

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

# National Innovation Systems and Policies

## Good Practices and Policy Recommendations



UNITED NATIONS

United Nations Economic Commission for Europe

# **NATIONAL INNOVATION SYSTEMS AND POLICIES**

**A COMPENDIUM OF POLICY RECOMMENDATIONS  
AND GOOD PRACTICES 2008-2012**



**UNITED NATIONS**  
New York and Geneva, 2013

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This volume is issued in English and Russian only.

ECE/CECI/17

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**Printed at United Nations, Geneva (Switzerland)**

**UNITED NATIONS  
PUBLICATIONS**

## *FOREWORD*

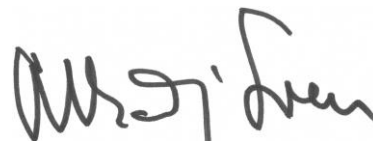
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Innovation is a key driver of sustainable development and economic growth, and for meeting the Millennium Development Goals, as re-affirmed by the 2013 Annual Ministerial Review of the United Nations Economic and Social Council. The global financial crisis of 2008-2009, the effects of which are still being felt in many countries, has only reinforced the need for innovation as a way of recovering lost ground and of making economies more resilient.

The region covered by the United Nations Economic Commission for Europe (UNECE) includes many of the most technologically advanced and innovative economies, but also most of the countries with economies in transition, and even some that qualify as developing economies. As such, our region is a very fertile ground for assessing innovation policies, learning from experience, and sharing the lessons thus learned.

UNECE has been doing this by organizing a series of international policy dialogues on the key aspects of innovation policy; distilling international good practices; developing policy recommendations; providing policy advice to requesting governments; and building capacity to implement policy reforms.

This Compendium is part of a series collecting the policy recommendations and good practices developed under the auspices of the UNECE Committee on Economic Cooperation and Integration. They are developed through an extensive multi-stakeholder policy dialogue within our international expert networks. The Compendium is intended to disseminate this work to a broader audience. The present volume discusses how to build up a coherent national innovation system through coordinated policy support for key innovation constituencies and the intermediaries which support them.



Sven Alkalaj  
Executive Secretary

United Nations Economic Commission for Europe



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***ABBREVIATIONS***

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<b>CECI</b>	Committee on Economic Cooperation and Integration
<b>EU</b>	European Union
<b>ICT</b>	Information and communication technologies
<b>IPR</b>	Intellectual property right
<b>KIS</b>	Knowledge-intensive Services
<b>NIS</b>	National innovation system
<b>R&amp;D</b>	Research and development
<b>SME</b>	Small and medium-sized enterprise
<b>UNECE</b>	United Nations Economic Commission for Europe

*EXECUTIVE SUMMARY***INNOVATION POLICIES AND NATIONAL  
INNOVATION SYSTEMS**

This first part of the book starts out by discussing the legal and institutional framework conditions which governments need to create in order for innovation to thrive. This includes coordinated policy support for human capital formation, for research, for knowledge and technology transfer, and for business investment.

Building on these general insights about national innovation systems and policies, we next turn to a discussion of the specific challenges and opportunities of innovation at the regional level. Innovation policy needs a regional dimension because regions differ in their economic structures, performance and potential. Economic growth is often regionally uneven, with one or a few regions accounting for the bulk of the expansion in national output. Globally, a few selected hubs concentrate most innovation activity across the world. Regional innovation policy should build on and exploit the existing capacities of each region. It should not be limited to support for technological innovations, but should, depending on regional comparative advantages, also include support for innovations in marketing, distribution or services.

Innovation in services is the topic of the third chapter of part I. Services play a growing role in economic activity, accounting for up to three quarters of total output in developed market economies. The services sector is also a major source of productivity growth overall, as it provides critical inputs for other activities and makes possible new forms of activities and business models. As manufacturing companies are often involved in the production of services, the implications for policies and regulations concerning services extend well beyond the services sector per se. In many cases, successful innovations represent the combination of technology-based products with new services. Policy initiatives aimed at promoting innovation in services therefore complement initiatives aimed at manufacturing and need to be coordinated with them. Moreover, non-technological innovation plays a more significant role in services. On the one hand, this means that innovation support policies for this sector need to encompass support for these forms innovation. On the other hand, it means that there is scope for support which helps services companies to better connect with the science base and to get better at technology-based innovation.





# CREATING A SUPPORTIVE ENVIRONMENT FOR INNOVATIVE DEVELOPMENT<sup>1</sup>

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The present chapter discusses good practices and policy options on how to create a supportive environment for innovative development and knowledge-based competitiveness in the UNECE region, with a special focus on innovative performance at the firm level. It largely draws on the findings of the Comparative Review “[Enhancing the Innovative Performance of Firms: Policy Options and Practical Instruments](#)”<sup>2</sup>, which UNECE published in 2009, and which reflects the work of the UNECE Team of Specialists on Innovation and Competitiveness Policies during that time.<sup>3</sup> The chapter provides a summary of good practices and policy options and the related country experiences. More detailed information can be found in the comparative review.

The UNECE region includes countries at very different levels of their innovative capability. In accordance with the mandate of the UNECE Committee on Economic Cooperation and Integration, this chapter is largely focused on good practices applicable in the catching-up economies of the UNECE region.<sup>4</sup> Nevertheless, it has a broader focus on transnational learning, that is to say the transfer of good experiences and best practices across the whole UNECE region. It thus aims to facilitate further this process and contribute to improved level of policymaking in policies for promoting technology and technology-based catching up.

### 1.1 Overview of Policy Options and Instruments to Support Firms’ Innovation Performance

A broadly accepted definition of innovation is the successful commercial or social exploitation of new ideas, where the idea is successfully brought to the market by offering a more effective alternative to existing arrangements. Firms and other business entities are the main agents of innovation in the modern economy.

Innovation in the commercial sector provides a competitive advantage over others in their market place. In today’s economy, it is necessary for all companies to connect knowledge to the market successfully in order to remain competitive. At the macro level, dynamic innovation activity by

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<sup>1</sup> This chapter is based on UN document ECE/CECI/2008/3, “Synopsis of Policy Options for Creating a Supportive Environment for Innovative Development”.

<sup>2</sup> United Nations Economic Commission for Europe (2009), *Enhancing the Innovative Performance of Firms – Policy Options and Instruments*, New York and Geneva.

<sup>3</sup> Additional background materials can be found at:  
<http://www.unece.org/ceci/documents/2008/icp/session2tosic08.html>.

<sup>4</sup> The term “catching-up economies” is used to define the following group of countries: the new EU Member States (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia), the countries of South-East Europe (Albania, Bosnia and Herzegovina, Montenegro, Serbia and the former Yugoslav Republic of Macedonia) as well as the countries of Eastern Europe, Caucasus, and Central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan).

firms raises the competitiveness of the national economy. Policies enhancing the innovation performance of firms therefore also help boost national exports and economic growth.

In order to innovate, firms need to gain a good understanding of their markets in order to appreciate the market pull for commercial benefits and to connect relevant knowledge that may be new to the market. Consequently, they need to look at related technology push and to develop internal management systems that bring them together and combine them with business opportunities.

Innovation relies on the production, diffusion, absorption and utilization of knowledge. For this process to reach its potential, each stage has to be understood and managed in relation to the other components and has to be driven by incentives. The recognition that there may be shortcomings in the performance of the operational units in this chain of activities has led to the development of policies and institutions which attempt to coordinate supply and demand for knowledge and set in place the capacity that builds the potential to diffuse and absorb ideas.

In the modern economy, innovation emerges from a continuous interaction between firms, their suppliers and buyers and external actors like universities or research and development (R&D) organizations. Firms are not isolated in their innovation activities but rather perform them in networks; these activities are highly dependent on the external environment at the sectoral, regional and national levels. The term “national innovation system” (NIS) characterizes the systemic interdependencies within a given country, which influence the processes of generation and diffusion of innovation in that economy.

The new models of innovation emphasize the collaborative relations between firms as a source of competitive advantage. This requires from firms the ability to develop specific skills and put in place strategies aiming to achieve superior innovation performance by explicitly incorporating the interactions with other innovation stakeholders.

Small and medium-sized enterprises (SMEs) are important stakeholders in the innovation process. They enjoy greater flexibility and can therefore take more risks than larger companies in experimenting with new processes or technologies. Thus SMEs are well placed to capture ideas from the research base of universities, other public sector institutions and commercial laboratories and drive them to the market place.

Commercializing an innovation can be an extremely difficult and cumbersome process, especially for start-up innovating entrepreneurs who need to overcome a myriad of barriers in the financing, technological, managerial, regulatory, administrative and other spheres. The main role of public policy in this regard is to establish a conducive environment that supports innovating entrepreneurs in bringing their innovation to the market. This includes both direct and indirect support through various public agencies, but also public support for the establishment of private innovation support institutions.

Effective implementation of innovation policy therefore requires the presence of an efficient institutional system. The horizontal nature of innovation policy and the variety of entities involved in innovation performance at both central and regional levels demands appropriate coordinating mechanisms.

