Territorial Co-operation cross-border area (Interreg IVA Nord).

Recommendations for cross-border innovation policies in the Bothnian Arc

The potential for cross-border co-operation in innovation in the Bothnian Arc is still under-exploited today. To grasp these opportunities, several new directions are recommended.

Cross-border area: Build on the two urban hubs, collect data and improve internal accessibility to support cross-border innovation potential

- Build on the main innovation hubs of Oulu and Luleå, while also connecting firms in more rural municipalities that have distinctly different industrial profiles.
- Collect cross-border statistics to help guide a potential strategy for the cross-border area, and document the main areas of expertise (public and private actors) in different sectors.
- Identify opportunities for improving internal accessibility within the cross-border area.

Governance: Develop a shared vision and strategy for the Bothnian Arc area, with greater involvement of firms and knowledge institutions

- Develop a joint strategy for the Bothnian Arc to drive cross-border innovation action.
- Seek the involvement of private actors and knowledge institutions (triple helix) in the development of cross-border activities.
- Connect regional and national authorities to the strategy.
- Increase resources to the Bothnian Arc Association to augment its capacity for supporting strategic cross-border development.

Innovation policies and instruments: Communicate more about cross-border area opportunities to support strategic programmes and instruments

- Communicate and diffuse information on the cross-border area's innovation potential and successes.
- Define strategic programmes and actions to increase cross-border, knowledge-based interactions, learning from other cross-border area experiences.

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Chapter 5

Hedmark-Dalarna (Norway-Sweden)*

Hedmark County (Norway) and Dalarna County (Sweden) are both rural, with the border being remote from regional centres. The total population of less than half a million inhabitants spans across almost 58 800 km², with an economic output of USD 22 billion. Efforts to support collaboration at the border focus on the sector of tourism that both share, and which would be facilitated by the construction of one airport to serve both sides. As most science and technology-related assets are located far from the border, the region does not seem to have the relevant conditions for a broad cross-border regional innovation policy since urban centres are perhaps better served by looking towards other locations rather than this border. On the border, efforts for innovation in other forms, such as in marketing and organisational methods in tourism, are more relevant.

* This chapter is an excerpt of Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Hedmark-Dalarna (Norway-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/18, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0r36gls-en.

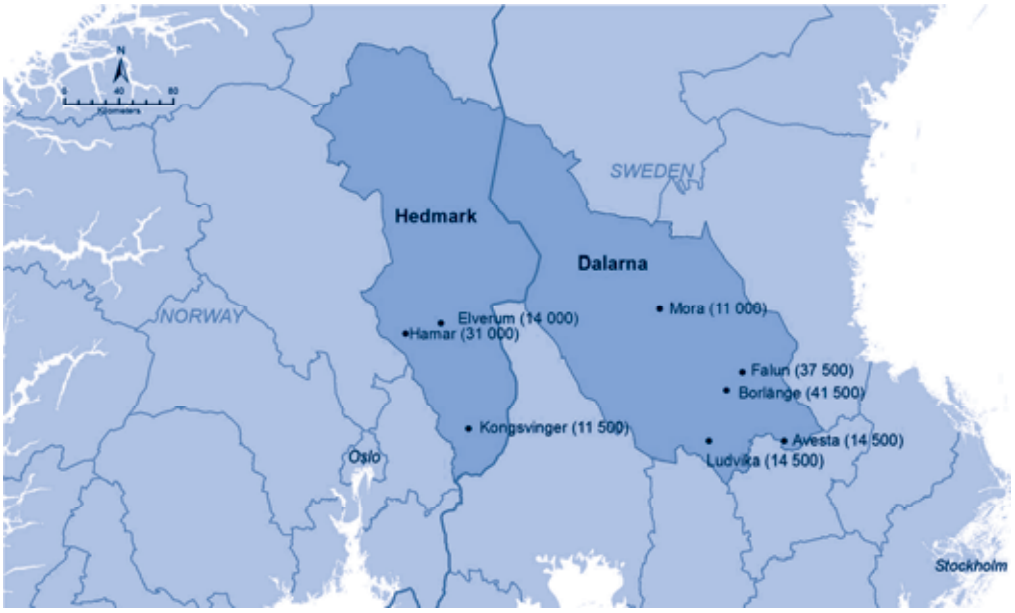
Introduction

Hedmark (Norway) and Dalarna (Sweden) are two bordering rural counties. The area is characterised by unspoilt natural areas, several small municipalities and towns, and no major urban hubs (470 000 inhabitants in total).

Cross-border collaboration between Hedmark and Dalarna has a short history. Compared to other cross-border areas in the European Union, their collaboration is quite recent (less than a decade). Collaboration efforts began in the 1990s, on a limited scale, between the municipalities at the border and focused on tourism. For example, the closest Swedish border municipalities, Älvdalen and Malung/Sälen, have a longer history of co-operation with Hedmark, dating back to 1995, through EU Territorial Co-operation funding (Interreg 2A programme). It was only in 2008 that broader cross-border regional co-operation began. The TRUST ("Growth and Regional Development in Scandinavia Together") project broadened the scope beyond the border municipalities and had the specific goal to strengthen the institutional linkages between the two counties. The period between 2008-12 was the real starting phase of Hedmark-Dalarna cross-border collaboration, and ended with the creation of the Border Committee in 2012, providing a structural basis for this collaboration. Cross-border co-operation has so far been focused on practical border issues rather than on innovation activities.

The young Border Committee is in search of a vision. Local actors identify a mutual interest in building critical mass and improving accessibility to the ski destination along the border. The question for the cross-border area is whether the current joint co-operation opportunity around tourism provides the basis for broader co-operation to promote knowledge-intensive products and services.

Figure 5.1. **The Hedmark-Dalarna cross-border area**



Note: This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries.

Source: Hedmark-Dalarna Border Committee (2013).

Table 5.1. **Socio-economic overview: Hedmark-Dalarna**

Variable	Total	Hedmark	Dalarna
Surface (km²)	57 796	27 398	30 398
Population (2012)	469 356	192 791	276 565
Population density (inhabitants/km²)	8	7	9
Main cities		Hamar	Falun and Börlange
Unemployment rate (2011)		2.7%	7.5%
Employment rate (2011 Norway; 2010 Sweden)		76%	77%
Share of national GDP (2009)		2.9%	2.5%

Source: Hedmark-Dalarna Border Committee.

Table 5.2. **Strengths, weaknesses, opportunities and threats for cross-border innovation policy: Hedmark-Dalarna**

Strengths/assets	Weaknesses/barriers
– Cultural and linguistic proximity – A common specialisation in tourism activities and some potential in forestry-related industries – Attractive and pristine natural areas – Presence of knowledge and support institutions oriented towards regional specialisations – Cluster policies to develop new knowledge-based niches of activities	– Long distances and lack of infrastructure, limiting accessibility between regional centres – Minimal potential for joint knowledge-based activities at the border – Imbalance in wage levels and currencies that impede cross-border collaboration – Depopulation and aging due to outmigration of youth – Limited presence of dynamic and knowledge-intensive small and medium-sized enterprises – Cross-border co-operation limited to public actors with weak involvement of private stakeholders (apart from the tourism industry) – Weak cross-border cluster co-operation
Opportunities	**Threats**
– Growth of the nearby Oslo region – Unique global brand for tourism based on sports, health and green assets – Openness to cross-border co-operation with more knowledge-intensive areas in Inner Scandinavia (such as Akerhus and Värmland counties)	– Competitiveness of traditional industries in high-wage countries – International (and national) competition in tourism destinations; rivalry of respective national tourism promotion

The profile and relevance of the Hedmark-Dalarna cross-border area for innovation

Hedmark-Dalarna cannot be considered a functional region for innovation. While socio-cultural proximity is relatively high, the long distances are a barrier for the development of common economic activities. Connections between the central towns of the two counties are made difficult due to distance, limited infrastructure and lack of public transport. Cross-border commuting and trade flows are also limited, and interactions between the two counties are predominantly among the very sparsely populated border municipalities. The two regions have a common specialisation in tourism and forestry at the border. However, knowledge-based activities are located much farther from the border, are different on each side, and offer limited potential for innovation-related synergies.

Beyond tourism, and potentially the forestry industry, cross-border co-operation offers more perspective at the level of Inner Scandinavia or beyond, rather than between Hedmark and Dalarna. As high-wage regions specialised in industries based on the primary sector and with a relatively large public sector, the counties are challenged to diversify into competitive knowledge-intensive activities. The region is not a knowledge hub within the OECD, but there are ongoing innovation activities on both sides of the cross-border area, principally in the main towns. In both counties, cluster policies are in place to support the diversification of the economy away from capital-intensive industries. The industries which have the most innovation potential (e.g. bioenergy, biotechnology, energy efficiency) are still small and their connections are mostly with actors located outside of the cross-border area. The reality of these connections indicate that accessibility and opportunities may make more sense for Hedmark with the booming Oslo region to the south, and in some cases to key actors in Värmland across the border to the south. For Dalarna, there are also perhaps greater accessibility and innovation-related collaboration with actors in its Swedish neighbour to the south, Värmland. Given distances for some communities at the northern edge of both counties, collaborations with northern neighbours for innovation-related opportunities may also be considered. Greater internal connections of different parts of Inner Scandinavia therefore help the wider region as a whole. Within the Hedmark-Dalarna cross-border area, there are benefits from economies of scale to be reaped in the tourism industry through joint branding and infrastructure (the possible construction of a new airport) but the footprint of this co-operation – the border mountain area – is only a small part of the two counties.

Table 5.3. **Innovation overview: Hedmark-Dalarna**

Variable	Hedmark	Norway	Dalarna	Sweden
Tertiary educational attainment as a share of labour force (2011)	24%	32%	28%	36%
Share of employment in high- and medium-tech manufacturing and services) (2011)	2.4%	5.6%	2.8%	7.3%
Total R&D expenditure as a share of GDP (2009)	0.4%	2.5%	0.7%	3.6%
Business R&D expenditure as a share of GDP (2009)	0.15%	1.1%	0.5%	2.45%
Share of R&D by private sector	42%	43.5%	68%	70.4%
PCT patents per million inhabitants (2008-10)*	88	433	387	929

Note: * Data for Hedmark and Oppland, and Värmland, Dalarna and Gävleborg.

Sources: Hedmark-Dalarna Border Committee (2013); OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en.

Table 5.4. **Snapshot of the functional region for innovation: Hedmark-Dalarna**

Characteristic	Specification	Comments
Region settlement patterns	Metropolitan area Network of small and medium-sized cities **Sparsely populated with small towns**	The two counties are sparsely populated with a few small towns.
Internal accessibility and flows (geographic proximity)	Strong Moderate **Weak**	The connection between the two main centres of the counties is made difficult due to geographic distance and poor infrastructure (roads and public transport).
Industrial and knowledge specialisations (cognitive proximity)	Similar with complementarities Same **Different**	The two regions have a common specialisation in nature-based tourism at the border, and in forestry and wood processing. However, knowledge-based activities are not located on the border and are in different sectors.
Socio-cultural context (social proximity)	**Very similar** Somewhat similar Different	This cross-border area has a similar socio-cultural context, even if national differences in business culture exist.
Innovation system interactions	Pervasive Hub-to-hub **On the border**	Existing cross-border interactions are limited to the border municipalities, specialised in the tourism industry.
Level of innovation development across border	Balanced, strong **Balanced, weak** Unbalanced	Neither region is an OECD knowledge hub, nor are they specialised in primary sector-based activities. On both sides, knowledge-based firms and clusters are emerging, albeit not with cross-border linkages.

Driving force and key actors for the Hedmark-Dalarna cross-border area

Local actors see mutual benefit in building critical mass and improving accessibility to the ski destination lying at the border. The impetus for formal cross-border co-operation was the TRUST ("Growth and Regional Development in Scandinavia Together") project in 2008, which centred on the removal of border obstacles impeding the mobility of people and firm interactions and improving external accessibility. This focus applies particularly to the tourism industry and the natural areas located along the border.

The establishment of a cross-border effort is driven by the local and regional authorities, not by the private sector. The two counties identified the relevance of addressing border obstacles and economies of scale in tourism jointly. Businesses and business support organisations play a limited role in the cross-border co-operation, except for the tourism industry with Skistar, the large Swedish firm managing the ski resorts in the two counties. Its interest in having a better infrastructure (airport) for accessing the area is obvious. Other tourism firms tend to be very small and are only focused on the local market and are not yet in a position to market their offer to a wider clientele. However, they can exploit linkages with larger firms in the tourism sector to develop higher-end products.

Co-operation between higher education institutions (HEIs) goes beyond the cross-border area. The small university colleges located in the region have an interest in developing research linkages with larger universities, located outside of the area. Because of their orientation towards regional specificities, they have, however, developed some joint activities in distance learning and in connection with the needs of the tourism industry.

Table 5.5. **Snapshot of the rationale and relevance for cross-border collaboration: Hedmark-Dalarna**

Driver	Explanation	Relevance for cross-border co-operation (strong, moderate, weak, not present)
Economies of scale	Combine resources for efficiency of investment, larger labour markets or access to wider business and knowledge networks to increase critical mass; often used to overcome peripherality	Strong
Political recognition	Increase the recognition and strengths of areas that are far from capitals to better negotiate and compete for resources from higher levels of government	Weak
Complementarities	Build on diversity of assets in terms of research, technology and economic base, as well as supply chain linkages	Weak
Branding	Increase internal recognition of the cross-border area as well as its external attractiveness to firms and skilled labour	Moderate
Border issues	Address the day-to-day opportunities and challenges associated with flows of people, goods and services (including public services) across the border	Moderate

Note: The assessment of relevance relates to the actual relevance in current cross-border collaboration, not necessarily to the potential relevance.

Governance of the Hedmark-Dalarna cross-border area

Cross-border collaboration between Hedmark and Dalarna counties has a short history. Some border communities in Sweden have had a longer collaboration with Hedmark, dating back to 1995. However, it was only in 2008, with the TRUST project, that broader regional co-operation took off. Prior cross-border efforts were less formalised and on a smaller scale. TRUST broadened the scope of collaboration from border municipalities to the county level and had the specific goal of strengthening the institutional linkages between the two counties. The programme period 2008-12 was the real starting phase of Hedmark-Dalarna cross-border collaboration, culminating in the creation of the Border Committee in 2012 that provides a structural basis for this collaboration.

The Border Committee provides a focal point for cross-border co-operation, but it has a marginal role in the institutional landscape of the two regions. Its mandate remains very generic and there is no integrated action plan for co-operation between Hedmark and Dalarna. The business development departments of the two counties lack the remit and resources to develop joint actions and policies to support the vision endorsed by the Border Committee. Hedmark-Dalarna co-operation does not appear in the regional development plans of either county; however, the plans share a priority focus in the tourism sector.