To strengthen the technology environment, there needs to be support from innovation networks that link a number of national and regional institutions and programmes. These include research and innovation funding, networks that link demand and supply of technology, programmes of individual ministries that support the national innovation strategy, physical infrastructure, technology transfer organizations, business support, discussion fora, standards organizations, finance structures, research activities, national and learned societies and industry, etc.

## **1.2 Creating Supportive Framework Conditions for Enhancing the Innovative Capacity of Firms**

The activities that are the foundation of the NIS include knowledge creation and its demand, the way this knowledge is diffused through institutions, including businesses operating in the market, the way knowledge is absorbed by business and the influence exerted on these activities by government, business and other stakeholders. Taken together these elements shapes innovation governance.

The role of policy is to establish a business, social and technology environment as supportive as possible for businesses to innovate and to raise awareness in the corporate sector of what other parts of the system offer by way of support to stimulate the market for innovative goods.

Policy interventions aimed at strengthening the operational units and linkages that make up the NIS also support firms' innovation activities. Examples include public investment in knowledge creation and its management, measures seeking to increase demand for innovation (for example, stimulating markets for technology products and services), public support to the links between the operational units in the innovation process and to the development of the "soft infrastructure" in the NIS (the ingredients that support collaborative relations), as well as establishing other incentives for companies to cooperate in their innovative efforts.

Diffusion of innovation necessitates intermediary organizations that establish effective networks between suppliers and customers, between sources and users of innovation, between R&D organizations and industry.

Options exist for policymakers to increase the demand for innovation by offering the opportunity for SMEs to bid for R&D contracts associated with procurement by government or by creating new markets for technology-based products. In addition, supporting the development of supply chains by increasing networking across regions helps customers and suppliers to work together to their common benefit.

The influence of the business environment is particularly important in encouraging innovation. This includes a transparent, accessible and simply organized business infrastructure that facilitates business formation and operation and allows those in universities to create companies for the exploitation of innovation. The business environment has to be conducive to investment in R&D and should not overburden business with regulations.

There are ways of structuring government R&D spending so that to address industrial relations that drive innovation. Examples include funding of knowledge transfer partnerships and, on a more generic basis, knowledge transfer networks. These knowledge transfer networks link broad groups of organizations that have a common interest in a particular technology.

In addition to supporting investment in R&D through grants for early stage ideas and matched funding programmes for technologies, there needs to be effective fiscal structures encouraging firm investment in innovation.

Some countries have applied policies aimed at improving their technological environment by attracting foreign direct investment. Strategies to do this include importing technology, attracting investment to “greenfield” sites or establishing new companies through merger or acquisition to build the innovation capacity in a region. Driving this process requires capacity-building in terms of skills (supply chains), adequate physical infrastructure and access to markets.

Pursuing policies to develop a culture of innovation and to increase the demand for innovation requires well-functioning markets for technology products. Public support to market development represents an important strategy in trying to build capacity in a region. Ways of achieving this include public competition policy, removing existing administrative barriers to business activity and public procurement for technology-based goods and services.

A well understood long-term constraint on the development of innovative companies is the lack of funding that fills the gap between the point where R&D grants end and private equity finance shows an interest. The market failure that creates this funding gap needs to be addressed effectively if companies are to be supported through their early stage of growth. Many countries have established programmes to bridge this funding gap and have enacted legislation to encourage the business angel sector to take an active role in supporting this process.<sup>5</sup>

In working through this process, there may be a need to supplement general innovation governance with government-sponsored groups that take special responsibility for dealing with SMEs to ensure that legislation does not have a detrimental effect on the sector. This is necessary as the resources available to SMEs are limited, especially while they are in the early stages of development and vulnerable to cash flow problems.

Innovation activity has a regional aspect as an important part of the innovation capacity is provided by a region’s skills base, including adequate supply of the right skills and the cost of these skills. Addressing these issues requires cooperation between local authorities and employers. This process helps to identify skills gaps in the regions which can be filled through the provision of relevant training or by targeted investments related to these needs.

One of several strategies for building a skills base is to provide external direct advice, mentoring and coaching to companies. One example is the creation of an innovation advisory service encouraging companies to develop the necessary internal structures to support innovation. Such a service can also be instrumental in promoting an innovation network across the region by attracting other companies that may contribute to the joint innovation programme.

A related policy is the support to the selective development of courses in universities aimed at meeting specific local needs.

With the increasing pace of change, many larger companies try to develop specific innovation strategies. These include internal restructuring to create innovation teams to which a company

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<sup>5</sup> See document ECE/CECI/2008/4.

delegates the innovation role, including the coordination of R&D efforts, managing relations with national innovation funds, adopting open innovation programmes and targeting innovation by mergers and acquisitions.

The organizational change in large companies centered on the establishing of targeted innovation teams may include the following main aspects:

- The level of authority delegated to the innovation team not only reduces delays but also helps to attract high-level executives to participate in the activity. The extent to which these teams are permanent and dedicated to this role varies across organizations;
- The need for both technology push and market pull to be part of the process means that both these activities need to be integrated into this team's responsibilities. This integration helps collaboration and also speeds up the process. In some cases, companies reorganize their R&D laboratories along business division or product structure lines in order to foster greater understanding of the process, better collaboration and speed of delivery;
- Closer proximity of all the parts of an innovation team by co-location assists integration and facilitates communications;
- In some cases, broad-based central innovation teams are focused on radical innovation. The reporting structure for these is important to ensure that such innovations are developed effectively;
- The process of innovation needs to be funded in such a way that any investment decisions are seen against business development opportunities;
- The need to extend innovation options has also been pioneered under the term "open innovation". This wider search within the business and research community can also be a prerogative of the firm's innovation team; and
- Many large corporations are now looking to secure innovation through the acquisition of small innovative companies. This route is part of achieving "high speed" innovation.

The process of innovation-related organizational change in firms needs to be driven by appropriate incentives and can be enhanced by targeted policy interventions.

The goal of open innovation is to draw in ideas that have commercial potential from a wider catchment than just within their own company. However, to make this process successful, there needs to be rafts of SMEs operating at different levels that can eventually develop new radical innovation. This also implies the existence of an infrastructure conducive to business development.

Establishing supportive framework conditions for enhancing the innovative capacity of firms therefore requires placing immediate policy-based actions into a longer-term strategic policy framework.

Short-term policies that support business development may include funding support to technology which has commercial potential, creating support services for business, running business awareness courses on how to create an innovative environment in a company, stimulating innovation by business through relevant procurement programmes and focusing on skills that would enhance the market potential of existing industrial activities.

Strategic policies need to build long-term innovative capacity by more widely promoting the processes that drive innovation, building relevant skills and investing in R&D that has long-term commercial potential. There is a number of dimensions to this which include altering the courses on offer in universities, long-term research funding in strategic technologies, building infrastructure such as science and technology parks, as well as putting in place legislation to allow mobility between the private, public and commercial sectors.

### **1.3 Strengthening Industry Science Linkages**

The innovation process requires a connection between the institutions generation knowledge and those organizations that address the market, that is, between education/science and business. For these linkages to be effective, the knowledge needs to be relevant and business needs to know how to use the knowledge.

Effective management of the links between the production of knowledge and skills and their utilization and commercialization is essential for the development of a sustainable knowledge and innovation base in any economic system. Sustainable education – science – industry linkages are essential for delivering skills and technology to the market place.

These linkages are weak in many countries, especially in some of the catching-up economies. Among the causes of poor linkages are the inadequate institutional infrastructure of the NIS, legacies of the “linear” model of innovation, old-fashioned courses taught in universities that lack relevance in the commercial domain, and traditional weaknesses of the NIS in the catching-up economies inherited from the period of centrally planned economy. It is essential that such gaps are closed which may require targeted policy interventions.

Closing the gap between the needs of business and the educational/R&D output of the NIS requires close collaboration and dialogue between the relevant stakeholders. Policy interventions may also enhance connectivity and cooperation among stakeholders.

Various publicly funded programmes have been developed to assist in this process in different UNECE countries. On the one hand, such programmes generally target enhancing the exposure of academics and students to the commercial sector including staff exchange, as well as technology and knowledge transfer. On the other hand, policy measures aim at reducing obstacles and barriers that may discourage the business sector from drawing on the intellectual resources of academic centres.

In addition, policy may support strategy groups in aligning public programmes with the needs of industry. Examples of such strategy groups include science and industry councils and technology strategy boards. To be effective, representation on these committees need to cover the interests of business, education and the organizations that deliver the services from one side to the other.



At the regional level, some regions establish learning and skills councils that actively engage with the problem of increasing the number and strength of linkages between education and industry.

Example of public programmes targeting to strengthen industry-science linkages include:

- Programmes for SMEs and micro-companies to employ undergraduates for short project based placements;
- Industrial professional year programmes for undergraduates in which students work in a placement in a company as a formal part of their course;
- Project work programmes, particularly associated with those universities that have science and technology parks, in which students undertake specific projects for tenant companies. These range from projects involved with technical problems to ones that are concerned with solving business management issues;
- Competitions for funding. An example is the Young Entrepreneurs Scheme (YES) in the United Kingdom which provides young scientists with an opportunity to develop entrepreneurship awareness and develop business plans founded on science which are then scrutinized and exposed to the business world;
- Establishing knowledge transfer partnerships among interested stakeholders, some of which may function as public-private partnerships; and
- Research councils which fund research in universities providing a foundation for future innovation. Their efficient work requires access to external expertise to better define future trends, in particular fields of science and technology.