Funding sources for cross-border projects are mostly public, from the Nordic Council of Ministers and the European Union. The structural work of the Border Committee is funded by local authorities and the Nordic Council of Ministers. Projects are essentially funded by the European Territorial Co-operation programme (Interreg) and matched by national Norwegian co-funding. No cases of private sector funding for cross-border activities are recorded. National and regional funding sources, targeting notably cluster development, cannot cross borders.

Table 5.6. **Snapshot of governance characteristics: Hedmark-Dalarna**

(Hedmark-Dalarna in bold)

Characteristic	Specification	Comments
National political capitals	Yes, each side Yes, at least one **None**	The cross-border region only involves cities of small size, even in their national context, and rural areas.
Longevity of public co-operation (social proximity)	>20 years 10-20 years **<10 years**	Co-operation between the two counties is recent and focused on border municipalities. Some co-operation among border communities had been in place previously, dating back to 1995.
Innovation policy competencies (institutional proximity)	Balanced, strong **Balanced, weak** Unbalanced	The institutional set-up is similar in the two countries, as both counties have relatively limited competences in innovation and thus rely on national funding sources.
Political commitment (institutional proximity)	Balanced, strong **Balanced, weak** Unbalanced	Political support is weak beyond the joint interest in having an airport at the border and other practical cross-border issues.
Institutionalisation and legitimacy (institutional and social proximity)	Present, strong **Present, weak** Not present	The Border Committee provides a focal point for cross-border co-operation but it has a marginal role within the institutional set up of the respective counties.
Actors in governance	**Public sector** University/research actors Firms Mix of actors (triple helix)	The public sector commitment is not matched by strong bottom-up engagement of universities, firms or other actors.
Funding sources	**Mainly public** Mixed public/private Mainly private	Funding sources are mostly public, from the Nordic Council of Ministers and the European Territorial Co-operation (Interreg) in addition to national Norwegian co-funding.

Hedmark-Dalarna cross-border innovation policy mix

No cross-border policies cover Hedmark-Dalarna, there are only a few projects funded by the European Territorial Co-operation programme. These are forums and demonstration platforms in domains such as green energy (FEM project), the tourism sector (SITE) or at the intersection between the two sectors (GREEN 2020).

Table 5.7. **Cross-border policy instruments: Hedmark-Dalarna**

Instruments	Programmes
Strategy and policy development	
Benchmarking and policy learning	
Analytical exercise (mapping of clusters or value chains, technology foresight exercises)	SITE
Joint branding of cross-border area	SITE
R&D support	
Joint public research programmes	
Joint research infrastructure, shared access to research facilities	
Cross-border private R&D funding programmes (generic and thematic)	
Technology transfer and innovation support	
Cross-border innovation advisory services (vouchers, intermediaries)	
Advisory to spin-off and knowledge-intensive start-ups	
Other technology transfer centres and extension programmes	
Science & technology parks and innovation networks	
Cross-border science, technology parks and incubators	
Cluster or network networks initiatives	FEM network on renewable energy, energy efficiency and environment and GREEN 2020 in energy savings for ski resorts

Table 5.7. **Cross-border policy instruments in Hedmark-Dalarna** (*cont.*)

Instruments	Programmes
Human capital	
Scholarships/student exchanges	
Joint university or other higher education programmes	UNISKA university network (covering Inner Scandinavia), specific co-operation between the University Colleges of Hedmark and Dalarna
Talent attraction, retention or mobility scheme; cross-border labour market assistance	
Other instruments	
Financing (venture capital funds or angel networks)	
Public procurement	
Other	

Recommendations for cross-border innovation policies in Hedmark-Dalarna

The search for economies of scale as well as addressing accessibility issues in the tourism sector are relevant goals that could be complemented by a distinctive "sports, health and green" offer. Given the competitive pressures on tourism industries worldwide, it seems appropriate that the areas in Hedmark and Dalarna join their assets to develop an offer that is marketed internationally. Improving external accessibility is necessary for developing the industry. Forward-looking cost-benefit studies, complemented by risk analyses, should inform the stakeholders on the feasibility of an international airport in the vicinity of this touristic area. This connectivity issue is not the only one to be solved. The marketing of a distinctive image, based on unique assets and innovative products and services, is essential for this high-cost tourism area to be competitive. The distinctive local assets contribute to a "sports, health and green" image. This would give several actors, notably the university colleges, the opportunity to participate in upgrading skills and the innovative potential of the sector.

Cross-border co-operation opportunities appear to be limited in other sectors; therefore pursuing them requires that the benefits outweigh costs. Actors from the construction and timber industry have mentioned some potential for co-operation, albeit some key actors may be located in other nearby counties. Teknikdalen and Tretorget (respectively a Swedish entity focusing on SMEs and innovation and a Norwegian agency promoting innovation in the wood processing sector in Hedmark) could play a central role in exploring other sectors and the possibility of joint use of specialised innovation coaches. Further collaboration possibilities between the university colleges, in the area of lifelong and distance learning in particular, makes sense, again in a broader context than the two counties, given the large geographical distances between urban centres in the two regions. Joint services that address the common challenges of these peripheral and sparsely populated areas (e.g. in the health sector), may be another useful area for exchanges, and possibly further development of joint innovative services between the two counties.

Cross-border area: For innovation partners, consider neighbouring Norwegian and Swedish counties of Inner Scandinavia, notably to the south

- Tourism co-operation at the smaller scale of the border municipalities makes sense.
- Promote proximity innovation co-operation activities, outside of the tourism sector, with relevant partners beyond Hedmark-Dalarna, notably to the south.

Governance: Expand the governance frameworks to include non-public actors ("triple helix") for innovation co-operation, with project financing from existing national programmes

- Associate private and knowledge actors in cross-border governance in a broad sense.
- Allow for cross-border funding in national programmes such as Vinnväxt (Vinnova, Sweden) or Arena (Innovation Norway), subject to demonstration of cross-border value-added.

Innovation policies and instruments: Explore joint cross-border initiatives of mutual benefit and where benefits outweigh costs

- Explore the relevance of joint activities of knowledge parks and innovation intermediaries (Innovation Centre Hedmark, Teknikdalen).
- Explore joint activities in distance learning and joint education, particularly in tourism and forestry-related industries.

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Chapter 6

Helsinki-Tallinn (Finland-Estonia)*

Estonia and Finland have centuries of collaboration, mainly between the capital areas of Tallinn and Helsinki that currently account for 2 million inhabitants and USD 76 billion in economic output. The entry of Estonia into the European Union and, since the mid-2000s, a two-hour ferry trip, have both facilitated flows of people and merchandise across the Gulf of Finland. The different levels of development between Helsinki and Tallinn result in many asymmetric flows (workers to Helsinki, tourists to Tallinn). Beyond infrastructure and labour market issues, there are interesting opportunities for joint innovation policy efforts given their shared strengths such as in ICT, a dynamic start-up environment and technologically sophisticated public services. Cross-border collaboration can help build an "entrepreneurial knowledge region" brand.

* This chapter is an excerpt of Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Helsinki-Tallinn (Finland-Estonia) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/19, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lrt1r6-en.

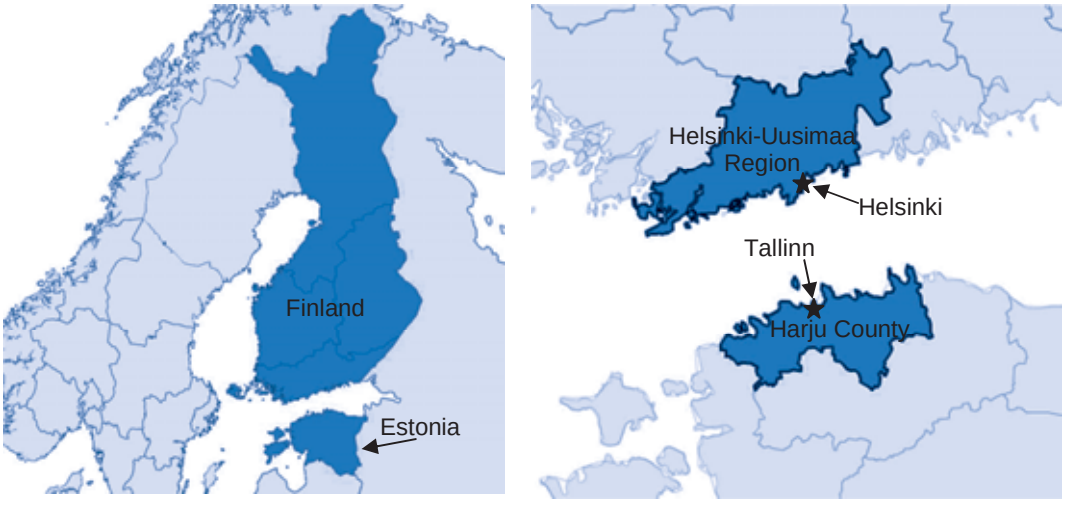
Introduction

Finland and Estonia have experienced centuries of economic and cultural exchanges, which have increased in recent decades thanks to the consecutive accession of the two countries to the European Union (Finland in 1995 and Estonia in 2004). Since regaining independence in 1991, Estonia is keen to develop as a dynamic and vibrant nation, building in part on the success of its northern neighbour across the gulf. Economic exchanges (trade, work, tourism, education, etc.) between the two countries have grown as barriers have been steadily lowered. Factors supporting greater exchange include: improved transport connections (notably a high-speed ferry), lowering of border barriers within the EU, and adoption of the euro (in 2002 for Finland and 2011 for Estonia).

Finland and Estonia share common challenges and opportunities within a larger Baltic Sea context. As small economies, the two countries are aware that they have to create international linkages to succeed in global competition. Fostering proximity linkages with close neighbours is one way to tackle this challenge. Attracting investment to this part of the Baltic Sea region is a benefit for both countries. The progress in Baltic Sea integration (notably through the establishment of the Rail Baltic Network and energy grid connections) as well as the closeness to Russian markets are additional shared opportunities. Two "Wise Men" reports on the bilateral collaboration opportunities (2003 and 2008) were commissioned by the respective Prime Ministers, paving the way for new forms collaboration.

The Helsinki-Tallinn Euregio was established in 1999 as a network, and as a non-profit association in 2003, for exchange between the Finnish and Estonian capital regions. Many subjects have been raised in the cross-border partnership, ranging from connections in Europe, identification of joint problems, academic co-operation, improving the business environment, joint social services and cultural activities, transport infrastructure, etc. A decade after formally establishing the Euregio, it is now time to assess further the potential for developing Helsinki-Tallinn as a knowledge-driven cross-border region.

Figure 6.1. **The Helsinki-Tallinn cross-border area**



Note: This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries.

Sources: OECD (2013), OECD eXplorer, www.oecd.org/gov/regional-policy/oecdexplorer.htm (accessed 15 October 2013).

Table 6.1. **Socio-economic overview: Helsinki-Tallinn**

Variable	Helsinki (Uusimaa)	Tallinn (Pohja-Eesti)
Surface (km²)	6 371	4 333
Population (2009)	1 405 974	524 938
Population density (inhabitants/km²)	222	121
Main cities (population)	Helsinki (600 000)	Tallinn (405 500)
Unemployment rate (2009)	6.19	11.85
GDP per capita (USD PPP, constant prices 2005) (2009)	42 396	25 364

Note: Uusimaa and Pohja-Eesti are the corresponding TL3 regions including the two metropolitan areas of Helsinki and Tallinn respectively.

Sources: Helsinki-Tallinn Euregio (2013), "Background report for OECD study on cross-border regional innovation policies: Helsinki-Tallinn"; OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en.

Table 6.2. **Strengths, weaknesses, opportunities and threats for cross-border innovation policy: Helsinki-Tallinn**

Strengths/assets	Weaknesses/barriers
– Strong economic, political and cultural ties – Increasing degree of cross-border economic integration through mobility and trade – Joint efforts for twin city and broader regional efforts (for example, the current Helsinki-Tallinn Euregio) – Support organisations working on both sides of the border – Proximity in innovation policy frameworks – Entrepreneurial culture and cross-border initiatives in entrepreneurship – Complementary expertise in ICT applications and, particularly in Estonia, strengths in public e-services – Innovation culture that goes beyond technology (Nordic design, living labs, the Aalto model, etc.) – Improving geographic accessibility – Both countries have the same currency and EU membership	– Unbalanced level of economic and innovation performance between the two sides – Unbalanced trade and mobility linkages (workers to Finland, tourists to Estonia) – Insufficient knowledge of actors and assets on the other side of the border – Differences in public administration culture – Low level of legitimacy and political support of Euregio, risk of losing co-operation momentum – Knowledge-based development a core element of the Helsinki-Tallinn Euregio strategy, but less so with respect to the overall co-operation activity – Constellation of cross-border projects but no overall strategy for innovation support
Opportunities	**Threats**
– Proximity to the Russian Federation and increasing integration within the Baltic Sea region (including the Rail Baltic EU project) –Building on Finnish-Estonia national level co-operation efforts – Increased global co-operation through Finnish-Estonian synergies in innovation strengths – Branding and positioning the cross-border area as a start-up/e-service/open data region in a global context (entrepreneurial knowledge region)	– Less global visibility relative to other Nordic innovation hubs – Helsinki-Tallinn as a mere corridor in Baltic Space, with few economic spillovers – Brain drain from both capital cities out of the cross-border area to other globally competitive hot spots

The profile and relevance of the Helsinki-Tallinn cross-border area for innovation

The twin-city region of Helsinki-Tallinn includes the capital regions of Finland and Estonia, separated by the 65 kilometre-wide Gulf of Finland. The trade ties and mobility flows between the two countries have grown in the last few years, triggered by Estonian accession to the EU and the adoption of the euro by both countries. The cross-border area

is one element in the larger Baltic Sea region. The definition of the cross-border region could extend from Tallinn to all of Estonia for innovation given: the small size of the country; the ability to influence national policy; and because the second city of Estonia, Tartu, has long-standing scientific ties with the Helsinki area.

Helsinki-Tallinn is an asymmetric area in terms of size and economic performance, but Estonia is catching up. Between 1999 and 2009, Estonia had an average annual economic growth rate of around 5%, higher than the average OECD rate of 1.4%. Estonia is one of the leading countries in Central and Eastern Europe with respect to foreign direct investment (FDI) per capita. However, the economic performance gap with Finland remains wide (the GDP per capita of the Tallinn area is 60% of that for Helsinki). Cost differences between the two economies remain significant. Many Finnish companies invest in Estonia to take advantage of cost differentials. Estonian investments in Finland are of a much lower magnitude. Mobility trends also reflect this asymmetry, as workers cross the border from Estonia to Finland to benefit from higher wages. Finns travel to Estonia mainly for tourism. Nevertheless, cross-border accessibility is an issue. Connectivity barriers prevent Helsinki-Tallinn from reaching its full potential as a functional region.