Universities may be encouraged to adapt management and education structures to sustain links with the business sector. Examples of these include:

- Assisting academics to apply for consultancy contracts from industrial and commercial partners;
- Providing project management and other resources for complex research programmes and other initiatives involving partners from universities and industry;
- Providing expertise and support in the management of intellectual property such as patents, legal contracts, business start-ups, venture capital and business incubation;
- Assistance to universities in developing educational modules on business as part of their main undergraduate courses;
- Helping to foster a spirit of entrepreneurship within the university for staff, students and alumni; supporting and developing entrepreneurial skills within the local and regional business community; and
- Running pre-incubators (business accelerator units) to help staff and students build finance-ready business plans.



More generally, the role of universities is now changing as there is an increasing expectation on them not only to contribute to developing and passing on new knowledge but also to take an active role in developing their communities and local business. This new role has two dimensions: first, providing an outreach programme that supports local business and, second, providing resources to commercialize their own technology and other intellectual property.

Management structures in universities to support these programmes may include units, such as:

- Legal services which provide legal advice to academics in negotiating contracts on behalf of the university;
- Technology transfer services which manage the university's intellectual property portfolio to enable the profitable transfer of technology from the university to industry;
- Research and business services to provide advice and support in generating income for the university through research collaborations with industry, consultancy and expert services;
- Projects teams to assist with project management services and cooperation with a variety of industry partners; and
- Liaison offices which assist with commercial research funding by linking with business.

Other outreach programmes that are aimed at strengthening the links between education and industry include establishing innovation clubs and bodies offering research advice services. These programmes target establishing direct links among potential stakeholders from both the academic and business communities.

#### **1.4 Raising the Efficiency of Innovation Support Institutions**

Innovation support institutions are public, private, or public-private institutions that provide support to start-up innovating entrepreneurs in commercializing their innovations and bringing them to the market.

Some institutions provide public financial and/or in-kind support to start-up ventures. However, this support is of one-off nature: at a certain point of time firms are expected to "grow up" and take care of themselves; those that fail to achieve financial viability within the established time limits will exit the market. All innovation support institutions provide business services, such as coaching, consulting, managerial and administrative services, etc. to innovating entrepreneurs.

Another important role of these institutions is in facilitating linkages between the potential key stakeholders of a project. They help in connectivity and networking both within the institution and also with the outside environment.

##### ***Business incubators***

A business incubator is a company or facility that provides physical space and a number of services to new businesses, helping them through the earlier stages of their development.

Incubators provide access to business support, finance, management coaching as well as other business and administrative services to assist in the formation and growth of companies. The expected outcome is to reach a stage of developing a revenue-generating company or one that is ready to attract investment for development.

There is a number of models for incubation. Full incubation offers a wide package of services that are aimed at increasing the chance of success of developing a company. The package may cover not only ordinary business services but support strategies that are tailored to developing the companies with the greatest potential.

The incubator's own business model is defined by the main support and service functions provided:

- Strategic counselling or provision of strategic guidance to tenant enterprises;
- Financing, namely the ability to mobilize support funds or venture capital and organize strategic cooperation in raising the necessary funds to support tenant companies;
- Monitoring, that is the capacity to monitor the technical and financial development, and the ability to impose sanctions if certain goals are not met;
- Outreach or the extent to which an incubator is actively involved in scanning and evaluating potential business ideas that fit its overall goals;
- Cooperation with knowledge institutions or with other institutions that are focused on the incubator's area of specialization;
- Networking, that is the scope of external partners that offer guidance or other services to tenant companies; and
- Degree of specialization or the extent to which an incubator constrains its activities within specific technologies.

The main steps in business incubator formation include the following:

- Specification of incubator goals. These should be coordinated with the objectives of the community and the sponsor;
- Establishment of a local working group to take responsibility for initial work in incubator formation;
- Assessment of local business support, in terms of training, experience, and technical expertise;
- Analysis of local economic activity, including both entrepreneurial activity and market potential;
- Site identification;
- Identification of financing sources for both the facility and its tenants;
- Creation of a start-up plan for the incubator;

- Marketing and publicizing of the incubator; and
- Evaluation and redefinition of goals.

Any tenant start-up only spends a limited time in the incubator and after going through the incubation process the company should be prepared to leave the incubator and start self-sustained performance in the market:

- Incubators usually have their specific graduation criteria which may include the reaching of certain size and profitability but also a maximum tenure at the incubator;
- Graduation policy should be open and transparent and tenant start-ups should be fully aware of it;
- Ideally, the timing of exit should be agreed upon between the incubator management and the tenant well in advance; and
- Graduation policy may also include criteria for exit by unviable companies.

### *Science and technology parks*

Science parks (sometimes called research parks, technology parks or technolopes) are property-based ventures providing R&D facilities to technology- and science-based companies. Compared to business incubators, science and technology parks tend to be much larger in size, often spanning across large territories and housing various entities from corporate, government, and university labs to big and small companies.

The park may be a not-for-profit or for-profit entity owned wholly or partially by a university or a university related entity. Alternatively, the park may be owned by a non-university entity but have a contractual or other formal relationship with a university, including joint or cooperative ventures between a privately developed research park and a university.

Science parks do not necessarily offer a full range of business support and services but some parks may host a business incubator focused on early-stage companies. Typically, however, science and technology parks serve the post-incubator phase of company development or provide a launch pad for companies that are "spun out" from a university or company.

There is no universal model for science and technology parks; however, according to origins, two groups can be identified. The first are those that have been developed as local initiatives championed by local interests. The second are those that have been planned as part of delivering a national innovation system to a region (or as part of a regional innovation system). Experience has shown that science and technology parks are most effective where they are connected into wider business support programmes.

Typically, the main objectives and functions of science and technology parks are:

- Promoting the generation and commercialization of innovative technologies and products;
- Promoting knowledge sharing and networking among different innovation stakeholders;
- Stimulating investment in new-technology-based firms;
- Generating new employment opportunities through the commercial application of new technology; and
- Contributing to wealth creation and rising welfare in the region through its activities.

Science and technology parks are important agents in industry-science linkages. Thanks to their nature, they can facilitate both the establishment of business relationships fostering the diffusion of innovation and the formation of partnership relationships with industry.

The key success factors that are commonly recognized in successful science and technology parks include:

- Clarity of vision and purpose amongst all stakeholders, with a consistent emphasis over time;
- The central involvement of at least one major research organization;
- Research and innovation are central in branding the park and shaping its culture;
- Strong interactions between the host academic/research campus and the park;
- A project champion (an individual or a group) with a clear and practical understanding of the park's purpose and the benefits it will bring;
- A park manager with strong leadership skills and preferably a background in R&D;
- The effective economic and social integration of the park with the community and region;
- The public sector (central or local government) playing a facilitating and enabling role;
- Sufficient capitalization to ride out any adverse effects of the business and property cycles;
- Financial self-sufficiency over time;
- A multi-phased development period of 15 or more years; and
- Absence of development constraints and an ongoing availability of substantial space.

### ***Innovation clusters***

An innovation cluster is a system of close links between firms and their suppliers and clients, and knowledge institutions, resulting in the generation of innovation. The cluster includes companies that both cooperate and compete among themselves. The links between firms are both vertical, through buying and selling chains, and horizontal, through having complementary products and services, and use similar specialized inputs, technologies or institutions, and other linkages.

Most of the linkages that shape a cluster involve social relationships or networks that produce benefits for the firms involved. Clusters become even more visible and attractive if they have strong linkages with related clusters in other regions and countries.

Clusters are based on relationships among firms. The relationships can be built on common or complementary products, production processes, core technologies, natural resource requirements, skill requirements, and/or distribution channels.

Cluster initiatives are organized efforts to increase the growth and competitiveness of clusters within a region, involving cluster firms, government and/or the research community. A cluster initiative typically involves:

- Different member organizations (these can include private industry, public organizations, academia, and public-private, typically non-profit, organizations);
- The cluster organization with an office, cluster facilitator/manager, website, etc.;
- Governance of the initiative (e.g. constellation of a board; facilitator, etc.); and
- Financing of the initiative (national/regional/local public funding, member fees, consulting, etc.).

Clusters breed an environment conducive to innovation:

- The cluster environment stimulates knowledge spillovers across institutional boundaries and encourages cooperation, both of which are essential for 'open innovation' generated in networks of cooperating companies and institutions;
- Competitive pressure resulting from the presence of firms in related industries also fosters the innovative activity of individual firms;
- Clusters stimulate the identification of new technology trends and potential innovation and lower the barriers for transforming new ideas into businesses and shorten start-up times;
- The cluster environment is conducive to learning and developing new competencies essential for the generation and commercialization of innovation; and
- Clusters provide opportunities for pooling innovation-related risk and a broad set of options to appropriate the benefit of investments in innovation.