There is a clear potential to exploit complementarities in advanced ICT applications across the area, as well as science co-operation. In Estonia, the societal use of ICT is well developed, in the form of a variety of innovative mobile and e-applications. Finland could build on these advances to develop innovative businesses, as Estonia is a test bed for e-services. The strong science and technology (S&T) capacity in Finland matches well with entrepreneurship dynamics, especially in ICT, on the Estonian side. Public R&D co-operation is mostly multilateral (rather than bilateral between the two countries only) and involves Tartu. Cross-border student flows are rising, but more so from Estonia to Finland than the reverse. Cultural differences are present, but they are explicitly acknowledged and often seen as opportunities.

Table 6.3. **Innovation overview: Helsinki-Tallinn**

Variable	Southern Finland	Estonia	OECD peer average: Knowledge and technology hubs[1]
Tertiary educational attainment as a share of labour force (2008)	39	--	30.8
R&D personnel (2010) (as a % of total employment)	3.6	1.7[2]	2.7
Share of employment in high-tech manufacturing (2008)	44.5	--	49.2
Share of employment in knowledge-intensive services (2008)	57.9	--	56.7
Total R&D expenditure as a share of GDP (2009)	3.8	2.4[2]	3.9
Business R&D expenditure as a share of GDP (2009)	2.6	1.5[2]	2.9
Share of R&D by the private sector (2009)	68.4	62.5	74.3
PCT patents per million inhabitants (average 2008-10)	342	34	260

Notes: 1. Only EU regions for R&D expenditure and personnel variables. 2. Data are for 2011.

Sources: OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en; Eurostat; Helsinki-Tallinn Euregio (2013), "Background report for OECD study on cross-border regional innovation policies: Helsinki-Tallinn".

Table 6.4. **Snapshot of the functional region for innovation: Helsinki-Tallinn**

(Helsinki-Tallinn in bold)

Characteristic	Specification	Comments
Region settlement patterns	**Metropolitan area** Network of small and medium-sized cities Sparsely populated with small towns	Helsinki-Tallinn is characterised by the presence of two medium-sized metropolitan areas on both sides (Helsinki and Tallinn) that are also respective national capitals.
Internal accessibility and flows	Strong **Moderate** Weak	Helsinki and Tallinn are separated by the 65 kilometre-wide Gulf of Finland. Flight and fast ferry connections provide linkages between the two cities. Despite improvements, the time and cost of crossing the gulf limits integration of the area.
Industrial and knowledge specialisations	Similar with complementarities Same **Different**	The two regions have different economic structures and levels of development. There are, however, several areas of common specialisation, such as for ICT applications.
Socio-cultural context	Very similar **Somewhat similar** Different	Despite cultural and linguistic differences, the two regions have a long history of exchanges and a good degree of mutual understanding.
Innovation system interactions	Pervasive **Hub-to-hub** On the border	Most innovation interactions take place between the two urban hubs. They are limited to a relatively small number of actors. Science collaboration also includes the University of Tartu, further south in Estonia.
Level of innovation development across border	Balanced, strong Balanced, weak **Unbalanced**	There is an imbalance between the two sides of the cross-border area, with Helsinki being a highly knowledge-intensive hub and Tallinn displaying lower overall values on most common innovation-related indicators, although it is improving fast. Estonia is internationally recognised for its excellence in IT and e-services.

Driving force and key actors for the Helsinki-Tallinn cross-border area

The main rationale for establishing a Helsinki-Tallinn cross-border area is to address the challenges associated with increased cross-border mobility of freight and people. The improvement of transport infrastructure within, around and between the two capital regions is the primary focus of public sector attention. This concerns both local linkages within the cross-border area and the role of the area as a hub in broader transport flows within the Baltic Sea region.

Overcoming peripherality, through greater critical mass, is another important objective. Policy efforts to take advantage of complementarities in the cross-border area do not target knowledge assets but rather a division of labour according to price differentials. While the idea of science twin-cities has been raised since the early times of cross-border co-operation, it has not yet been operationalised. The two high-level Wise Men reports on Finnish-Estonian co-operation from 2003 and 2008 provided several recommendations pertaining to the development of cross-border research and education. Joint branding is another opportunity, but not one currently as high on the collaboration agenda.

There are several barriers to cross-border co-operation. Major firms and higher education institutions tend to view co-operation opportunities on a broader international scale rather than consider nearby cross-border opportunities. Public funding sources, such as the EU Framework Programme, requires multilateral over bilateral collaboration. The

current use of EU Structural Funds on both sides only encourages local activities. The lack of a clear identification of collaboration potential across the gulf is another barrier for firms and other actors to enter into cross-border partnerships.

Table 6.5. **Snapshot of the rationale and relevance for cross-border collaboration: Helsinki-Tallinn**

Driver	Explanation	Relevance for cross-border co-operation (strong, moderate, weak, not present)
Economies of scale	Combine resources for efficiency of investment, larger labour markets or access to wider business and knowledge networks to increase critical mass; often used to overcome peripherality	Moderate
Political recognition	Increase the recognition and strengths of areas that are far from capitals to better negotiate and compete for resources from higher levels of government	Not present
Complementarities	Build on diversity of assets in terms of research, technology and economic base, as well as supply chain linkages	Moderate
Branding	Increase internal recognition of the cross-border area as well as its external attractiveness to firms and skilled labour	Weak
Border issues	Address the day-to-day challenges and opportunities associated with flows of people, goods and services (including public services) across the border	Strong

Note: The assessment of relevance relates to the actual relevance in current cross-border collaboration, not necessarily to the potential relevance.

Governance of the Helsinki-Tallinn cross-border area

Cross-border co-operation is currently institutionalised through a co-ordination body, Helsinki-Tallinn Euregio NPA, which is a non-profit association of several public authorities. The Euregio Secretariat provides some technical assistance behind the scenes, but lacks the recognition of many leading public and private actors. The governance of cross-border activity only involves public actors, with weak participation of innovation actors. Euregio has been quite active in generating and collecting data on cross-border flows of freight, goods and people as part of the latest project H-TTransplan; data which are useful to monitor the level of integration of the area. However, data on knowledge potential and flows are less available, limiting awareness and the development of cross-border innovation policies and programmes.

National and regional innovation policies do not explicitly incorporate the goal of fostering cross-border co-operation in innovation, and national policy instruments do not allow cross-border funding. Aligning programmes across borders (through joint calls with separate funding flows) is also not practiced. Public funding for cross-border co-operation in innovation is mainly provided by the European Territorial Co-operation programme (Interreg) through the Southern Finland-Estonia sub-programme. This funding source, like in other cross-border areas, suffers from a number of deficiencies for financing cross-border activities with a science or innovation focus.

Table 6.6. **Snapshot of governance characteristics: Helsinki-Tallinn**

(Helsinki-Tallinn in bold)

Characteristic	Specification	Comments
National political capitals	**Yes, each side** Yes, at least one None	The cross-border area includes the wider capital area (city-region) on each side. This creates close relationships with national governments and institutions.
Longevity of public co-operation (social proximity)	>20 years **10-20 years** <10 years	Cross-border activities started with the establishment of Euregio, as an informal network in 1999 and a formal body in 2003. Note that management of the Interreg programme is performed by another entity, although Euregio has managed many Interreg projects.
Innovation policy competencies (institutional proximity)	Balanced, strong **Balanced, weak** Unbalanced	On both sides, the main competences for innovation policy are located at the national level. However, both Finnish and Estonian counties and cities are active in business development promotion.
Political commitment (institutional proximity)	Balanced, strong **Balanced, weak** Unbalanced	There is political alignment at the national level on the wish to deepen co-operation linkages between the two countries, as well as twin-city action. The overall commitment may be somewhat stronger from the Estonian side.
Institutionalisation and legitimacy (institutional and social proximity)	Present, strong **Present, weak** Not present	Helsinki-Tallinn Euregio is a dedicated institution responsible for the promotion of cross-border relationships. Its visibility and its mandate are limited and its future sustainability uncertain.
Actors in governance	**Public sector** University/research actors Firms Mix of actors (triple helix)	The governance of the Euregio involves the public sector, and there are no other formal consultation bodies or working groups for wider stakeholder participation (i.e. firms and universities).
Funding sources	**Mainly public** Mixed public/private Mainly private	Most of the joint activities in the innovation area are funded through the European Territorial Co-operation programme (Interreg). Private co-financing of these activities remains low.

Helsinki-Tallinn cross-border innovation policy mix

The most significant joint initiatives under the cross-border partnership between Helsinki-Tallinn concern transport and infrastructure development, with a few in the field of innovation. Such innovation activities include a number of temporary initiatives aimed at mutual exchanges in entrepreneurial activities. There are currently no joint policies. Most projects are temporary and funded by the European Territorial Co-operation programme (Interreg) to develop mutual knowledge and joint actions in the area of entrepreneurship, particularly related to the ICT sector. Some projects (twin-city of science launched in 2004 and the Knowledge Arena programme since 2006) have also promoted contacts between academics for common scientific projects.

Life sciences, ICT and new materials are areas which have been identified as having potential for joint knowledge-based activities. Helsinki and Tallinn are test bed medium-sized cities for advanced smart city applications. Bilateral co-operation agreements exist between universities in the Helsinki-Tallinn area. Joint university participation in multilateral R&D projects is probably more intense than bilateral co-operation. Several types of joint academic activities in education and research could be further explored, with innovation goals in mind.

Table 6.7. **Cross-border policy instruments: Helsinki-Tallinn**

Instruments	Programmes/initiatives
Strategy and policy development	
Benchmarking and policy learning	
Analytical exercise (mapping of clusters or value chains, technology foresight exercises)	Several reports and research, although not always with the cross-border innovation aspect as the central theme of research
Joint branding of cross-border area	
R&D support	
Joint public research programmes	Cross-use of experts for projects evaluation
Joint research infrastructure, shared access to research facilities	Mainly in the framework of ESFRI or larger consortia (e.g. Sweden Max IV) Joint discussion in the two research councils
Cross-border private R&D funding programmes (generic and thematic)	
Technology transfer and innovation support	
Cross-border innovation advisory services (vouchers, intermediaries)	Finnish-Estonian Chamber of Commerce Finnish-Estonian Trade Association
Advisory to spin-off and knowledge-intensive start-ups	StartSmart
Other technology transfer centres and extension programmes	
S&T parks and innovation networks	
Cross-border science, technology parks and incubators	Mutual contact points in science parks and incubators; Office of Helsinki School of Economics in Tallinn Technology Park Tehnopol; joint mentoring programme under development, networks between southern Finnish and Estonian business incubators
Cluster or networks initiatives	
Human capital	
Scholarships/student exchanges	
Joint university or other higher education programmes	Joint doctoral schools
Talent attraction, retention or mobility scheme; cross-border labour market assistance	EURES (EU cross-border mobility services)
Other instruments	
Financing (venture capital funds or angel networks)	Business angels working cross-border (not a specific policy *per se*)
Public procurement	
Other	Finnish implementation of data exchange layer infrastructure akin to the Estonian X-Road (facilitating cross-border secure data exchange to support public services and firms)

Recommendations for cross-border innovation policies in Helsinki-Tallinn

Cross-border area: Extend the definition of the cross-border area to Helsinki-Estonia, branded as an "entrepreneurial knowledge region"

- Extend the area to include the whole of Estonia.
- Brand the area as an "entrepreneurial knowledge region".

Governance: Improve governance mechanisms to include a new "innovation" direction, reinforce the co-ordination function and bring in relevant actors

- Involve national governments to raise the profile of cross-border activities.
- Integrate the triple helix of actors in the governance of the cross-border area.
- Further develop the joint work of the two national R&D and Innovation Councils.
- Underpin cross-border innovation policy efforts with a stronger policy intelligence function that provides the relevant analysis and data.

Innovation policies and instruments: Mainstream cross-border innovation into national programmes and focus on impacts and results in areas of strong expertise

- Mainstream cross-border policies in the work of Enterprise Estonia and Tekes (Finland).
- Focus on results and impacts as a next step from the current co-operation platforms.
- Encourage opportunities in joint development of e-society applications where skills in the cross-border area are particularly strong, among other priorities, for an overall strategy.
- Further develop the collaboration on entrepreneurship between incubators, technology centres, universities and venture capital funds.

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Chapter 7

Ireland-Northern Ireland (United Kingdom)*

The island of Ireland, which includes both Ireland and Northern Ireland (United Kingdom), is home to 6.4 million people and has a combined economic output of USD 205 billion. Several cross-border institutions were created in response to the 1998 Belfast/Good Friday Agreement to recreate functional economic linkages across the border. InterTradeIreland is a rare example internationally of a cross-border entity to promote trade and innovation that is co-funded by respective governments. These efforts have led to stability in funding such programmes. The differences between the public sector-driven economy in Northern Ireland and the dual economy of Ireland (outward-looking multinationals and the local small and medium-sized enterprise base) are a challenge for cross-border efforts.

* This chapter is an excerpt of Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Ireland-Northern Ireland (United Kingdom) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/20, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0llxhmr-en.

Introduction

History plays an important role in assessing the potential and barriers for economic cross-border relationships between Ireland and Northern Ireland (United Kingdom). In the 19th century, the island was a poor agricultural region part of the United Kingdom, the epicentre of the industrial revolution. The Great Famine in mid-century led to a 25% drop in the population, including through massive emigration. The northeast part of the island suffered less, as the Belfast area was enjoying the benefits of heavy industrialisation, notably in shipyards and the textile industry. Ireland became independent in 1922, while Northern Ireland remained part of the United Kingdom. Northern Ireland was granted devolved administration status in the United Kingdom in 1998, with its own parliament and devolved government. Since the late 1960s and until the mid-1990s, the people of Northern Ireland endured a period commonly called "The Troubles", with its associated civil unrest along religious lines (Protestant and Catholic). After ceasefires in 1994, the peace process gathered pace and resulted in the Good Friday/Belfast Agreement in 1998.

The period since the Agreement has opened a new era of possibilities for developing cross-border linkages across the island. Institutions and policies have been enacted jointly by Irish and British authorities, with support from the EU and the international community, to promote peace on the island. These institutions serve to restore trust across the border in addition to economic ties. The willingness to "reap the benefits of peace", relying on mutually beneficial exchanges, is currently high on the political agenda. Beyond the contribution of economic exchanges, the new question in this report relates to the potential for innovation-oriented co-operation for the delivery of economic growth, employment and competitiveness on the island of Ireland. Cross-border co-operation is one way to reinforce the strengths of both sides of the border by capitalising on proximity linkages to expand innovation possibilities. Promotion of cross-border co-operation goes hand-in-hand with the promotion of openness towards EU and world markets. The two strategies complement, not substitute, each other.

Table 7.1. **Socio-economic overview: Ireland-Northern Ireland (United Kingdom)**

Variable	Ireland	Northern Ireland
Surface (km²)	70 283	14 148
Population (2011)	4 588 282	1 810 910
Population density (inhabitants/km²)	66	128
Main cities	Dublin – 28% of island population	Belfast – 18% of island population
Unemployment rate (Q2 2012)	14.8%	7.8%
GDP per capita (2009) (USD PPP constant prices 2005)	36 346	24 014

Note: TL3 is the second level down from the national level in administrative terms.

Sources: InterTradeIreland (2013), "Background report for OECD study on cross-border regional innovation policies: Ireland/Northern Ireland", InterTradeIreland, January; OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en.

Figure 7.1. **Ireland-Northern Ireland (United Kingdom): The all-island area and its city-regions**

Grey line denotes border between Ireland and Northern Ireland (UK)

Note: This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries.

Source: Irish Academy of Engineering & InterTradeIreland (2010), *An Infrastructure for an Island Population of 8 Million.*

Table 7.2. **Strengths, weaknesses, opportunities and threats for cross-border innovation policy: Ireland-Northern Ireland (United Kingdom)**

Strengths and assets	Weaknesses and barriers
– Strong political commitment to cross-border relationships – Institutionalisation of collaboration through InterTradeIreland – Structural bi-national funding sources for cross-border efforts, limiting dependency on external funding sources (i.e. European Territorial Co-operation funding) – Development and use of strategic intelligence produced by InterTradeIreland – Cross-border innovation co-operation instruments by InterTradeIreland and their positive impacts – Lack of language barriers and limited cultural barriers	– History of social conflict limiting trust and social capital – Accessibility/proximity challenges for the peripheral areas of the island – Different economic structures and innovation potential (Ireland multinational corporation [MNC] base, Northern Ireland public sector) – Insufficient linkages of Ireland-based MNCs with island-based SMEs (both sides of border) – Weak open innovation practices by many SMEs – Differences in university regulations and study programmes – Limited visibility of InterTradeIreland – Public sector-dominated cross-border initiatives (need for more privately led initiatives)
Opportunities	**Threats**
– Greater critical mass of public research and technology development through national policy – Use of European Cohesion funding sources (e.g. ERDF and ESF) for cross-border innovation – All-island branding for FDI attraction, particularly in key sectors	– Insufficient job creation in the crisis recovery throughout the cross-border – Lack of long-term sustainability of publicly funded efforts

The profile and relevance of the Ireland-Northern Ireland cross-border area for innovation

Two concepts for this cross-border area co-exist: the "narrow border" area and the "all-island" area, with the latter being more relevant for innovation. The narrow definition is mainly a peace- and politically-led definition reinforced by international funding. This narrow definition disconnects the less dynamic parts of the island from its most dynamic parts, thus forming a community of peripheral counties that is a less appealing option for exploiting innovation potential. The focus on innovation activities and partnerships implies a broadening of the relevant spatial scale compared to the traditional treatment of local border issues.

The "all-island" area, while more adapted to cross-border efforts for innovation, is not a functional area. Cross-border flows are below their potential at present in terms of trade, commuting, business networks, access to public procurement, sales of design services, students and tourists, collaboration between research, technology and development (RTD) centres and between these centres and industry. Furthermore, engagement of actors with significant distance from the border can be difficult. Despite a strong socio-cultural proximity, the creation of the border and the resulting conflict had severed many cross-border ties that take time to rebuild.

There are significant differences between the two sides of the "all-island" cross-border area (scale, economy and innovation performance). Ireland generally has stronger economic and innovation performance than Northern Ireland (UK), including dynamism, export openness, attraction of foreign direct investment, intensity of R&D, patenting and SME innovation propensity. Their current industrial structures differ markedly. The Irish economy includes several prominent sectors such as: food and beverages; printing, publishing and reproduction of recorded media; chemicals and chemical products; and electrical and optical equipment. The Irish economy is more of a dual economy, as it has a multinational sector that remains generally disconnected from the local SME base. In contrast, the Northern Ireland economy suffered to a greater extent from industrial restructuring and social unrest, and its economy today is relatively more dependent on the public sector. Its current economic development strategy seeks to rebalance the economy for a greater private sector share, focusing on innovation, R&D and creativity as tools to do so. SME internationalisation and progress in R&D investments could result in important sustainable economic growth and job creation on both sides of the border. Local studies show that SMEs with cross-border linkages perform better than those that do not have cross-border linkages. In some cases, those cross-border linkages serve as a stepping stone for access to EU and world markets.

Table 7.3. **Innovation overview: Ireland-Northern Ireland (United Kingdom)**

Variable	Ireland (Southern and Eastern region)	Ireland (Border, Midland and Western)	Northern Ireland	OECD peer regions average: "Medium-tech manufacturing and service providers"*
Tertiary educational attainment as a share of labour force (2008)	36.4%	29.7%	31.9%	28.1%
R&D personnel (as a % of total employment) (2009)	1.9%	1.4%	1.4%	1.9%
Share of employment in high-tech manufacturing (2008)	42.8%	39.5%	30.9%	39.8%
Share of employment in knowledge-intensive services (2008)	53.9%	48.7%	48.8%	48.9%
Total R&D expenditure as a share of GDP (2009)	1.8%	1.7%	1.6%	1.7%
Business R&D expenditure as a share of GDP (2009)	1.2%	1.1%	1.0%	1.1%
Share of R&D by private sector	70%	66%	63%	65%
PCT patents per million inhabitants (2008-10)	75	81	39	78

Note: Peer regions average: average of the cluster "Medium-tech manufacturing and service providers". *Averages of only EU regions for R&D expenditure and personnel variables.

Sources: OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en; Eurostat.

Table 7.4. **Snapshot of the functional region for innovation: Ireland-Northern Ireland (United Kingdom)**

(Ireland/Northern Ireland in bold)

Characteristic	Specification	Comments
Region settlement patterns	Metropolitan area **Network of small and medium-sized cities** **Sparsely populated with small towns**	The island of Ireland is characterised by the presence of two medium-sized metropolitan areas on both sides (Dublin and Belfast) as well as several smaller cities. Much of the area on the island is sparsely populated.
Internal accessibility and flows	Strong **Moderate** Weak	Motorways connect most of the larger cities; however, the size of the island renders internal accessibility challenging in some parts, such as from the southern and western areas with Northern Ireland.
Industrial and knowledge specialisations	Similar with complementarities Same **Different**	The two regions have different economic structures. There are, however, several areas of common specialisations, such as agri-food and ICT, among others.
Socio-cultural context	**Very similar** Somewhat similar Different	This is a cross-border area with a very similar socio-cultural context. However, some civil unrest related to historical issues has limited other aspects of social proximity and trust.
Innovation system interactions	**Pervasive** Hub-to-hub On the border	Some SME business and community development are addressed at the border, largely supported by EU funds, but most innovation potential is between large urban hubs. InterTradeIreland activities focus on cross-border interactions across the island.
Level of innovation development across border	Balanced, strong Balanced, weak **Unbalanced**	There are several imbalances between the two sides that impact the level of innovation development. Ireland itself is a dual economy. However, looking on an OECD-wide basis, Ireland and Northern Ireland have relatively similar innovation performance as compared to many other OECD regions.

Driving force and key actors for the Ireland-Northern Ireland cross-border area

The main driving force for building the cross-border area is shared political will to capture the peace dividends, including innovation-driven economic growth. This could be supported by creating greater critical mass of innovation-related assets. For example, the Irish and the Northern Ireland authorities are supporting research centres in similar fields: ICT, life sciences, nanotechnology, agri-food and aerospace. In total there are more than 100 centres in Ireland alone, which suggests that there are likely opportunities for

synergies and complementarities across centres on an all-island basis. While the industrial structures do differ, studies have noted opportunities in common areas of specialisation to support collaboration as well as complementarity. Bringing together actors with complementary expertise and linked to different networks and markets could be an opportunity for mutual benefit. While political recognition is not an issue for Ireland since the all-island area includes its capital, many innovation-related resources for Northern Ireland are managed by UK authorities. The need for joint external branding is less of a consideration than in other cross-border areas since some potential FDI investors already take an all-island view, and that approach is used by both sides for tourism.

The key actors for policy in the cross-border area are the Irish and Northern Ireland (UK) governments, which have devolved some aspects of economic development promotion with a cross-border dimension to InterTradeIreland. Respective counterparts are Invest Northern Ireland and Enterprise Ireland. Local authorities (the beneficiaries of European Territorial Co-operation – Interreg – funding) lead efforts for the actions in the "immediate border" area. Bottom-up initiatives play a minor role in the development of cross-border efforts. The so-called "triple helix" appears thus to be unbalanced, with strong public sector involvement but a weaker role for the other two legs, the private sector and higher education/training sector. To address this, InterTradeIreland uses its convening power to bring triple helix partners together and to co-develop programmes.

Higher education and research establishments and firms can therefore play a greater role in innovation in the cross-border area. The main barriers for cross-border linkages among research and technology centres and with companies are: the lack of information on the potential available on the other side of the border and the weak internal incentives for cross-border collaboration. For universities, differences in arrangements for intellectual property, technology transfer management and the organisation of academic studies remain important hurdles for cross-border co-operation in technology transfer and education. For scientific collaboration, their vision is on a global scale. The limited degree of openness of innovation-active companies further hampers the development of cross-border partnerships for innovation.

Table 7.5. **Snapshot of the rationale and relevance for cross-border collaboration: Ireland-Northern Ireland (United Kingdom)**

Driver	Explanation	Relevance for cross-border co-operation (strong, moderate, weak, not present)
Economies of scale	Combine resources for efficiency of investment, larger labour markets or access to wider business and knowledge networks to increase critical mass; often used to overcome peripherality	Moderate
Political recognition	Increase the recognition and strengths of areas that are far from capitals to better negotiate and compete for resources from higher levels of government	Weak
Complementarities	Build on diversity of assets in terms of research, technology and economic base, as well as supply chain linkages	Moderate
Branding	Increase internal recognition of the cross-border area as well as its external attractiveness to firms and skilled labour	Moderate
Border challenges	Address the day-to-day challenges associated with flows of people, goods, and services (including public services) across the border	Weak

Note: The assessment of relevance relates to the actual relevance in current cross-border collaboration, not necessarily to the potential relevance.

Governance of the Ireland-Northern Ireland cross-border area

InterTradeIreland plays the key role in implementing cross-border innovation efforts, with strong political backing. Cross-border economic co-operation has acquired a high level of legitimacy. The concept of "mutual benefit" is at the core of the high-level political commitment for economic relations between Northern Ireland and Ireland. The establishment of InterTradeIreland ensures structural funding and continuity for the promotion of cross-border economic and (increasingly) innovation activities. But there seem to be relatively few strategic linkages between the scattered projects of local authorities in the narrow border area focused on addressing "peripherality" and community-based development (funded by EU Peace and European Territorial Co-operation funds), versus the programmes of InterTradeIreland (funded jointly by respective governments). There are opportunities to use a larger share of European Territorial Co-operation funds and other EU regional funds for promoting cross-border innovation. An active strategy to jointly pursue EU Framework Programme funds with entities on both sides of the border already exists, yet another financing vehicle for building stronger cross-border ties.

One opportunity to strengthen the governance of cross-border co-operation in innovation is greater alignment of policies on both sides. In general, authorities in Ireland have taken a somewhat more open approach to allowing public funding from one jurisdiction to actors from the other, relative to the approach of Northern Ireland. The development of two "smart specialisation" strategies in the context of EU requirements, one for Ireland and one for Northern Ireland, with little connection between the two exercises, limits cross-border co-operation potential. Incorporating the cross-border dimension in the relevant regulatory impact assessment exercises is another tool to align policies so as to facilitate cross-border innovation ties.

Ireland-Northern Ireland cross-border innovation policy mix

There are several publicly funded instruments and initiatives acting on a cross-border basis and an all-island scale. Individual initiatives by different organisations are not tracked and therefore difficult to estimate. The main public instruments are managed by InterTradeIreland, but there are other noteworthy programmes with a cross-border dimension:

- InterTradeIreland delivers a range of company support programmes for cross-border trade and innovation, which are all working cross-border by design and funded by Irish and Northern Ireland authorities, with a total annual budget for programmes of around EUR 8.5 million.
- The Innovation Vouchers scheme is a shared programme between Invest Northern Ireland and Enterprise Ireland, with a EUR 4 million annual budget.
- The US-Ireland R&D Partnership programme promotes joint research activities. The programme is supported by research funding bodies in each of the three jurisdictions. The average annual budget since 2006 has been around EUR 3.5 million. InterTradeIreland plays the role of facilitator.
- European Territorial Co-operation (Interreg), including also Western Scotland, funds some innovation-oriented projects, with an annual average of EUR 3.7 million during the latest seven-year programming period.

Table 7.6. **Snapshot of governance characteristics: Ireland-Northern Ireland (United Kingdom)**

(Ireland-Northern Ireland in bold)

Characteristic	Specification	Comments
National political capitals	Yes, each side **Yes, at least one** None	Dublin is the capital city of Ireland. Belfast is the capital city of the Northern Ireland region, but is located far from the UK capital of London.
Longevity of public co-operation	>20 years **10-20 years** <10 years	Formal cross-border activities for innovation, notably through InterTradeIreland, began after the Good Friday/Belfast Agreement of 1998.
Innovation policy competencies	Balanced, strong Balanced, weak **Unbalanced**	Many decisions for innovation-related instruments are under the remit of the two jurisdictions. While Northern Ireland has a notable degree of autonomy within the United Kingdom as a devolved administration, it does not manage the full range of instruments as is the case in Ireland with full powers in innovation policy.
Political commitment	**Balanced, strong** Balanced, weak Unbalanced	Strong political commitment exists at a very high level in the Ireland, Northern Ireland and the UK governments, due to the unique political and historical circumstances.
Institutionalisation and legitimacy	**Present, strong** Present, weak Not present	InterTradeIreland is the dedicated institution responsible for the promotion of business development and co-operation on a cross-border basis. This is a unique asset for a cross-border area.
Actors in governance	**Public sector** University/research actors Firms Mix of actors (triple helix)	The strong public commitment has not yet been matched by as strong a bottom-up engagement from universities or firms.
Funding sources	**Mainly public** Mixed public/private Mainly private	InterTradeIreland, as well as bodies responsible for EU funds in the two jurisdictions, finance these efforts. Some additional resources from the constituent entities for a specific programme (for example Innovation Vouchers) or a multi-lateral R&D programme with the United States also provide public finds. Private co-financing for participation in InterTradeIreland programmes is generally 50%, but often lower in the case of European Territorial Co-operation programmes.