The main ingredients of a well-functioning innovation cluster include the following:

- The presence of functioning networks and partnerships that facilitate linkages;
- A strong innovation base with supporting R&D activities;
- Human capital endowment, in particular, a strong skills base;
- Well developed and functioning physical infrastructure and communications;
- Presence of large firms shaping the specialization of the cluster;
- Favourable business climate, competitive business environment and spirit of entrepreneurship;
- Access to finance, business support and specialist services; and
- Leadership and managerial skills.

### 1.5 Main Policy Conclusions

Firm innovation activity is a key driver of competitiveness and economic growth. Although the process occurs at a company level through the skilful management of firms, firms' innovation performance can be enhanced by appropriate policy measures conducted in a business-friendly environment.

The provision of such a supportive business environment calls for a coordination of a number of policies and the related public investment that help in shaping the “soft” and physical infrastructure, as well as the legislative framework in which the private sector operates.

Developing national innovation systems provides a framework in which to embed policy, guide investment and bring together the stakeholder partners in the process:

- The national innovation system provides an institutional and business environment that supports the creation and demand for knowledge as well as its diffusion and absorption into business activities; and
- Such a system is most effective if business benefits from this and increases its investment in the innovation process.

The most effective influence on business is market opportunity. Businesses will innovate when they see innovation as an important business opportunity. This implies that companies can both recognize and understand how to exploit the innovation-driven market. Policy can also provide support to businesses in identifying innovative business opportunities.

Innovation by companies also requires access to capital to commercialize innovative market opportunities. Capital needs to be channelled to innovating companies in an effective manner to make the innovation process self-sustained.

Among the key factors driving the innovative activities of firms are the following:

- Investment in education that is relevant to business. Universities need to link with business and develop courses that are relevant to the operational units that make up national innovation systems.
- Support to investment in R&D by both government and business. Governments can stimulate private R&D investment by ensuring the fiscal structures provide the necessary incentives to businesses.
- Business investment in innovation strategies. It can be stimulated by both relevant education and incentives to influence companies so that they recognize the need to change. Appropriate management training programmes can support this process;
- Specific policy measures to address the concerns of SMEs and to provide a conducive environment for such firms to engage in the commercialization of innovative business opportunities.
- Establishing strong and self-sustained industry science linkages. Public policy is a key factor for stimulating the cooperative efforts of all the relevant stakeholders in the innovation process.
- Policy needs to drive the development and support of the soft and hard infrastructure that breeds innovative companies. Careful consideration should be given to planning and developing innovation support institutions and the related business support programmes.
- Joint efforts by public and private sector (public-private partnerships) are an efficient and effective way to develop innovation support institutions.

Governments in cooperation with other relevant stakeholders also need to improve the management structures to identify and protect intellectual property with commercial value in order to broaden the scope of the entrepreneurial approaches to appropriating the benefits of intellectual property and of the investment in innovation.

### ***THE REGIONAL DIMENSION OF INNOVATION POLICIES***<sup>6</sup>

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The regional dimension has played an increasing role in national innovation strategies. The economic dynamism of regions, which is based on their own set of assets and skills, is seen by national policymakers as making an important contribution to overall innovation performance. In addition, regional development policies, which are designed at a sub-national level, emphasise the importance of innovation in promoting growth and increasing the share of high-value-added activities in economic activity. In the current economic environment, policies that promise to generate new jobs and foster economic development have become even more relevant.

The degree of regional diversity differs significantly across countries and economic growth is regionally uneven. Some regions within each country account often for most of the observed expansion in output. Globally, a few selected hubs concentrate most innovation activity across the world. Innovation policies are being seen as a way to preserve the competitive advantage of the more advanced regions and contribute to exploit the underdeveloped potential of those that are lagging.

The present chapter presents some key policy issues related to the regional dimension of innovation policies. It is based on the outcomes of the fifth session of the UNECE Team of Specialists on Innovation and Competitiveness Policies and its substantive segment “[Building strategies for regions of innovation](#)”, which was held in Geneva from 12 to 13 April 2012.<sup>7</sup>

The chapter is structured as follows. First, it discusses the importance of linkages in supporting regional innovation and the way in which collaboration between innovation stakeholders can be promoted. Second, it introduces a number of policy issues related to the elaboration of regional innovation strategies. Third, it presents different aspects concerning regional innovation governance and the policy instruments used at the regional level. Finally, it identifies a number of key policy messages and recommendations.

#### **2.1 Collaboration and Linkages in Regional Innovation Policies**

Innovation depends on the allocation of sufficient resources to scientific research but also on the extent and quality of the interaction between different innovation agents, which facilitates the development of successful commercial applications. Innovation is based on the collaboration between different types of stakeholders. The notion of linkages is inherent to the concept of innovation systems and an important dimension of their effectiveness.

Despite technological advances, distance remains a barrier to the transmission of knowledge, in particular tacit knowledge, which often relies on personal links. The possibilities for collaboration and the strengthening of linkages are closely associated to the proximity between

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<sup>6</sup> This chapter is based on UN document ECE/CECI/2012/3, “The Regional Dimension of Innovation Policies”.

<sup>7</sup> Additional background materials can be found at <http://www.unece.org/index.php?id=28471>.



agents, hence the importance of developing policies that seek to develop the potential of territorial linkages. Collaboration serves to overcome the disadvantages of geographical distance, including through the development of transnational contacts.

The diversity in the innovation potential of different regional innovation systems is related to the density of external and internal linkages. The mobilization of regional assets and the implementation of regional development strategies draw often on various forms of collaboration between innovation stakeholders, which have sometimes a cross-border dimension.

The efficiency of the innovation system depends on the collaboration between multiple agents. This is best encapsulated by the concept of “Quadruple Helix”, which refers to the interaction between four key agents of the innovation system, namely, knowledge institutions, enterprises, government and civil society.

The scope for innovation policy includes also support to social and cultural aspects that seek to develop collective capacities and networking strengths at the regional level. Thus, the traditional concept of clusters can be broadened into the wider notion of development coalitions, which provide impetus to an agenda of regional economic transformation.

The so-called extended innovation alliances have been promoted to overcome development challenges in backward regions. These alliances focus on the potential of trans-regional cooperation and collaboration between regions with different levels of development to foster innovation. While geographic proximity is not a necessary condition for success, a clear contractual set-up and pro-active management of these alliances is required.

Collaboration among different innovation stakeholders should be encouraged through appropriate institutional structures that define organized frameworks for cooperation. It is therefore important to create a space for the exchange of views and the coordination of investment decisions at the local/regional level.

Work on reinforcing regional linkages should be complemented with support to the development of national and international linkages in order to avoid the negative effect of excessively emphasising local ties. An inward orientation could lead to isolation and lack of connection with external actors. The assessment of the potential for collaboration should also include cross-sectoral and cross-regional aspects.

Local and regional actors should be supported in their efforts to gain access to global knowledge and resources as such linkages are a necessary condition to foster innovation. Partnerships between research and education organizations and business should be promoted at the regional, national and international levels.

Information and communication technologies have an important role in facilitating collaboration and knowledge-sharing among different actors, resulting in the emergence of virtual communities that provide an environment for the effective matchmaking of partners.

## 2.2 Regional innovation strategies

There are multiple strategies that can articulate a vision for regional innovation-based development. This diversity is partly a reflection of the variety of regional situations but also is an expression of different views regarding the direction of change and the ultimate goal that is being pursued. Regions with similar profiles may opt to pursue different strategic goals. As the private sector will have to play a key role in the implementation of any strategy, it is important that its views are also reflected in the design phase.

Regions can be understood as a system of complementary activities which have emerged in a particular historical setting. The local environment and the existing assets greatly influence the available options. Problems and bottlenecks are defined in a region-specific context. Regional strategies need to acknowledge the diversity of regional situations. Therefore, a departure point for successful outcomes is to build on existing strengths and capabilities, as identified by an assessment of regional resources.

Some regions are at the frontier of innovation. These knowledge-based regions are technology leaders where genuine innovation (i.e. new products or services that are new to the world) takes place. For many other regions, the policy emphasis is more on access to external knowledge and the absorption and diffusion of this knowledge.

The transfer of knowledge can take place through a variety of channels, including mobility of the labour force, formal technology transfer and activities initiated at the enterprise level such as joint research or ventures co-development.

Innovation is seen increasingly as a way to address the problems of backward regions. These innovation-based strategies rely not on the mere transfer of resources from more advanced regions but on the ability to promote development through the absorption of external knowledge and the imitation of products, technologies and business models existing in more advanced economies. This requires the creation of a basic infrastructure that increases the absorption capacity and facilitates collaboration and exchanges.

The ultimate aim of regional innovation strategies is to promote a change in the behaviour of innovation stakeholders through the use of different instruments, so they become more open and ready to work together for the transformation of region. A key factor contributing to this behavioural change is learning, so the development of human capital needs to be an important component of regional interventions.

Innovation strategies require the integration of multiple policy instruments targeting different areas to ensure the consistency of interventions. A proper understanding of the linkages between different types of interventions poses a challenge to policymakers, who have to deal with a portfolio of instruments which is a result of previous interventions.

The diversity of regional strategies and the policy experimentation that takes place at the subnational level represents a source of inspiration and fresh ideas that can be incorporated in the design national innovation strategies and be replicated in other regions, once factors that are intrinsic to the region are taken into account.

The competitiveness and resilience of clusters derives from the linkages between companies and sectors within a given region but also with the rest of the world. Cluster based strategies need to be aware of how the desired pattern of specialization fits with overall international trends, so as to seek synergies and avoid duplications. Thus, a global perspective should be retained to identify potential competitive advantages but also possibilities for cooperation. International openness is also important to have access to technological solutions and business processes, so to avoid investing resources in what is already available and can be sourced externally.

Regional innovation strategies should rely on the active involvement of the private sector, as government intervention cannot be the main driver of the necessary changes. The key objective of these strategies should be to improve the conditions for the development of innovative firms, facilitating their interaction and the access to external knowledge and providing services that complement their internal capabilities. Public investment in research and innovation plays an important role but its main focus should be stimulating private investment, not replacing it.

The rationale for the support to competitiveness poles and competence centres lies on the search for beneficial agglomeration effects and the resulting increased scope for knowledge exchange. A systemic approach emphasises the importance of the linkages between different types of innovation stakeholders and the environment in which they operate. The aim is to facilitate the cooperation between different firms in collaborative arrangements that bring together also research institutions. While competence centres have a clear regional focus, competitiveness poles have more global ambitions that seek to position them as part of complex value chains with an international dimension.

“Smart specialization” strategies include public support to a process of entrepreneurial discovery that capitalises on existing strengths and seeks to facilitate collaborative leadership of this process and provide necessary complementary inputs in the innovation process. Strategies should be evidence-based – hence the importance of needs assessment.

This entrepreneurial discovery process can take many different forms. It may concern the transformation of traditional sectors into new competitive areas. The introduction of new technologies may lead to new forms of specialization within existing sectors. Diversification on the basis of existing specialization is also possible. More radical changes, which are a departure from current comparative advantages, are also possible.

Critical dimensions of these “smart specialization” strategies are appropriate stakeholder involvement and the synergy between different sources of funding and instruments. The private sector should have a leading role in the identification of sectors with growth potential but it is also important that this process of entrepreneurial discovery is not captured by vested interests that block or distort change.

Action plans should result in policy packages that integrate different forms of support and targets, with appropriate funding provisions. The number of priorities should be limited, so to achieve critical mass and avoid a wasteful dispersion of resources.

The identification of the potential venues for economic specialization can be supported by a variety of methods used in combination, including foresight, consultation mechanisms, structured interviews or pilots. Business needs identified through this entrepreneurial discovery process

should be matched with the provision of research and innovation capacities under the leadership of the public sector. Practical self-assessment tools can help regions to draft smart specialization strategies.

“Smart specialization” does not prescribe specialization in particular sectors but emphasises the policy process through which the identification of areas to be developed emerges. The outcome of this process should result in distinctive areas of specialization, not on the imitation of existing ones. The focus should be not only technological but include also other forms of innovation, which are practice based. More than one sector can be targeted in the search of synergies.

### **2.3 Innovation governance and policy instruments**

Regions differ in the degree of autonomy they have to develop innovation policies, the extent of financial resources, regulatory means they can deploy and the capacity to formulate and deliver policy. The degree of control of regions over science and technology resources depends on the level of political and agency decentralization. In addition, there is a diversity of governance structures in regional innovation systems.

Institutions greatly influence the scope and efficiency of policies. Policy initiatives may be impeded by administrative boundaries which do not fit with the scope for policy intervention according to economic considerations. Actions with a limited regional focus miss out on the potential offered by collaboration between different regions, in a context in which the globalization of economic activity creates strong pressures for the outward orientation of policy initiatives.

The design of effective innovation strategies may require coordinated actions across different administrative divisions. This coordination facilitates the pooling of complementary assets, the emergence of larger networks and the achievement of a critical mass in key areas that increase external recognition. On the other hand, some policy areas may be inadequately covered because of existing gaps in the allocation of responsibilities across different levels of government.

A major challenge for the design of appropriate policies in complex institutional arrangements that involve different levels of government is the creation of appropriate mechanisms for sharing information. Regions have only control or influence over certain aspects relevant to innovation. It is therefore important that regional interventions take place within an overall national framework that ensures mutual consistency of the interventions carried out at lower territorial levels. The proliferation of programmes at different levels can be a source of potential inefficiencies.

There are different mechanisms to facilitate coordination and synergies between central and regional interventions. The alignment of national and regional policy objectives and planned interventions can be facilitated through a consultation process, in particular concerning the design of the overall national innovation strategy. A continued dialogue, underpinned by concrete institutional arrangements, can facilitate mutual knowledge of policy developments at different levels of government. Contractual arrangements can be established to finance specific projects with the involvement of both national and regional authorities.

Regional innovation agencies can be established to implement innovation policies at the regional level. Proximity to the groups targeted by policies is seen as beneficial, as these agencies are in a

better position to collect the necessary information and react to the demands of their customers. However, there is no single model but a variety of practices that reflect different policy priorities and institutional settings. Regional innovation agencies can differ regarding the scope and target of intervention, funding model and sector focus. They may act as a central node in the system of regional agencies or be just another agency among others.

The perception of the role of regional innovation agencies has undergone a transformation in line with the emerging view which sees them not just a provider of resources but a critical actor in the regional innovation system who seeks to facilitate linkages and promote economic transformation. The emphasis is on strategic change through a variety of policy instruments which rely on the mobilization and collaboration of multiple innovation stakeholders.

Regional differences in innovation capabilities demand different policy mixes. The starting point needs to be an analysis of the existing situation. While for knowledge and technology hubs, the main priority is to build on existing advantages, for less advanced regions, which are, for example, specialized in traditional manufactures or primary sectors with low technological content, the emphasis is on catching up.

There is a variety of instruments that can be used to promote innovation at the regional level, targeting the generation, diffusion or exploitation of existing knowledge. Most instruments are used at both the regional and national policy levels. This creates the need for a policy design that identifies clear roles for interventions at different territorial levels and seeks to exploit complementarities.

Overall framework conditions including a strong intellectual property regime, entrepreneur-friendly policies and social norms that encourage risk-taking and trust are important factors influencing innovation and the effectiveness of policy interventions. Some of these conditions can be shaped at the subnational level.

Different types of instruments are used at both the national and regional levels but the efficiency of innovation policy is increased when the interrelation and complementarity between these instruments are duly taken into account. Coordination mechanisms should be used to ensure alignment of objectives and synergies between national and regional interventions.

Instruments that are used at both the national and regional levels do not necessarily imply duplication, as these interventions may be complementary, sharing financing, targeting different groups and seeking different aims. Policy instruments should be used as part of policy packages that pay attention to the relations between different types of interventions and the dependencies between different instruments for successful implementation.

Traditional policy instruments, such as support to infrastructure development, science parks, technology transfer offices and incubators, are more often deployed at the regional level. Regional innovation policy focussed initially on the creation of an appropriate physical infrastructure and the transfer of resources but the emphasis has shifted towards the development of innovative enterprises and the provision of support services.

Science and technology parks were created initially in many countries to support the commercialization efforts of existing research organization, without particular concern for the

implications for regional development. However, they have become important policy tools for regional innovation policies, which seek to capitalize on the existence of research institutions and the proximity to other innovation stakeholders. At the national level, science parks have been set up as part of overall technology development policies or in the search for large-scale foreign investment.

In addition to these traditional interventions, there are a number of more novel instruments that are becoming widespread, such as public-private partnerships for innovation, innovation vouchers and the benchmarking of innovation efforts. These emerging instruments are particularly relevant for less favoured regions, where there is a need to develop capacity for policy design and implementation and to identify latent demand for innovation in local SMEs.

Some experimental instruments that emphasise international aspects, such as a cross-border research centres, or which reflect the emerging paradigm of open innovation, are also being deployed at the regional level.

Regional instruments have been increasingly integrated into strategies that seek to coordinate a range of interventions on different areas, emphasizing the importance of linkages between firms and other innovation stakeholders. This approach is in line with the prevailing notion of regional innovation systems, which encompasses different types of organizations and public and private actors and the organizational and institutional arrangements that facilitate their interaction.

However, in backward regions, there is a lack of entrepreneurial culture favouring cooperation between firms. These regions are often specialized in traditional sectors and have poor links with international markets. Technological intermediaries and business services are poorly developed. The strengthening of linkages between different components of the regional innovation system faces particular challenges in these regions.

Some areas of intervention appear particularly suited to the regional level. For example, SME support policies can be more effective when implemented in close contact with entrepreneurs. Agencies working at the subnational level are more aware of the problems faced by local companies, which operate in a specific regional context, and may be able to provide more suitable advice, in particular regarding the possibilities for inter-firm cooperation.

Policy focus should go well beyond research and development (R&D), which is too narrow to address the problems of the regions. Non-technological innovation has different dynamics and presents a potential that should be actively exploited by regional innovation policies. As these forms of innovation are not easily captured in traditional indicators, it is important that appropriate indicators are developed.

Policy design should pay attention to the possibilities for collaboration across sectors and technologies, leading to a more comprehensive view of the innovation potential, which should be associated with an emphasis on strategic planning and decision-making.