There is a broad base of joint actions in the cross-border innovation policy mix. This is unusual for cross-border areas and is due to the presence of a dedicated agency. Experimentation is supported by both InterTradeIreland but also European Territorial Co-operation projects that address the immediate border area. Most of these projects tend to be fully publicly funded: this situation creates a difficulty to ensure full adequacy of projects to firm needs, additionality and sustainability after the public funding period. Alignment of policies, such as for the Innovation Voucher programme, is an example of the utility of incorporating the cross-border dimension into respective jurisdiction programmes where relevant. The importance of greater bottom-up engagement of firms, higher education institutions and other intermediaries needs to be further promoted.

The use and effectiveness of instruments implemented, notably by InterTradeIreland, demonstrate that there is a potential for innovation-oriented co-operation on the island. Given the large number of universities, institutes of technology and public research institutions on both sides, opportunities for research co-operation to reach critical mass do exist. Cross-border company networks and clusters in common areas of expertise are also part of the largely untapped opportunities. One more option for new cross-border co-operation relates to the promotion of multinational corporation engagement in innovation partnerships across the island.

Table 7.7. **Cross-border policy instruments: Ireland-Northern Ireland (United Kingdom)**

Instruments	Programmes (Budget amounts annual figures, ITI=InterTradeIreland)
Strategy and policy development	
Benchmarking and policy learning	– ITI supports this task to a certain extent by bringing together both jurisdictions in its Board – Steering groups on public procurement and FP7/Horizon2020
Analytical exercise (like mapping of clusters or value chains, technology foresight exercises)	– First-stop shop line, advisory guide, market reports, statistics and studies on cross-border trade and innovation (ITI)
Joint branding of cross-border area	n/a
R&D support	
Joint public research programmes	– US-Ireland R&D Partnership Programme: single proposal/peer review for collaborative research across three jurisdictions (multi-national competitive process: EUR approx. 3.5 million per year, average annual budget since 2006) – EU Framework Programme preparation: advice, information and funds for preparatory steps to participation (ITI)
Joint research infrastructure, shared access to research facilities	n/a
Cross-border private R&D funding programmes (generic and thematic)	– Innova: funding for private collaborative R&D (ITI: EUR 1.7 million)
Technology transfer and innovation support	
Cross-border innovation advisory services (vouchers, intermediaries)	– Fusion: partnership between SME and higher education institutions through graduate placement (ITI: EUR 3 million) – Challenge: coaching and mentoring programme for SMEs to raise their innovation capabilities (ITI; EUR 0.15 million; all-island) – All-island innovation programme: conferences and events on innovation, in partnership with universities – Interreg funds sometimes used for this instrument
Advisory to spin-off and knowledge-intensive start-ups	n/a
Other technology transfer centres and extension programmes	n/a
S&T parks and innovation networks	
Cross-border science, technology parks and incubators	– Interreg funds sometimes used for this instrument
Cluster or network initiatives	– Interreg funds sometimes used for this instrument
Human capital	
Scholarships/student exchanges	n/a
Joint university or other higher education programmes	– Universities Ireland: exchange of policy and other information – Innovation Academy: for entrepreneurship courses among doctoral students at universities on both sides (run by Trinity College Dublin, University College Dublin and Queen's University, Belfast)
Talent attraction, retention or mobility scheme; cross-border labour market assistance	n/a
Other instruments	
Financing (venture capital funds or angel networks)	– HALO/HBAN: Business angel programme based on business angel syndicates across the island; on the basis that this provides more critical mass and allows the development of more focused expertise through specialised syndicates (e.g. in Medtech) (ITI: EUR 0.4 million) – Equity network and seedcorn business competition: support for companies to secure venture capital funding, business competition (ITI: EUR 0.82 million)
Public procurement	– Go2Tender: support for public procurement by SMEs (ITI)
Other	– Innovation awards: a public-private partnership between ITI and the *Irish Times* to increase awareness of innovation. The *Irish Times* is a daily broadsheet newspaper that is circulated in Ireland and Northern Ireland

Recommendations for cross-border innovation policies in Ireland-Northern Ireland

Cross-border area: Use the all-island definition to include innovation hubs, building on relevant statistics and policy intelligence, to stimulate co-operation and measure its progress

- Use the all-island definition, as opposed to the narrow border area definition, for cross-border innovation support so as to capitalise on the innovation hubs on both sides.
- Continue to provide relevant analyses and statistics on the progress of cross-border flows, in addition to strategic policy intelligence.
- Identify complementary strengths on both sides of the border to stimulate bottom-up cross-border co-operation.

Governance: Build on InterTradeIreland's experience for greater cross-border policy intelligence and more strategic use of innovation-related EU funds (European Territorial Co-operation and Cohesion Funds)

- Adopt a more strategic use of the innovation-related European Territorial Co-operation funds, including by involving InterTradeIreland as a partner to deliver certain programmes.
- Bring the cross-border dimension explicitly into respective efforts for innovation strategy development, such as the current "smart specialisation" strategies, and incorporate the cross-border dimension in mainstream EU Structural Funds programmes.
- Demonstrate the cross-border "additionality" gained through InterTradeIreland instruments, as a basis for future policy development.

Innovation policies and instruments: Ensure consistency of cross-border efforts with strategic objectives, consider cross-border elements in certain domestic policies, build greater bottom-up cross-border support and target InterTradeIreland's efforts by technology or sector

- Ensure cross-border policies and projects are in line with the strategic objectives of both jurisdictions for greater impact and sustainability.
- Consider the cross-border dimension in the programmes managed by Enterprise Ireland and Invest Northern Ireland where relevant, as a complement to the work of InterTradeIreland.
- Encourage stronger cross-border leadership and financing by private and non-profit stakeholders.
- Target InterTradeIreland programmes towards technologies, research fields, sectors or value chains of particular cross-border value added.

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Chapter 8

Oresund (Denmark-Sweden)*

The Oresund is the most well-known example of European cross-border collaboration, building on the metropolitan area around Copenhagen and, across the sound, southern Sweden with the cities of Malmö, Lund and Helsingborg. Cross-border integration intensified following the opening of a fixed-link bridge/tunnel in 2000. Commuting, student flows and cross-border residency have been on the rise in this knowledge-intensive area. Cross-border cluster efforts have had varying degrees of longevity, with Medicon Valley being the most internationally known brand. After hitting a plateau in terms of integration, the area is seeking renewed inspiration for cross-border efforts.

* This chapter is an excerpt of Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of Oresund (Denmark-Sweden) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/21, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lk8knn-en.

Introduction

The Oresund Region enjoys a long history of cross-border interaction and co-operation. Historically, the Swedish region of Skåne was part of the kingdom of Denmark. Under the 1658 Treaty of Roskilde, territories now included in the Skåne region were transferred from Denmark to Sweden, but Danish remained the official language until the early 19th century. The idea of a bridge across the sound was born at the end of the 19th century. Denmark and Sweden, like other countries in the Nordic space, have a long tradition of intergovernmental co-operation. A cross-border Council, made up of politicians from both sides, existed back in 1963 and raised the possibility of a bridge and a joint urban area of "Orestad". The decision to build a bridge was fiercely debated before the final decision was reached to go forward in 1991. At that time, the decline of traditional industries and the closure of shipyards, car and textile factories had visible effects on unemployment figures on both sides of the sound. A political Committee was formally established for the Oresund in 1993, in anticipation of the bridge, to get the most out of the investment once it opened in 2000.

The Oresund is the most widely publicised flagship model of cross-border EU integration. "Borders, bridge and branding" (Hospers, 2006) is a shortcut for the success story. Overcoming border problems thanks to a bridge and with the help of area branding are seen as keys towards the creation of a new, wealth-generating functional region. The opening of the bridge has facilitated the movement of people and goods across the border, in line with the European Union ideal of a space without borders. With the strongly branded Medicon Valley, the value of cross-border science and technology co-operation in high-technology fields, such as life science, has been an important element of the Oresund model.

More than ten years after the symbolic bridge opening, the Oresund is in search of a new chapter for its collaboration. The bridge, while initially the catalyst for greater integration, is no longer sufficient. After integration jumped in the years following the opening of the bridge, the crisis and changing price differentials have contributed to the current stagnation in integration and cross-border mobility. The Oresund Integration Index, capturing various dimensions of the functional area, has slightly declined over the last four years. The delocalisation of large multinational companies and an ageing population are common threats to the cross-border region; therefore, raising its attractiveness is a common need for both sides of the Oresund. For politicians, the bridge is now a past achievement, and a new symbolic vision is needed. Some in the area are looking to the new scientific infrastructure in Skåne as one of the catalysers for renewed co-operation. An increased emphasis on cross-border innovation can be the new engine for cross-border co-operation, with policy efforts that contribute to a positive sum game for both sides.

Figure 8.1. **The Oresund cross-border area**

Note: This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries.

Source: OECD (2013), OECD eXplorer, www.oecd.org/gov/regional-policy/oecdexplorer.htm (accessed 15 October 2013).

Table 8.1. **Socio-economic overview: The Oresund**

Variable	Capital Region of Denmark	Zealand (Denmark)	Total Danish part of the Oresund	Skåne (Sweden)	Oresund
Population (2011)	1.7 million	0.8 million	2.5 million	1.2 million	3.8 million (67% Denmark; 33% Sweden)
Surface (km²) (2011)	2 546	7 217	9 763	11 035	20 800 (47% Denmark; 53% Sweden)
Population density (inhabitants/km²) (2011)	660	113	256	110	178
Main cities	Copenhagen			Malmo, Helsingborg, Lund	
Unemployment rate (2012)	7.8% (2010)	6.7% (2010)	8%	9%	
GDP per capita (USD, PPP, 2009)	46 552	27 938	40 117	32 250	37 703
GDP growth (2000-09)	5.5%	-3.9%	3.4%	13.4%	6.1%

Sources: OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en; Orestat database, www.orestat.se, www.orestat.dk.

Table 8.2. **Strengths, weaknesses, opportunities and threats for cross-border innovation policy: The Oresund**

Strengths/assets	Weaknesses/barriers
– Enhanced internal accessibility after opening of the bridge and increased integration – International airport serving the whole area – Strong endowments in universities, S&T capacities, resources and skills – High level of innovation, strong clusters in life science (Medicon Valley) and cleantech – Infrastructure for start-ups and entrepreneurs – Long history of cross-border co-operation – Linguistic and cultural proximity – Legitimacy, stability and political endorsement with the Oresund Committee – Cross-border vision with ORUS – More strategic use of European Territorial Co-operation (Interreg) funding than in many other cross-border areas, focus on innovation in 2014-20 – Regional and cross-border development strategies with a strong focus on innovation – Numerous cross-border initiatives – Area branding – Presence of cross-border policy intelligence tools (Orestat, Oresund Institute, etc.)	– Stagnating to declining integration post crisis – Termination of significant cross-border initiatives (Oresund University, Oresund Science Region) – Regulatory obstacles for cross-border labour market integration – Imbalance in economic power of the two sides in their national context (stronger in Denmark) – Imbalance in political commitment and citizen identity on both sides of the border (stronger from Skåne) – Relatively weak national interest and support for cross-border co-operation, innovation – Growing regional imbalances between the core and the periphery of the Oresund – Insufficient private sector involvement in strategy and policy development – Dependence on European Territorial Co-operation (Interreg) funding sources; not conducive to private sector participation – Insufficient level of venture capital sources for the entire cross-border area
Opportunities	**Threats**
– Joining forces for accessing EU competitive funds (e.g. getting Knowledge and Innovation Communities [KIC] and large knowledge-based investments) – Large scientific infrastructures such as the European Spallation Source (ESS) as assets for the Oresund international brand – Opportunities in the strong health sector, facilitating cross-border patient mobility – Cross-border perspective in respective national innovation instruments – Additional connections in the cross-border area (metro from Copenhagen to Malmö in the south and tunnel/bridge from Helsingør to Helsingborg in the north) – Further co-operation with neighbouring regions (Oslo-Hamburg corridor), better integration in global hubs	– Common labour shortages leading to increased competition between the two sides for external talent – Stronger global competitors in life science (a key Oresund sector) and other fields – Delocalisation or job cuts of key multinationals (recent examples of AstraZeneca and Nokia) – Future funding difficulties for cross-border data and statistics (Orestat)

The profile and relevance of the Oresund cross-border area for innovation

In the Oresund area, many pre-conditions for a functional region are present. Physical internal accessibility, thanks to the Oresund bridge, and external accessibility, thanks to Kastrup Airport, are both excellent. Efforts to build an "Oresund identity" in a culturally and linguistically similar but still diversified population stand high on the political agenda, albeit the sense of an Oresund identity appears to be much higher on the Swedish side. Both sides of the sound share similar levels of development and present profiles of increasingly knowledge-based economies, with strong universities and innovative companies. Regional strategies across the area share many similar economic development priorities for high-tech areas in life science, ICT, material science or clean technology.

The economic centre of gravity of the Oresund is on the Danish side. With a core around the Copenhagen-Malmö-Lund hub, the respective parts of the Oresund region cover a more important share of the Danish (49%) than the Swedish (11%) economy. Over two-thirds of the 3.8 million population of the Oresund is on the Danish side. Including the Danish Capital Region naturally reinforces the strengths of the cross-border area, but creates internal tensions in Denmark when it looks east to Sweden instead of west to the Jutland peninsula. The Oresund has a core-periphery configuration, as most of the population, economic growth and activity is concentrated in the central area of the Oresund, in direct proximity of the bridge. The Danish Capital Region has the highest GDP per capita (and Zealand the lowest at 60% of that of the Capital Region), but the Swedish side of the sound, Skåne, (81% of the Capital Region GDP per capita) is growing at a faster rate. The Oresund is further nested in the wider Oresund-Kattegat-Skagerrak border region, and in the Baltic Sea macro-region.

Economic and innovation assets of the Oresund are important, but the region still faces threats. Although specialised in services, the Oresund still has a sizeable manufacturing sector in Skåne and Zealand. The region as a whole, and especially its urban core, has a highly educated population (35% of the overall workforce has a tertiary education, above the average of OECD peer knowledge hubs regions at 31%). GDP growth and productivity are, however, not as impressive in a Nordic context. GDP growth has been much lower on the Danish side of the Oresund. Ageing, labour force shortages and growing international competition for its key industries, are common challenges throughout the Oresund. Its specialisation in high-tech industries relies on a few large companies, and their strategic decisions have significant economic impacts on the region. New firm creation dynamics in the Oresund are better than their national contexts (according to Orestat, in 2009, 26% of all new business in Denmark and Sweden were launched in the Oresund region), but not as high in wider comparison.