Evaluation plays an important role in effective policymaking. Quantitative and qualitative information on the outcomes of past initiatives helps to improve policy design and implementation. It is important that monitoring and evaluation mechanisms are tailored to reflect the particularities of specific programmes. Evaluation should be used also as a mechanism of



reporting to stakeholders, not only to policymakers, so as to preserve ownership of the regional strategy.

The variety of experiences across regions also provides opportunities for policy learning. Pilot initiatives in some regions can be replicated, if successful in other regions, or become the basis to develop national policies. However, in order that these experiences are a useful source of knowledge for other regions, it is important to have a proper understanding of the different factors that contribute to the success or failure of a certain initiative, in particular, those that cannot be easily replicated elsewhere.

Evaluation should be concerned not only with the use of resources but, critically, with the impact and outcomes of the policies implemented. In particular, the ability of regional innovation policies to change the behaviour of innovation stakeholders is an important measure of their effectiveness. The evaluation of the outcomes of policies, which may include many different instruments, and the involvement of multiple agents, is a challenging task that requires a systematic approach.

Strategic intelligence, which collects and analyses information to support the development of an evidence-based regional innovation strategy, is complementary to evaluation efforts. Regional foresight projects are systematic attempts to look into future trends through a mixture of methods. Regional benchmarking is also a useful tool to inform strategic intelligence initiatives. The importance of the local context should not be forgotten in order to avoid a mechanic interpretation of the results obtained in these benchmarking exercises.

## 2.4 Main Policy Conclusions

Regions can make an important contribution to national innovation performance by mobilizing local assets and developing linkages which rely on the proximity of stakeholders. Supportive policies can enhance the potential of regions to innovate and increase the consistency of interventions at different territorial levels.

Policy actions aiming to promote regional innovation should consider the following principles and recommendations:

- The strengthening of linkages between innovation actors should be supported by institutional structures that facilitate cooperation. Social and cultural aspects are also important to develop networking capacities at the regional level.
- Besides the strengthening of local ties, policies should pay attention to the need to avoid regional isolation by fostering cross-regional and cross-border collaboration, so that regions can have access to global knowledge and exploit synergies and complementarities. International openness is an important success factor.
- Regional innovation strategies should be built on a realistic assessment of existing capacities, identify clear goals and involve the private sector in both design and implementation.
- The integration of different policy instruments in a consistent manner and the coordination of interventions at different territorial levels greatly increase the

effectiveness of public interventions. These tasks present major challenges that can be addressed through well-established mechanisms for consultation and sharing of information.

- The public sector has a critical role in providing leadership to facilitate collaboration between different actors, supporting the entrepreneurial discovery of new comparative advantages and providing the necessary assets that facilitate changes in regional productive specialization.
- The focus of regional innovation policies should be well beyond R&D and technological aspects, as other forms of innovation have a significant potential to contribute to regional development and should not be neglected.
- Evaluation mechanisms should be developed to facilitate policy learning, both within and across regions. Communication with stakeholders on the outcomes of interventions contributes to the continued engagement of these actors, which is an essential factor in the implementation of regional innovation strategies.





### ***PROMOTING INNOVATION IN THE SERVICES SECTOR***<sup>8</sup>

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This chapter is based on the outcomes of the Applied Policy Seminar “Promoting Innovation in the Services Sector”, held on the occasion of the third session of the Team of Specialists on Innovation and Competitiveness Policies in Geneva on 25-26 March 2010. It summarizes the policy recommendations and good practices identified at the seminar. Additional, more detailed materials can be found in the [proceedings of the seminar](#).<sup>9</sup>

The chapter is structured as follows. It first introduces the role of services in modern economies and the specific features of innovation in the services sector before considering the rationale for policy interventions and the challenges involved. It presents a number of policy approaches and discusses different instruments that can be used to promote innovation in the services sector. Finally, it concludes with some consideration on the importance of policy learning in this relatively novel policy area and the contribution that international cooperation can make.

#### **3.1 Services in a Modern Economy**

Services play a growing role in economic activity, accounting for up to three quarters of total output in developed market economies. In countries with economies in transition, the shift towards services was part of the transformation towards the market economy. Globalization and increased international opening have also changed the environment in which services operate. Deregulation has increased competitive pressures for some type of services. As technological advances have facilitated tradability, delocalization trends have emerged, as some services activities shift to lower cost countries.

The development of services is a major source of productivity growth, as it provides critical inputs for other activities and makes possible new forms of activities and business models. Information and communication technologies, in particular, have a direct impact on organizational innovation capabilities in manufacturing.

There are significant differences in productivity in services sectors across countries. To some extent, these are partially explained by national variations in the composition of services. Slow productivity growth in this sector, as a result of low innovation, can be a major drag on economic dynamism. The disparity observed in national performances suggests a role for policy to enhance the competitive position of this sector and, by extension, the whole economy.

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<sup>8</sup> This chapter is based on UN document ECE/CECI/2010/5, “Policy options for promoting innovation in the services sector”.

<sup>9</sup> United Nations Economic Commission for Europe (2011), Promoting Innovation in the Services Sector – Review of Experiences and Policies, New York and Geneva (<http://www.unece.org/fileadmin/DAM/ceci/publications/icp3.pdf>).

At the company level, including firms whose primary activity is manufacturing, services represent an important dimension of their competitive position. Moreover, the boundaries between services and manufacturing are often unclear, as services are an important element of the production processes and commercial offerings of manufacturing companies. Intangible add-on activities (for example, after sales services) are a factor in determining the value of manufacturing products. As manufacturing companies are often involved in the production of services, the implications for policies and regulations concerning services extend well beyond the services sector per se.

In many cases, successful innovations represent the combination of technology-based products with new services that jointly define compelling commercial proposals. Manufacturing companies are often both consumers and providers of services. The distinction between manufacturing and services is evolving as a reflection of business strategies to adapt and take advantage of changing economic circumstances. Thus, companies may have sought to exploit opportunities in new activities or may have shifted specialisation in response to competitive pressures.

Some manufacturers have repositioned themselves as business services companies, in an attempt to move up the value chain. In other cases, manufacturers have seen the potential of delivering services that tap into the knowledge they have of their own products. In some cases, firm dynamics lead to the outsourcing of manufacturing processes while retaining service functions. In others, companies that started initially as service providers evolve to encompass also manufacturing functions.

In fact, it has been noted that a certain convergence can be observed in the dynamics of manufacturing and service firms through a process of horizontal integration. Service companies seek to be more closely involved with supply chains and manufacturing companies want to improve the commercial appeal of their products through added services. The concept of “integrated solutions” has blurred the distinction between sectors – in practice, this means that service and manufacturing activities are integrated into complex chains that seek to deliver value for customers and enhance the competitive position of these networks.

Given the difficulties in isolating services from other activities, a conceptual difference is often made between innovation in services (i.e. within the services sector) and service innovation (innovation in activities that have the characteristics of services and that can take part in any other sector). However, in practice, data limitations preclude a close examination of services functions embedded in other sectors.

There is a general awareness that reforms in the services sector can have significant positive impacts on employment, productivity and innovation. Knowledge-intensive services, in particular, can make a significant contribution to increased productivity in other sectors. A well performing services sector is increasingly seen as an important dimension of an effective innovation system.

The acknowledgement that services play an important role in ensuring overall economic dynamism and in enhancing the competitiveness of manufacturing has replaced the more traditional view of services as passive consumers of technological innovation produced

elsewhere. Services firms are no longer seen just as consumers of technology but real innovators. From this broader perspective, service innovation is considered as a key factor in economic growth, while avoiding an excessive focus on technological innovation.

The increased relevance of services for economic performance has brought a growing interest in understanding the specific drivers that influence innovation in this sector and on how to design and implement supportive policy initiatives. However, despite their economic significance, the recognition of the importance of the services sector in innovation policies is a relatively recent phenomenon that is still not well understood.

### **3.2 Innovation in the Services Sector: Some Features**

The services sector includes a wide range of activities with very different characteristics:

- They display a large degree of diversity regarding technological orientation and research and development (R&D) intensity, from traditional sectors like retail and tourism to others with higher technological content such as telecommunications and computer services;
- Services also show display various degrees of tradability, as a result of their inherent characteristics but also because of the role of regulations at various levels of government; and
- They also differ regarding the type and level of skills required and markets served.

A common feature, however, is that unlike manufacturing, which typically results in the delivery of material products, many services are essentially intangible. From a policy perspective, this heterogeneity raises the question of whether general policies are appropriate or differentiated forms of intervention would be more suitable to effectively address this variety.

Innovation in services is typically multidimensional, as it tends to embrace not only new products (service concepts) but also includes a wide range of non-technological issues, such as changes in the customer interface, the business model and organizational arrangements while incorporating often also a technological aspect. Product and process innovation tend to coincide in the service sector, because of the simultaneity between the production of a service and its consumption. New services are often accompanied by new ways of distributing them or interacting with customers.

Overall, innovation in the services sector is often associated with non-technological changes. “Hidden innovation”, i.e. not accounted for by traditional innovation indicators and without a technological basis, is particularly important for services. By contrast with manufacturing, the expected impact of innovation in services is likely to be less focussed on achieving a reduction in costs and more on quality, delivery process, access and changing customers’ experiences.

Users are therefore called to play an important role in the innovation process as the interaction between customers and firms is a critical source of information about their actual and potential needs. The relevance of non-technological innovation and the close interaction with customers emphasizes the importance of skilled staff, who are important agents of change in service companies.

Rates of innovation tend to be particularly high in knowledge intensive services (KIS) which have distinctive characteristics, being as technologically forward as manufacturing and displaying a high growth potential. KIS can play an important role in facilitating innovation in general, providing key inputs to other activities.

Some KIS subsectors, like information and communication technologies (ICT) have traditionally been the object of specific policy initiatives. The development of ICT has broader implications, driving efficiency gains in other sectors and making possible the emergence of new business models. The availability of KIS over a certain geographic domain can represent a significant competitiveness factor that confers locational advantages and facilitates the formation of networks.

Knowledge intensive service activities are sometimes integrated within manufacturing or services companies. Typically, these include functions such as management and employment, research and development, ICT, legal services, accounts or marketing. This sort of activities plays a key role in transferring existing knowledge among or within organizations. Furthermore, they are essential for the shift into higher added value activities by manufacturing firms.

As innovation is the result of a collaborative process between different stakeholders, these activities are enablers or carriers of innovation. As ICT, they facilitate the type of collective problem-solving processes that can drive innovation. The availability and use of KIS activities in firms (including those where their main activity is non-services related) can be linked to its overall innovative capacity, as those types of activities tend to be more common in larger firms with more developed innovation capabilities.

Innovation in services can play an important role in addressing social and environmental challenges, while reacting to the market opportunities created by secular trends such as population ageing or sustainability concerns. For example, environmental services, including areas such as recycling and waste disposal, have received growing policy and business attention. In some cases, offering recycling or remanufacturing services is an extension of the activities of traditional manufacturing companies that seek to extend the life of their products.

### **3.3 Innovation Policies: Need, Biases and Measurement Challenges**

The typical arguments focusing on various types of market failures as a justification for the need to put in place innovation policies apply also to innovation in the services sector. Some of these market failures would appear to be stronger in the case of services, thus reinforcing the case for policy intervention.

There are a number of examples of market failures that may require corrective action:

- Innovation in services is harder to protect through patents or other intellectual property mechanisms, which would result in the underprovision of innovation. Innovation in these sectors is often immaterial and more difficult to defend. Thus, new business models and organizational innovation (including when they have a technological base) cannot be protected by patents;

- Due to their higher reliance on intangibles and typically smaller size service companies may find particular difficulties in raising venture capital financing;
- Markets for services are fragmented and pricing is far from transparent, which may lead to the emergence of localized monopolies, with detrimental effects for innovation; and
- Restricted tradability and problems with the evaluation of services before they are consumed may result in information asymmetries.

The formulation and implementation of innovation policies regarding the services sector faces a number of specific difficulties. To start with, there is a need to develop concepts and measurements to assess the effectiveness of the initiatives undertaken. Policy actions need to be supported by a clear understanding of the issues that need to be addressed.

The diversity of the services sector presents a challenge for analysis. Statistical measures for services handling goods (like retail or transportation) are better established than for those that are not directly related to this type of activities (like business services or communications). However, these are very important as instruments of technological and social change.

While the so-called Oslo Manual<sup>10</sup> has been updated to cover service innovation, there is still a bias towards technological innovation, which is particularly limitative for services. The extension of the European Union Community Innovation Survey<sup>11</sup> beyond manufacturing to include services has allowed better insights on innovation processes in this sector. However, the development of indicators that support policymaking based on an improved understanding of innovation in the services sector remains a critical issue. Non-technological innovation is more difficult to track and record. Existing measures only partially capture innovation in services.

Reviews of the use of typical instruments of innovation policies, including the development of basic infrastructure, support through tax credits, provision of training or procurement suggest that innovation in services is at disadvantage in many countries. Knowledge transfer between the science base and services companies is also less developed.

Overall, innovation policies continue to emphasise the role of technology, but this dimension is less relevant for services companies. The challenge is therefore to develop forms of policy intervention that are not technology-based.

As promotion of innovation in the services sector is a relatively new area in many countries, effective design and delivery of policies may require the development of new skills and attitudes among stakeholders and government agencies involved.

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<sup>10</sup> Organisation for Economic Cooperation and Development, *The Measurement of Scientific and Technological Activities Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd Edition (Paris), 2005.

<sup>11</sup> The Community Innovation Surveys undertaken by national statistical offices in EU Member States are based on a common methodological approach to innovation as defined in the *Oslo Manual*. They cover many different aspects of firms' innovation activity and performance, including inputs used in the innovation process, sources of information for innovation, the firms' partners in its innovation efforts as well as different types of innovation outputs.

### 3.4 Innovation in Services and R&D

The strength of innovation in services companies relies to a lesser extent than that in manufacturing on technological R&D. Other types of innovations, such as those concerning marketing, relations with customers, delivery channels or combinations between services and products tend to have a more widespread application in services. However, R&D is also important for the innovation capabilities of services firms.

Business expenditure on R&D in services tends to be lower than in manufacturing but this general statement needs to be qualified, when considering specific subsectors. Moreover, this type of expenditure has grown faster in most countries, as services are becoming more R&D intensive, albeit significant differences remain among various types of activities. In particular, technological R&D is high in knowledge-intensive services. While it is true that the type of knowledge generated through innovation in services cannot be protected through patenting in many cases, the growing importance of R&D suggests that there may be an increased scope for intellectual property rights (IPRs) protection, which has policy implications.

There are measurement problems concerning R&D in services:

- Some R&D is attributed to manufacturing firms while some services companies may underreport the extent of R&D undertaken;
- R&D in services is often an informal activity that is difficult to measure, often entangled with R&D in manufacturing. Thus, R&D in services is often not isolated but appears closely related to the production of physical goods.

Improvements in measurements may explain part of the increased R&D intensity observed in the services sector. Statistical evidence (as available in the European Union Community Innovation Surveys) shows that services benefit less than manufacturing from public support to innovation, in particular concerning R&D, although there are wide national and subsectoral differences. Knowledge-intensive services perform better than other areas such as trade, transports or finance.

Tax credits and other incentives to R&D are based on binding definitions that identify eligible activities. The difficulties in measuring R&D in the services sector have implications for the effectiveness of policies. Policy efforts need to be devoted to improve the statistical understanding of R&D in services and address the bias against these sectors in public support initiatives.

### 3.5 Policy Approaches

There is a general opinion that innovation policies and strategies in relation to the services sector are less developed than those targeting manufacturing. The recognition of the importance of a dynamic services sector has been accompanied by efforts to ensure that the promotion of innovation in services is duly acknowledged in innovation policies and strategies and that this is backed by appropriate statistics. However, despite the progress observed, the attention received in policy initiatives remains relatively limited. Well-defined frameworks for policy intervention in this area are rare, being only present in a handful of countries.



The awareness that innovation policies tend to neglect services has led to initiatives to widen the range of policy measures designed to support manufacturing to the services sector as well. To some extent, this approach represents the extension of a manufacturing-based view of innovation to services, while retaining a privileged focus on technological R&D. This creates a technological bias that may be detrimental to services, given the importance of non-technological forms of innovation in this sector.

Other policy approaches underline the specific characteristics of innovation in the services sector, in particular, the relevance of non-technological innovation. The emphasis on differentiation takes place also within the services sector itself. The diversity of activities and their varied characteristics lead to the implementation of subsectoral innovation programmes (focussing, for example, on tourism or financial services), as these are seen as a way to effectively address the different barriers to innovation in a sector which shows a wide range of heterogeneity.

By contrast, more recent policy strategies tend to emphasise a more comprehensive view of innovation, which considers services in an integrated fashion. There is a close relation between various forms of innovation in manufacturing and services, which are difficult to disentangle. Successful companies usually present a mixture of these activities employed to develop compelling commercial proposals.

This integrated approach considers that the lack of services innovation should be understood as a failure of the overall innovation system. Innovation policies in services would need to be developed as part of general innovation policies:

- There are important links between manufacturing and the services sectors and these relations would need to be taken into account when designing policies;
- Improving relationships and connectivity between services and manufacturing companies is required to address observed systemic failures in the innovation system; and
- Knowledge intensive services are seen as a key input to improve the competitive capacities of manufacturing companies.

### **3.6 Instruments for Promoting Innovation in the Services Sector**

Policy instruments for promoting innovation in the services sector may aim to:

- Correct existing biases against services in the conduct of traditional innovation policies;
- Devise specific interventions that are tailored to the particular problems of some services activities; and/or
- Develop measures that are based on the understanding of the services sector as an essential dimension of the overall innovation capacities of the economy.

In practice, concrete interventions may include a mixture of these approaches, often reflecting a combination of sectoral and horizontal policies. The choice of instruments and areas of intervention is usually a reflection of concrete national circumstances, including the particular innovation governance set up. Moreover, the policy mix is an expression of the views on how to develop a strategy for innovation in the services sector.