The Oresund region is a technology hub with excellent innovation potential, world-class scientific infrastructure and a good environment for start-ups. The Oresund accounts for a large share of total Swedish and Danish R&D: its R&D expenditure (4.9% of GDP), mainly of private origin (73%), outperforms national figures. The Oresund has a critical mass of workers in high-technology sectors among its already well-educated labour force. The bi-national region is characterised by a concentration of research-intensive multinational companies, innovative SMEs, and leading higher education and research institutions, specialised in life science and ICT. Pharmaceuticals and electro-medical equipment are its most important high-tech specialisations. Large infrastructure adds to the scientific potential and high-tech image of the region: two large scientific facilities for materials science research are being built, MAX IV and the European Spallation Source (ESS). Their reach extends much further than the cross-border region, but efforts are devoted to stimulate spillovers from the new infrastructure to regional companies. They are also giving a reason for the Danish side to look towards its “little brother”, Skåne, where the facilities are located. Several incubators and other initiatives exist on both sides of the straight to support start-ups in knowledge-based activities.

According to the Oresund Integration Index, labour market integration increased until 2008 and then stagnated, but the index does not capture knowledge and innovation flows. Labour market integration, which is commuting flows mainly from Sweden (of both Swedes and Danish nationals) to Denmark, jumped after the bridge opened. Until 2008, differences in salaries (higher in Denmark), housing prices (higher in Denmark) and unemployment rates (higher in Skåne) had driven these mobility patterns. Subsequently,

the narrowing in housing price differentials, combined with growing unemployment on the Danish side, explain the slight decline in labour and housing market integration. Regulatory, tax and other policy obstacles remain that impede cross-border mobility. There is also an influx of students, more so from Sweden to Denmark, but this flow is hampered by differences in university rules and tuition fee structures. Visa regulations for non-EU citizens are reported to be an obstacle for cross-border mobility of highly skilled workers. The Oresund Committee, comprised of regional and local authorities, lobbies national authorities to resolve the barriers to cross-border integration, in particular the differences in taxation and social security systems. With respect to knowledge and innovation, evidence in the life science sector, for example, shows increased intra-Oresund scientific co-operation over time.

Table 8.3. **Innovation overview: The Oresund**

Variable	Oresund	Denmark	Capital Region of Denmark	Zealand	Sweden	Skåne (Sweden)	OECD peer average: Knowledge and tech hubs*
Tertiary educational attainment (as a % of labour force) (2010, 2008 for OECD peer average)	35	32	39	26	32	33	31
R&D personnel (as a % of total employment) (2009)	--	3.1	5.2	2.7	2.6	2.7 (South Sweden)	2.7
Share of employment in high-tech manufacturing (2008) over total manufacturing employment (%)	--	39	48	44	43	43 (South Sweden)	49
Share of employment in knowledge-intensive services over total service employment (2008) (%)	--	59	63	57	63	62 (South Sweden)	57
Total R&D expenditure as a % of GDP (2009)	4.9 (South Sweden)	3.1	5.3	4.0	3.4	4.7 (South Sweden)	3.9
Business R&D expenditure as a % of GDP (2009)	3.6	2.2	3.8	3.4	2.5	3.5 (South Sweden)	--
Share of R&D by private sector (%)	73%	71%	72%	85%	73%	74%	--
PCT patents per million inhabitants (2008-10 average)	315	207	339	323	309	425	260

Notes: Peer regions average: average of the clusters "Knowledge and technology hubs". For further information see Ajmone Marsan and Maguire (2011). * EU regions only, for R&D expenditure and personnel variables. South Sweden includes the Swedish areas of Skåne and Blekinge.

Sources: Eurostat; OECD (2013), *OECD Regional Statistics* (database), http://dx.doi.org/10.1787/region-data-en; Orestat database, www.orestat.se, www.orestat.dk.

Table 8.4. **Snapshot of the functional region for innovation: The Oresund**

(Oresund in bold)

Characteristic	Specification	Comments
Region settlement patterns	**Metropolitan area** Network of small and medium-sized cities Sparsely populated with small towns	The core of the Oresund is composed of the Capital and Zealand Regions on the Danish side, with Copenhagen as the hub (a relatively small capital in OECD standards). Skåne, on the Swedish side, contains smaller cities, including Malmö, the third largest city in Sweden, and the university town of Lund as well as Helsingborg to the north. The rest of the Oresund region is composed of small towns and rural areas.
Internal accessibility and flows (geographic proximity)	**Strong** Moderate Weak	The Oresund bridge, combined with efficient train connections, ensures strong internal accessibility between the two main conurbations and external accessibility with its major international airport.
Industrial and knowledge specialisations (cognitive proximity)	**Similar with complementarities** Same Different	Both sides of the cross-border region have several areas of common specialisation, such as life science and ICT with complementary potential in universities and companies.
Socio-cultural context (social proximity)	Very similar **Somewhat similar** Different	Danes and Swedes share many common Nordic values, habits and cultural traditions. But business culture differences are reported which create both potential assets as well as difficulties for co-operation.
Innovation system interactions	Pervasive **Hub-to-hub** On the border	Most potential for innovation co-operation and complementarity is between the adjacent urban hubs of Copenhagen and Malmö, but smaller size cities also participate in the interactions, particularly Lund and its university/science infrastructure.
Level of innovation development across border	**Balanced, strong** Balanced, weak Unbalanced	Both sides of the Oresund have high living standards and are knowledge and innovation intensive.

Driving force and key actors for the Oresund cross-border area

Achieving greater critical mass is the main rationale for establishing the Oresund. Reaping the benefits of agglomeration economies by creating a larger metropolitan region, with an integrated labour market, serves to overcome the disadvantages of the area's relative peripherality globally. This is a more important problem for Skåne in a Swedish national context, but even Copenhagen on its own is a small city in a global perspective. Expanding the size of the labour market increases the possibility of skills matching for its workers, therefore overcoming border obstacles for an integrated labour market is a major driving force in building the Oresund. Common drawbacks of metropolitan regions relate to congestion costs as well as higher land and housing prices. The Oresund helps bring the best of both worlds by combining the advantages of the two types of regions, metropolitan (Copenhagen) and intermediary regions (Malmö-Lund).

Exploiting complementarities in knowledge assets is another driving force for the Oresund that has benefits for both sides, though this could be more fully exploited. The bi-national life science cluster is a flagship initiative within the Oresund, supported by the Medicon Valley Alliance (MVA), that contributes to the region's international visibility.

While MVA promotes external linkages to global life science knowledge hubs, the potential for collaboration projects across the border remains under-exploited, in part due to the loss of a key pharmaceutical player on the Swedish side (AstraZeneca). Actors in other sectors, such as food, ICT and cleantech, are also working towards the goal of mobilising their strengths to reap benefits from cross-border collaboration, but lessons should be drawn as to why several previous cross-border cluster associations have essentially reverted back to only one side of the Oresund.

Branding is another goal in the Oresund project. From the mid-1990s, many "O" organisations and initiatives were born to give life to the "Oresund" brand. This has been used for developing an internal identity and networking. It has also helped with international profiling, along with the MVA. Several possible new brand names for the region have been under discussion.

Table 8.5. **Snapshot of the rationale and relevance for cross-border collaboration: The Oresund**

Driver	Explanation	Relevance for cross-border co-operation (strong, moderate, weak, not present)
Economies of scale	Combine resources for efficiency of investment, larger labour markets or access to wider business and knowledge networks to increase critical mass; often used to overcome peripherality	Strong
Political recognition	Increase the recognition and strengths of areas that are far from capitals to better negotiate and compete for resources from higher levels of government	Moderate
Complementarities	Build on diversity of assets in terms of research, technology and economic base, as well as supply chain linkages	Moderate
Branding	Increase internal recognition of the cross-border area as well as its external attractiveness to firms and skilled labour	Strong
Border issues	Address the day-to-day opportunities and challenges associated with flows of people, goods and services (including public services) across the border	Strong

Note: The assessment of relevance relates to the actual relevance in current cross-border collaboration, not necessarily to the potential relevance.

Governance of the Oresund cross-border area

Governance is institutionalised through the Oresund Committee and supported by several public, private and non-profit organisations. The Oresund Committee gathers several regional and local authorities in the area. National authorities (observers until 2006), firms and universities are not members. The Committee is supported by a ten-person Secretariat. It is complemented by a number of specialised organisations, such as Oresund Direkt to support cross-border labour market integration, and the Oresund Institute which carries out studies on the area. Private voluntary initiatives, such as the Oresund Chamber of Commerce and StudentSamarbetet Oresund, also reinforce cross-border collaboration. The Oresund Business Council, the former Oresund University and the Oresund Committee represent the bi-national triple helix actors that played key roles in the origin and development of the Oresund as a formal cross-border initiative. The Orestat initiative, a project funded by the European Territorial Co-operation programme, produces cross-border statistics which are useful for strategy development. However, the longevity of this database is threatened by insufficient national support.

The Oresund has a vision, but not yet an implemented joint strategy. ORUS is the Regional Development Strategy adopted by the Committee in 2010. It includes a long-term vision for the area for 2020 and focuses on four themes, one of them being "knowledge and innovation". This is one step ahead of most other cross-border regions, whereby the strategy is limited to *ad hoc* projects. However, the vision is not yet accompanied by a developed joint strategy targeting economic development and innovation. Local and regional authorities in the Oresund are involved in joint strategies in the areas of land planning, transport and environment, but not as much in economic development and innovation. The future European Territorial Co-operation programme in 2014-20 will be an opportunity to develop more joint and precise goals and indicators.

Regional and national authorities' commitment to the cross-border area is mixed. Due to the different position of the Swedish and Danish parts of the Oresund in their national context, the commitment towards the cross-border area is unbalanced. There is, broadly speaking, a stronger interest from Skåne than from the Capital Region of Denmark. Interest at the national level is moderate to weak on both sides. In their support to the Oresund, regional authorities face a dilemma between regional growth and cohesion goals. For Sweden, the question is strengthening the area around Malmö and Lund versus the rest of Skåne, albeit the entire region benefits from a stronger Oresund. The dynamics of Denmark result in tensions between Copenhagen-Zealand versus Jutland areas, thus politicising national efforts that support the Oresund.

Funding for Oresund initiatives is mainly from supra-national sources that also help place cross-border co-operation higher on local, regional and national policy agendas. The Oresund Committee is funded by the Nordic Council of Ministers and local and regional authorities. Public funding for cross-border co-operation projects comes mainly from European Territorial Co-operation (Interreg A), which has been instrumental in establishing the platforms that make the Oresund collaboration stronger, particularly for innovation. The Nordic Council and European Union programmes also support wider cross-border co-operation. Beyond European Territorial Co-operation initiatives specifically targeted at the Oresund, programmes with a larger territorial scope such as the Baltic Sea macro-region are also used to support cross-border co-operation.

The Oresund cross-border innovation policy mix

The main innovation-related cross-border initiatives are platforms funded by successive generations of European Territorial Co-operation (Interreg) projects. Public support for innovation is not based on jointly designed and implemented programmes, but rather takes the form of temporary projects, such as cross-border cluster initiatives. Many of these projects stop after the initial public funding period ends, raising questions of both project quality and sustainability issues. One ongoing initiative is the Medicon Valley Alliance, but other cross-border cluster platforms exist, or have existed, in areas such as ICT, food, environment and energy, new materials, and sustainable building. Some clusters only continued on one side of the border upon project completion. Another initiative was the Oresund University, which played a key role in developing cross-border projects, notably the cluster platforms. The Oresund University formally closed down in 2010, in part related to problems with national regulations regarding higher education, but certain areas of co-operation continue through a variety of projects.

Table 8.6. **Snapshot of governance characteristics: The Oresund**

(Oresund in bold)

Characteristic	Specification	Comments
National political capitals	Yes, each side **Yes, at least one** None	Copenhagen, the capital city of Denmark, is part of the Oresund, while Skåne is located more than 600 kilometres away from Stockholm (the capital city of Sweden).
Longevity of public co-operation	**>20 years** 10-20 years <10 years	Cross-border integration in Oresund is long-standing, starting well before the opening of the bridge in 2000, and further promoted at Nordic level.
Innovation policy competencies	Balanced, strong Balanced, weak **Unbalanced**	Even if both Denmark and Sweden are centralised countries in an OECD perspective for innovation policy, the level of autonomy of the Skåne region for supporting innovation collaboration is higher than that of Danish regions. However, regions on both sides have resources for innovation and R&D investment.
Political commitment	**Balanced, strong** Balanced, weak Unbalanced	The overall commitment to the Oresund integration goal is high among respective regions, particularly relative to other cross-border areas, even if there is stronger interest from Skåne than from the Danish side. At the national level, the political commitment is not as strong.
Institutionalisation and legitimacy	**Present, strong** Present, weak Not present	The Oresund Committee and its supporting institutions provide strong institutionalisation and legitimacy to the area.
Actors in governance	**Public sector** University/research actors Firms Mix of actors (triple helix)	Public commitment drives the governance, which is not matched by strong bottom-up engagement by firms. University and research actors play a key role in cross-border linkages, albeit termination of the Oresund University and associated network decreases the direct joint university engagement.
Funding sources	**Mainly public** Mixed public/private Mainly private	Nordic and EU sources of public funding, with co-funding from local authorities, are the main funding sources to nurture the Oresund initiatives. Private co-financing of these activities remains low.

There is a lack of cross-border policies to match the governance vision. National authorities on both sides of the border do not develop joint policies to support Oresund initiatives. Despite political declarations, there are few instances (outside of the Nordic Council of Ministers) where national authorities exchange and decide on joint action to support the Oresund. One exception is that Danish national public R&D funding can, in principle, be used for cross-border co-operation, but this is not translated into practice.

There is untapped potential for a better Oresund policy mix for innovation. Regions on both sides are important actors with competences and budgetary resources to promote R&D and innovation. Beyond the existing cluster experiments, there is ground to investigate opportunities for cross-border synergies in other areas (such as merging the two cleantech cluster organisations – the Sustainable Business Hub in Skåne and the Copenhagen Cleantech Cluster). However, given that some prior experiments did not survive, care should be taken in future initiatives to identify actors and projects with a genuine cross-border value-added. Extending the work of business incubators, science parks and start-up support initiatives over the border can also contribute to greater cross-border benefits for both sides. Joint innovative public procurement and open data strategies are other opportunities. Using the two healthcare markets as a source for innovation is another area under consideration, but a challenge given different regulations in the sector. Removing barriers towards patient mobility across borders would reinforce

opportunities in healthcare. The work around the new scientific infrastructure can be a catalyser for helping to better align Danish and Swedish innovation-related policies. Finally, a more innovation-driven Oresund would need to be supported by an extension of the coverage of the Oresund Database and deepening Orestat's work to cover innovation.

Table 8.7. **Cross-border policy instruments: The Oresund**

Instruments	Programmes
Strategy and policy development	
Benchmarking and policy learning	
Analytical exercise (like mapping of clusters or value chains, technology foresight exercises)	Orestat, Oresund Integration Index, Oresund Institute studies
Joint branding of cross-border area	Life science ambassadors from Medicon Valley Alliance Brand IT (branding for ICT in Oresund) 2009-12 *Oresund Magazine* and promotional activities
R&D support	
Joint public research programmes	Formerly: Oresund Contracts
Joint research infrastructure, shared access to research facilities	Formerly: Oresund University ESS and MAX IV (larger territorial scope)
Cross-border private R&D funding programmes (generic and thematic)	
Technology transfer and innovation support	
Cross-border innovation advisory services (vouchers, intermediaries)	
Advisory to spin-off and knowledge-intensive start-ups	
Other technology transfer centres and extension programmes	
S&T parks and innovation networks	
Cross-border science, technology parks and incubators	
Cluster or network networks initiatives	Medicon Valley Alliance (also supports international cluster networking), Oresund Foodbest, Oresund Material Innovation Community, Oresund Energy, (formerly) Brand IT
Human capital	
Scholarships/student exchanges	Formerly: Oresund University
Joint university or other higher education programmes	Formerly: Oresund University Cross-border industrial PhD Joint PhD programmes and proof-of-concept programmes between Lund and Copenhagen universities Various temporary Interreg university co-operation projects
Talent attraction, retention or mobility scheme; cross-border labour market assistance	Oresund Direkt EURES
Other instruments	
Financing (venture capital funds or angel networks)	
Public procurement	
Other	

Recommendations for cross-border innovation policies in the Oresund

Cross-border area: Continue to remove barriers that limit further integration and build on the Oresund identity and brand

- Continue to remove barriers for cross-border student and labour mobility, the core of the Oresund co-operation, which requires national action.
- Further develop the Oresund internal identity and external brand.
- Expand cross-border statistics and analyses to capture the innovation dimension.

Governance: Ensure the ORUS vision's action plan is implemented, with innovation as a priority, cultivating greater engagement from national governments and the private sector

- Transform the ORUS vision and recent action plan into a reality with key partners, including universities and industry.
- Place a greater focus on innovation (in a broad sense) among the multiple development visions for the Oresund, including jointly defined priority areas.
- Clarify the incentives for national authorities to increase their role in achieving the goals of the Oresund Committee.
- Engage more actively the private sector in strategy and programme development to accompany a greater emphasis on innovation.

Innovation policies and instruments: Align or mainstream cross-border elements in respective national and regional programmes, building on cross-border specialisations and highlighting firm impacts

- Align relevant national and regional innovation policies and, if possible, mainstream cross-border participation (making participants from the other region eligible for funding), to ensure funding sources are better adapted to cross-border innovation needs.
- Develop more detailed knowledge of cross-border resources to support networks and clusters with the greatest cross-border potential, including cleantech and healthcare.
- Prioritise projects and initiatives which are most likely to lead to impacts for firms, including cross-border business incubators, science parks and innovation support services.

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Chapter 9

Top Technology Region/ Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) (Netherlands-Belgium-Germany)*

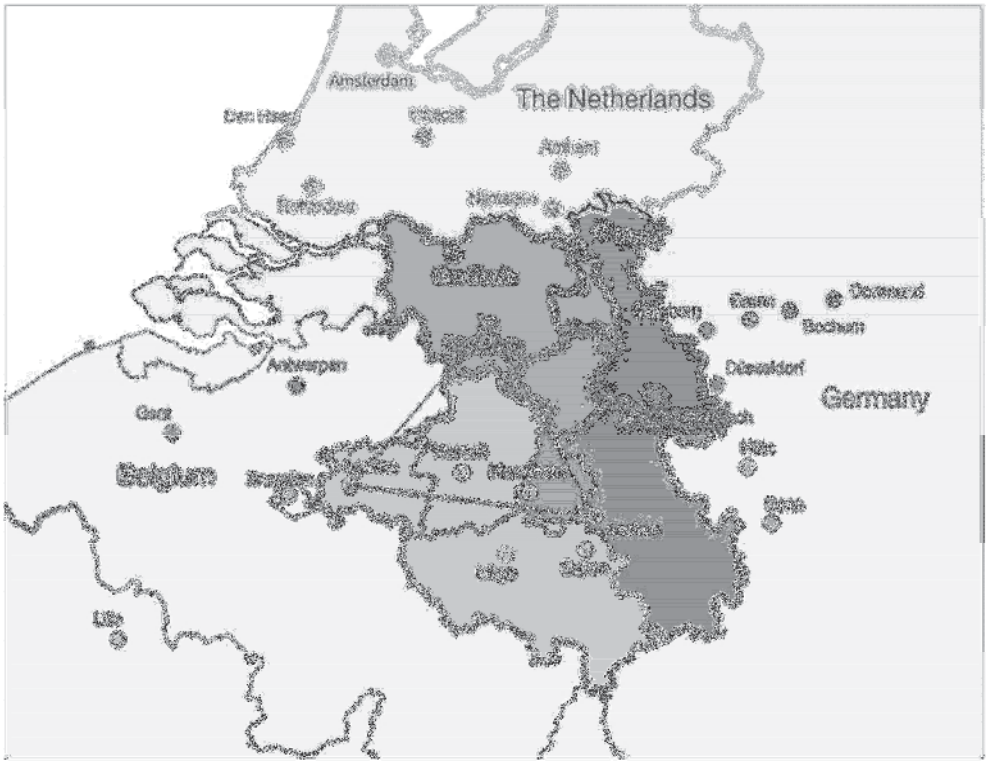
The TTR-ELAt is an initiative to support cross-border collaboration in a densely populated network of small and medium-sized cities located at the heart of western Europe with an economic output of USD 244 billion. The collaboration spans three countries, four science and technology policy regimes and six sub-regions. The collaboration centres on a shared recognition of technological strengths (chemicals and advanced materials, high-tech systems and health sciences). The area seeks to better capitalise on its skilled workforce, multinational enterprises and strong research facilities. While building on decades of cross-border activities, the TTR-ELAt seeks to overcome cumbersome governance issues to create the benefits of agglomeration with complementarity expertise so as to increase international attractiveness.

* This chapter is an excerpt of Nauwelaers, C., K. Maguire and G. Ajmone Marsan (2013), "The case of the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders", *OECD Regional Development Working Papers*, No. 2013/22, OECD Publishing, Paris, http://dx.doi.org/10.1787/10.1787/5k3xv0lg3hf5-en.

Introduction

The TTR-ELAt (Top Technology Region/Eindhoven-Leuven-Aachen Triangle) gathers six regions located at the intersection of Germany, the Netherlands and Belgium (Figure 9.1). The area in which the TTR-ELAt is located has a long history of cross-border policy efforts. Such collaboration began in the 1970s with project-based co-operation among the cross-border regions of the Euregio Meuse-Rhine (an area that covers a large part of the TTR-ELAt area) and the Euregio Rhine-Meuse-North (EMRN). These activities provided a test bed for experimenting with cross-border collaboration. The TTR-ELAt was launched in 2009 as the merger of two initiatives, the TTR and the ELAt. The TTR (Top Technology Region) was first established in 2004 in recognition of the role of the Southeast Netherlands in its national context for technology-led growth, and subsequently enlarged through collaboration with the neighbouring regions. The ELAt (Eindhoven-Leuven-Aachen Triangle) was an initiative of the mayors from the three cities that also began 2004, which was soon joined by several local and regional actors, notably universities, located in the "triangle" area. The large number of co-operation projects in the cross-border area has helped to define the combined TTR-ELAt as the most relevant cross-border functional definition for technology and innovation policy support.

Figure 9.1. **Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAt)**



Note: This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries.

Source: TTR-ELAt (2013), "Background report to OECD study cross-border regional innovation policies", March.

Table 9.1. **Size of the TTR-ELAt area**

Variable	TTR-ELAt total	Limburg Province (BEL)	Leuven Arr. (BEL)	Liège Province (BEL)	Central Lower Rhine Region (DEU)	Aachen Region (DEU)	Mid and East North Brabant (NLD)	Limburg Province (NLD)
Surface (km²)	19 640	2 422	1 163	3 862	2 680	3 525	3 779	2 209
Population (2011)	8 193 814	844 621	487 502	1 077 203	1 544 579	1 279 324	1 837 958	1 122 627
Population density (inhabitants/km²) (2011)	417	349	419	279	576	363	486	508

Note: The shaded column is a region that is not actively involved in the TTR-ELAt policy efforts.

Source: TTR-ELAt (2013), "Background report to OECD study cross-border regional innovation policies", March using data sources from Eurostat, November 2012.

Table 9.2. **Key economic indicators: The TTR-ELAt and its regions**

	TTR-ELAt-NUTS 2	Limburg Province (BEL)	Flemish Brabant Province (incl. Leuven) (BEL)	Liège Province (BEL)	Cologne region, (incl. Aachen) (DEU)	Düsseldorf region (incl. Central Lower Rhine) (DEU)	North Brabant Province (NLD)	Limburg Province (NLD)
GDP (millions EUR)	340 501	22 417	35 938	25 373	133 236	179 340	87 671	35 866
GDP per capita	31 163	26 734	33 371	23 764	30 376	n.a.	36 011	31 949
Long-term unemployment (%)	2.3	1.5	1.7	5.6	3.1	3.4	0.7	1.3
Economic activity rate aged 25-64 (%)	n.a.	73.9	79.5	72.2	79.4	79.0	81.1	77.8
Share of population commuting internationally (%)	n.a.	0.056	0.008	0.037	0.005	0.008	0.003	0.018
Total exports (millions EUR)	162 006	15 345	25 091	11 397	34 773	44 694	53 364	22 036
Export (% of GDP)	0.48	0.68	0.70	0.45	0.26	n.a.	0.61	0.62
Employment % industrial (2009)	21.9	31.7	16.5	26.9	16.5	10.8	19.3	20.2
GDP growth (2004-08) (%)	n.a.	4.8	5.6	5.0	2.7	n.a.	4.7	4.3
EU Structural Funds, allocations per million inhabitants	n.a.	150	117	277	149	n.a.	119	135

Notes: Regional definitions used here often cover larger sub-regions than are actually covered by the TTR-ELAt. The shaded column is a region that is not actively involved in the TTR-ELAt policy efforts.

Source: TTR-ELAt (2013), "Background report to OECD study cross-border regional innovation policies", March using data from Eurostat and UNU-MERIT, November 2012.

Table 9.3. **Strengths, weaknesses, opportunities and threats for cross-border innovation policy: The TTR-ELAt**

Strengths/assets	Weakness/barriers
– Network of well-connected cities and regions of 8 million inhabitants at the heart of Europe – Significant innovation and research assets and strong innovation performance throughout the area – Similarities in areas of technology specialisation as well as opportunities for complementary expertise – Large share of the workforce with skilled human capital – Presence of leading multinational firms and research centres favouring cross-border S&T flows and open innovation practices (i.e. Philips, Imec) – Active collaboration among firms, the public sector and research institutions in different science parks and campuses ("triple helix" in action) – Long history of public cross-border collaboration in the area – Diverse set of cross-border initiatives with several good practice examples (i.e. Holst Center, TTC/GCS projects) – Commitment of many partners to develop the cross-border area (including Dutch national authorities)	– Lack of a large and globally prominent city – Relative peripherality of many cross-border constituent regions in their national political and economic contexts – Unclear branding strategy with competing definitions for the cross-border area – Insufficient awareness of potential across borders, especially for SMEs – Complex multi-level governance structure of the 3 countries, 4 S&T regimes and 6 active partner regions – Different degrees of institutional powers for innovation policy among constituent regions – Weak institutionalisation and unbalanced political commitment among regions limiting policy momentum – Limited funding for cross-border activities beyond European Territorial Co-operation (Interreg) – Regulatory and language barriers hindering labour market flows and business contacts – Lack of data about cross-border relations and flows
Opportunities	**Threats**
– Availability of government funding at higher levels for innovation in general – Greater mainstreaming of cross-border dimension in policies of constituent regions and their national governments or flexibility for alignment (i.e. virtual pots) – Developing a globally recognised cross-border area brand that improves external (and internal) visibility	– Job reductions in certain areas of production, such as by multinationals, due to increasing cost competitiveness of other locations – Increasing difficulty in retaining and attracting high-skilled talent relative to other locations – Funding sources render collaboration more difficult with relevant stakeholders near, but outside, the TTR-ELAt footprint

The profile and relevance of the TTR-ELAt as a functional region for innovation

The TTR-ELAt cross-border area has many assets to thrive as a strong hub in the global knowledge-based economy. The TTR-ELAt is a dense cross-border area of over 8 million inhabitants, including multiple city and regional growth poles. Most of the member regions have completed their successful transition from declining traditional industries, such as coal mining and steel industries, towards higher value-added and knowledge-based industries and services. Today, several of these regions are among the "innovation leaders" group of regions within Europe. The TTR-ELAt hosts a highly educated workforce and many innovative firms, universities and research institutions, some of which are niche players of international excellence. Philips in Eindhoven, other large R&D-intensive multinationals, and the IMEC research centre in Leuven are among the leading actors in supporting the high-tech orientation and open innovation practices in the TTR-ELAt area. Industrial campuses and science parks promote interaction among firms, research centres and universities, and the public sector ("triple helix" activity) serving as strong nodes throughout the area for innovation-driven growth. With this density of actors located within a radius of 100 kilometres, travel for face-to-face meetings can take place within a day, supporting functionality from an innovation perspective.

The constituent regions of the TTR-ELAt have a strong and balanced potential for innovation, building on similarities and complementarities in high-technology specialisations. Areas of particular strength include chemicals and advanced materials, high-tech systems and health sciences. Even more interesting, this combination of expertise gives rise to opportunities at the intersection of these domains thanks to the pervasive use of ICT and other technologies of wide application. Naturally occurring linkages throughout the area follow a variable geometry, as not all sub-regions are as strong in all TTR-ELAt fields of expertise and most cross-border activities are bilateral between two TTR-ELAt partner regions, not multilateral across all partners.

There remain barriers for the TTR-ELAt to capture the full innovation potential of its resources. Competing definitions for the area (TTR-ELAt, Euregio Meuse-Rhine) and weak branding limit its internal and external recognition as a functional and innovation-intensive cross-border area. The region needs to raise its profile to attract and retain talent, a core resource for this knowledge-based cross-border area. Language and cultural differences continue to play a role in hampering the cross-border flows among some of the constituent regions. There is still a lack of awareness of the assets and actors present on the other side of the border, limiting the benefits of the large and diverse asset base. Highly complex governance issues also limit the potential to capitalise on cross-border resources.

Table 9.4. **Snapshot of the functional region for innovation: The TTR-ELAt**

(TTR-ELAt in bold)

Characteristic	Specification	Comments
Region settlement patterns	Metropolitan area **Network of small and medium-sized cities** Sparsely populated with small cites/towns	The TTR-ELAt includes several medium-sized cities and their regions in a densely populated area. The Dutch and German areas are located at some distance from their capital areas.
Internal accessibility and flows	**Strong** Moderate Weak	The TTR-ELAt extends over a relatively compact territory with good rail and road connections and multiple regional airports. Some inter-connections within the area could be improved, but overall accessibility is not a major challenge.
Industrial and knowledge specialisations	**Similar with complementarities** Same Different	The TTR-ELAt member regions share strengths in three broad fields: health and life science; high-tech systems including ICT and energy; and advanced materials and chemicals. Regional strengths also differ, giving rise to complementarities in knowledge-based activities (such as aerospace in Liège).
Socio-cultural context	Very similar **Somewhat similar** Different	Language barriers are low, with the exception of the French-speaking part of the TTR-ELAt. Cultural differences are reported as sometimes a challenge, even if these are playing a diminishing role in business interactions.
Innovation system interactions	**Pervasive** Hub-to-hub On the border	Actors throughout the area co-operate with each other in a variable geometry, due to the multi-polar configuration of the area. Much of these interactions occur bilaterally between actors in two cities or regions within the area.
Level of innovation development across border	**Balanced, strong** Balanced, weak Unbalanced	All regions in the TTR-ELAt are advanced in terms of innovation assets and performance.

Driving force and key actors for the TTR-ELAt

There is a long history of cross-border co-operation in the area, with economies of scale (critical mass) and scope (exploiting knowledge complementarities) being the main rationales for the TTR-ELAt's efforts. A core idea for building the TTR-ELAt was to enhance critical mass in this network of regions and cities to better compete with large metropolitan areas. Sources of economies of scale for the cross-border area include: combining public resources for efficiency of investment, larger labour markets, and access to wider business and knowledge networks. Exploiting complementarities through economies of scope is a more recent, but promising, rationale in their collaboration, and one of the unique sources of competitiveness of this cross-border area still facing some deindustrialisation and delocalisation threats. Actors in the region can build on the diversity of assets in terms of research, technologies, economic base and supply chain linkages. The region has indeed considerable potential to find new combinations of complementary knowledge, expertise, skills, infrastructure and funding sources in order to develop new niches of knowledge-based activities.

While historically cross-border collaboration in the area has focused on solving border problems for local authorities, a shift towards an innovation focus requires some changes. The creation of the Euregio Meuse-Rhine, like other cross-border efforts at the time, was intended to promote greater flows of people, goods and services by addressing border-related barriers. For the TTR-ELAt, an additional collaboration effort complementing the Euregio, the primary focus is improving technology and innovation capacity and linkages throughout the area to better compete globally. This shift also changes the role of key actors in cross-border collaboration, with firms and knowledge institutions taking on a more prominent role for policy action.

Table 9.5. **Snapshot of the rationale and relevance for cross-border collaboration: The TTR-ELAt**

Driver	Explanation	Relevance for cross-border co-operation (strong, moderate, weak, not present)
Economies of scale	Combine resources for efficiency of investment, larger labour markets or access to wider business and knowledge networks to increase critical mass	Strong
Political influence	Develop greater political power for more financial resources and better dialogue with higher levels of government	Moderate
Complementarities	Build on diversity of assets in terms of research, technology and economic base, as well as supply chain linkages	Strong
Branding	Increase internal recognition of the cross-border area as well as its external attractiveness to firms and skilled labour	Strong
Border issues	Address the day-to-day opportunities and challenges associated with flows of people, goods and services (including public services) across the border	Weak

Note: The assessment of relevance relates to the actual relevance in current cross-border collaboration, not necessarily to the potential relevance.

Governance of the TTR-ELAt

The TTR-ELAt's cross-border governance is complicated by the number of sub-regions and imbalances in both policy competences and political commitment. The governance of the TTR-ELAt is by nature complex with regard to its composition: three countries, four S&T policy regimes and six active partner regions with different sets of competences in innovation policy. The Dutch side of the TTR-ELAt appears to be the leader of the cross-border region from a public governance perspective. The Dutch national government is a supporter of the concept and contributes to cross-border efforts in terms of leadership and public funding. The government of North Rhine-Westphalia (Germany) has recognised the value of cross-border co-operation in innovation. Within North Rhine-Westphalia, the Aachen region participates in the TTR-ELAt. The Flemish provinces are active followers in the TTR-ELAt. The political commitment of the Province of Liège (Wallonia) to the cross-border efforts requires some clarification. A seventh region in Germany has not yet chosen to participate. More active engagement of the regional authorities is needed in Belgium (Wallonia and Flanders), as well as a re-engagement of North Rhine-Westphalia, given their extensive responsibilities for innovation policy that the participant TTR-ELAt areas from their regions do not have.

The absence of a permanent co-ordinating body with dedicated resources hinders the strategic development of the TTR-ELAt. Partner regions have all developed an innovation strategy, or at least regional development policies incorporating the innovation dimension. Common sectors and horizontal actions for cross-border work have been identified, but this is not part of a cross-border strategy. Current co-ordination efforts rely on the good will of a few public sector employees who can dedicate only a small and decreasing share of their time to promote this cross-border collaboration. There are many bilateral projects along different axes within the cross-border area based on identified opportunities. A recent co-operation agreement between two regional development agencies is an example of a pilot that could be tested in other parts of the cross-border area. However, some of the broader common good functions associated with cross-border governance require greater common efforts. European Territorial Co-operation (Interreg) projects are the main funding sources for multilateral cross-border policy instruments and play a key role in catalysing the cross-border efforts. However, their fragmented, project-driven approach is not complemented by a strategy to ensure alignment with other regional/national/EU policies in the regions. The European Territorial Co-operation cross-border intervention area was designed with the goal of solving localised border issues, and in the case of the Euregio Meuse-Rhine, the geographic coverage is less adapted to innovation promotion than the TTR-ELAt.

The TTR-ELAt cross-border innovation policy mix

The TTR-ELAt is quite advanced in developing a mix of policies to take advantage of the innovation assets throughout the cross-border area using "variable geometry" cross-border partnerships. The area hosts a number of good practice examples of successful instruments covering many aspects of a cross-border innovation policy mix. Variable geometry is a pragmatic approach to pursue the objectives of the TTR-ELAt, as seeking agreement across all constituent regions to implement multilaterally a fully joint policy mix co-funded by all would be too cumbersome.

Table 9.6. **Snapshot of governance characteristics: The TTR-ELAt**

(TTR-ELAt in bold)

Characteristic	Specification	Comments
National political capitals	Yes, each side Yes, at least one **None**	The region is multipolar and includes secondary cities in their national/regional context.
Longevity of public co-operation	**>20 years** 10-20 years <10 years	The Euregio Meuse-Rhine (EMR) was founded in the 1970s. The TTR-ELAt builds on this long history of cross-border co-operation in the area, with the TTR and the ELAt each beginning in 2004 and joining forces in 2009.
Innovation policy competencies	Balanced, strong Balanced, weak **Unbalanced**	Dutch provinces have few legal competences but are very active in innovation policy; Belgian regions have full competence in this matter (but not the Belgian provinces) and the same holds for German *Länder*.
Political commitment	Balanced, strong Balanced, weak **Unbalanced**	Commitment towards this cross-border innovation co-operation is the strongest at Dutch national and provincial level. Other regions remain engaged but to a lesser extent, although North Rhine-Westphalia could be re-engaged in the collaboration. The political commitment of the Province of Liège to the TTR-ELAt needs to be clarified, as well as that of the 7th region (Düsseldorf area) that is not yet active.
Institutionalisation and legitimacy	Present, strong Present, weak **Not present**	There is no institutionalisation of the TTR-ELAt, and the partial but not total mapping with the EMR represents a missed opportunity to reinforce cross-border area growth.
Actors in governance	**Public sector** University/research actors Firms **Mix of actors (triple helix)**	The formal governance structures are entirely public sector driven. However, increasingly collaboration in policy making and projects takes on a more triple helix form, including multinationals and other firms, research centres and universities, and intermediaries.
Funding sources	**Mainly public** Mixed public/private Mainly private	Many projects in the area are bilateral between two countries. Multilateral TTR-ELAt projects are funded mainly by the European Territorial Co-operation (Interreg) programme with co-funding from other regional and sub-regional authorities.

The most interesting initiatives are bottom-up programmes combining funding sources on the various sides of the border; however, regional and national programmes limit cross-border participation. The Holst Centre, a joint research infrastructure co-funded by the Dutch and Flemish authorities, is one flagship initiative among a subset of cross-border regions. The TTR-ELAt has developed a strategy of supporting business development through the Top Technology Clusters (TTC) and the Cross-border Cluster Stimulation (GCS) projects, involving joint funding from all constituent regions and making strategic use of European Territorial Co-operation funding through the Euregio Meuse-Rhine. A large set of experiments through joint R&D projects of a temporary nature, mostly with European Territorial Co-operation funding, serve to reinforce these cross-border linkages for innovation. In addition, other co-operation takes place without public intervention. Missing in the policy mix are efforts to open existing regional and national programmes to partners from part or the whole TTR-ELAt area (mainstreaming the cross-border element). Mutual exchanges on policies occur on an *ad hoc* project basis, but not yet in a systematic way at strategic policy-making level.

Table 9.7. **Cross-border policy instruments: The TTR-ELAt**

Instruments	Presence in the TTR ELAt
Strategy and policy development	
Benchmarking and policy learning	
Analytical exercise (like mapping of clusters or value chains, technology foresight exercises)	– BAK Basel Economics reports (on innovation performance and areas of technological expertise in international comparison)
Joint branding of the cross-border area	– ELAt Investment Forums
R&D support	
Joint public research programmes	
Joint research infrastructure, shared access to research facilities	– Holst Centre, joint initiative from the IMEC in Flanders and the TNO in the Netherlands – Forthcoming Biomaterials Research Centre, a joint Dutch-German initiative (AMCBM)
Cross-border private R&D funding programmes (generic and thematic)	– GCS (Cross-border Cluster Stimulation) project: grants for cross-border R&D projects involving SMEs
Technology transfer and innovation support	
Cross-border innovation advisory services (vouchers, intermediaries)	– TeTTRA: promotion of academia-SMEs linkages and of SMEs recruiting in non-urban areas of the TTR-ELAt – BiELAt Foundation (networking events to support firm matchmaking)
Advisory to spin-off and knowledge-intensive start-ups	– AC2 start-up competition, EUBAN
Other technology transfer centres and extension programmes	– Leuven-Inc
S&T parks and innovation networks	
Cross-border science, technology parks and incubators	– Avantis and EURODE (Netherlands-Germany) – AMIBM on Chemelot Chemical Campus (Maastricht University and Rheinisch-Westfaelische Technische Hochschule – RWTH – Aachen)
Cluster or network initiatives	– Top Technology Clusters (awareness raising, soft business support, innovation vouchers) – Cross-border automotive cluster ACEMR – Energy Hills (Aachen-Dutch Limburg) – DSP Valley (smart systems and embedded technology solutions)
Human capital investment	
Scholarships/student exchanges	
Joint university or other higher education programmes	– Transnational Limburg University (joint Flanders and Netherlands) – Executive Master in medical imagery Jülich-Maastricht – ELAt Master classes in entrepreneurship
Talent attraction, retention or mobility schemes and support initiatives (like cross-border placement or information for cross-border commuters)	– Info points for border commuters
Other	
Financing (venture capital funds or angel networks)	– Euregional business Angels Network
Joint public procurement	

Recommendations for cross-border innovation policies in the TTR-ELAt

The TTR-ELAt is one of the most advanced European experiments in building an innovation-driven functional cross-border region. The TTR-ELAt has passed the stage of experimentation and can further intensify its current efforts toward more strategic policy with associated funding. The main challenge for the cross-border area is the mismatch between its good potential for innovation-oriented growth and the weak and complex cross-border governance for capitalising on that potential.

Cross-border area: Adopt an innovation-driven definition of the cross-border area with a variable geometry for bottom-up activities

- Use the TTR-ELAt definition as the relevant cross-border area for innovation-related funding and analysis, to be recognised by supranational, national, regional and local governments.
- Maintain the variable geometry approach for programming to preserve the pragmatic and bottom-up philosophy of the TTR-ELAt.
- Collect data and communicate on cross-border facts and trends to help the constituent regions demonstrate the importance of joint action as well as measure policy impact.
- Brand the cross-border area more effectively to support an internal identity and greater external visibility.
- Continue to signal to relevant national (and in some cases regional) authorities significant cross-border integration barriers, such as regulations, transport connectivity or tax and pension issues restraining labour market mobility.

Governance: Promote a stronger co-operation platform for the TTR-ELAt with a strategic intelligence role, building on greater involvement of relevant public and non-public actors

- Maintain a coalition governance structure given the challenges of formalising governance.
- Invite regional authorities from Flanders and Wallonia (Belgium) and re-engage North Rhine-Westphalia authorities (Germany) in the TTR-ELAt cross-border efforts, for political awareness and policy support.
- Promote a stronger co-operation platform for the TTR-ELAt to support policies and to provide relevant information and analyses.
- Seek greater coherence between the Euregio Meuse-Rhine and the TTR-ELAt geographies through alignment or other means for strategic use of European Territorial Co-operation innovation-related funds, data collection and policy intelligence.
- Involve firms and knowledge actors (triple helix) to work in co-operation with public actors to support cross-border strategies and actions with bottom-up involvement.

Innovation policies and instruments: Develop a pragmatic strategy and align public funding to the strategy goals

- Refine the current cross-border strategy to better complement and engage the constituent regions and cities.
- Encourage national or regional innovation policy instruments (the level depending on the country) to "mainstream" cross-border activities for diversification and sustainability of funding sources.
- Refine the policy mix according to strategic goals, lessons from the past, and building in a maximum degree of flexibility.
- Adapt, where possible, EU policy instruments under Territorial Co-operation, including Interreg, to support the new realities of this knowledge-based cross-border economy through more strategic rather than stand-alone projects.
- Use the border as a test bed for innovation in relevant technological sectors (i.e. energy grids, ICT solutions, etc.).

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