The heterogeneity of the services sector and the difficulties in differentiating services from manufacturing activities may explain the general absence of broad strategies supporting innovation in services. Innovation initiatives in specific subsectors are much more frequent, with countries targeting areas that are particularly relevant for the national economy.

The potential scope of innovation in services is very wide, encompassing, among other possible aspects, new services concepts, business models, organizational arrangements and customer interfaces. Designing innovation policies poses a challenge, as the new agendas involve different target groups. Specific instruments that target innovation in services remain rare.

Policy documents at the more general level typically do not discriminate against services and, in some instances, may even make an explicit mention to the promotion of innovation in this sector. However, it is at the level of the design of specific instruments and mechanisms where problems often arise. While the policy instruments available in this area may be sector neutral, the evaluation of proposals or projects often has an implicit bias toward technological innovation that may put services at a disadvantage. It is therefore critical that instruments appropriately reflect the distinctive features of innovation in the service sector.

Overall, innovation in services is sensitive to general framework conditions. In particular, the degree of competition, including foreign competition, and the conditions for labour mobility influence innovation in the services sector.

The fact that traditionally services have been sheltered from foreign competition and that they are more difficult to trade across borders may have been one of the factors constraining innovation in some countries. However, with the advance of globalization competitive pressures from international markets are becoming more widespread. The opening of markets has created new opportunities for firms to expand and innovative mechanisms to reach out different markets. Initiatives to widen the markets and increase the internationalization of services are likely to have a positive effect on the rate of innovation.

However, services are delivered locally and therefore are very sensitive to local circumstances. Some services operate in areas where there is a high degree of regulation. Policies need to assess the appropriate degree of regulation and find a suitable balance between the need to protect consumers and achieve other goals while providing an impetus to innovation.

Labour market policies appear also as particularly relevant for the development of the services sector, which depends on the existence of a qualified and mobile workforce endowed with a varied range of skills to interact with customers and capable of engaging in the labour market in a flexible way. This may include arrangements that facilitate part-time work.

The promotion of SMEs and entrepreneurship may have a particularly favourable impact regarding innovation in the services sector, as small companies are more prevalent in services activities, which often have a more local orientation. High rates of new firm creation are typical of the services sector. This is a factor encouraging innovation that can be nurtured by supportive policies.

Internationalization may spur innovation but it also generates significant competitive pressures for SMEs, which may require specific forms of support to address this challenge, providing them with the necessary international marketing and sales capabilities.

As non-technological innovation plays a more significant role in services, it is important that innovation policies have a broader focus that encompasses also support to other forms of innovation, including, for example, organizational and marketing arrangements. However, R&D expenditures have also a positive impact in fostering innovation in services, so policy efforts may also be directed towards promoting awareness and the use of R&D in services.

Services firms are generally less connected than manufacturing companies with the science and technology base, with the exception of knowledge-intensive services. Addressing these weak links may require the use of specific policy instruments. Innovation vouchers and similar schemes can be used to facilitate the upgrade of innovation capabilities by services providers.

However, the absence of a stronger relationship may reflect the fact that existing research outputs are of limited use to services companies. The challenge is how to make the science base more responsive to the needs of services companies, which may not have a special emphasis on technological innovation. Such efforts demand new attempts to create concepts and disciplines that address these tasks.

In this regard, “service sciences” have emerged as a multidisciplinary approach that seeks to provide a foundation for the creation of new services and business models in a systematic manner, in particular in connection with the use of ICT. The availability of individuals who have a varied mix of skills (both technical and managerial) appears as an important ingredient of this approach, which therefore emphasises the need for appropriate training and learning initiatives.

In many countries, in particular, in economies in transition, areas such as consumer behaviour, marketing, cultural understanding and communication, have been neglected in comparison with the more technological aspects of innovation. It is important that research and education policies reflect the relevance of these areas for innovation in services.

Overall, the services sector’s need for a wide range of skills implies that vocational training and training on the job play an important role in ensuring the availability of qualified personnel. It is important that policy instruments recognise and encourage this type of qualifications.

Effective partnerships between different types of services providers and between services and manufacturing companies are an important factor of economic flexibility and dynamism. The traditional mode of in-house production has been replaced by more complex arrangements than link various companies in developed business networks.

Participation in these value chains has both an external (between firms) and internal (within firms) dimensions. Innovation policies face the challenge of how to create conditions that promote the development of these relationships and how to adapt existing instruments to an environment defined by collaboration, specialization and sharing of information.

Standards can facilitate the development of complex value chains and support efforts to increase productivity. They are an important ingredient of the institutional framework that provides

certainty for business to operate. In a globalized world, this has an important international dimension that may require cross-border coordination efforts.

Policy mechanisms could therefore be developed that facilitate networking and cooperation among the various stakeholders on innovation in services processes. This may involve the creation of suitable ICT-based platforms that operate on the basis of open innovation principles.

Human capital plays a particularly important role in fostering innovation in the services sector, where there is the need not only to generate new solutions but to implement them on a continued basis in close connection with customers. A high degree of customisation, facilitated by closer interrelationship with customers, is an important ingredient of commercial success.

Overall, services companies seem to rely to a larger extent on the skill base of their staff to gain a competitive advantage. A wide range of skills is demanded, including non-technical. Tacit knowledge, often resulting from the interaction with other members of staff, clients and suppliers, is critical for successful adaptation. The involvement of employees in the innovation process, which can be encouraged through appropriate organizational structures and incentive mechanisms, is therefore an important element of services innovation. Given the type of continuing and growing exigencies on the workforce, this may require particular attention to vocational education and life-long learning.

Service companies rely less on patents than manufacturing firms to protect their innovations. However, other intellectual property rights (IPRs) such as copyrights and trademarks are more significant, as these are more suitable to the characteristics of the sector. Typically, trademarks serve to address the problems of how to evaluate the quality of a service prior to consumption, as they facilitate building the necessary reputation. However, the increased use of R&D in the services sector that can be observed in most countries suggest that awareness of IPR mechanisms is also becoming increasingly relevant.

The heterogeneity of the services sector should be recognised when proposing measures targeting IPRs. In some subsectors, such as software, engineering and computer services, R&D is more important and therefore, traditional protection through patents would be more appropriate.

In any case, the existence of mechanisms of IPR protection that do not have a formal character, including first-mover advantage, should be underlined. IPR systems need also to pay attention to the relevance of collaborative methods in the provision of services. A paramount example is the development of open source software and the creation of open standards. The flexibility and speed provided by these arrangements are important contributors to innovation.

As in generalist innovation policies, supply-side measures tend to predominate among the initiatives undertaken to promote innovation in the services sector. While demand-side actions tend to be rare, these have a particular relevance for the services sector. User-demand has an important role in fostering innovation in this sector, as new services often result from the interaction between suppliers and users. The creative industries, which have a great potential in modern economies, is a paramount example of the need to maintain and develop close contacts with users.

Services in which close relationships with clients are the norm tend to display higher innovation rates, as these links allow companies to acquire the necessary information to make attractive new proposals and to react quickly to the demands of users. Engaging customers and suppliers represents a source of competitive advantage that reflects well the non-linear nature of innovation and provides a continuous focus on market needs.

Clients, who are often closely associated with the design and delivery of services, encourage innovative firms to make adjustments to the services they offer in order to tailor them to their needs. This may continue even after the initial service has been rendered in the form of technical support or after-sales care. Such a high degree of interactivity emphasises again the importance of skills. Policy instruments may be deployed to facilitate and encourage these relations, including through the development of appropriate skills.

However, as with manufacturing, weak demand can stifle innovation. Policy measures to encourage the demand for innovation through the use of standards and public procurement are also useful to foster innovation in services. The visibility of new offerings by early adopters from the public sector can contribute to the subsequent diffusion of these innovations. Public procurement can stimulate the offering of new services but for the beneficial effects of such instruments to materialise, it is important to have mechanisms that are open and transparent while seeking the involvement of SMEs and addressing existing barriers to competition.

The development of services is often part of policies that seek the general promotion of innovation, in particular, with a territorial dimension. Cluster policies are a clear example, as the development of transport, logistic and business services are seen as means of establishing a favourable environment that encourages the growth of firms and their interaction. A thriving services sector provides locational advantages and a channel for the circulation of information. Cluster policies are particularly relevant also for the promotion of specific types of services like tourism, finance or creative industries, where proximity between companies is a source of economic dynamism and customer attraction.

Regional development programmes are often a main conduit for the articulation and implementation of initiatives to foster innovation in services. Central agencies tend to be more concerned with the planning and delivery of public services of general significance but private stakeholders usually operate at the regional and local levels. Regional innovation policies are also more closely aligned with the economic structure of the region.

Therefore there is a need to effectively integrate the strategies and measures carried out at different levels of government. Policies should not neglect the importance of small local projects, which are easier to coordinate than large scale national initiatives and which can focus on local needs.

### **3.7 Policy Learning and the Role of International Cooperation**

The promotion of innovation in services is a relatively new policy area. Countries are at different stages in the conceptualisation and implementation of relevant strategies. Specific choices need to be made to translate policy documents into concrete operational measures. Overall, there is a need to develop further the understanding of innovation in services and increase policy awareness of the importance of innovation in the services sector but also in service activities in general.

This creates a significant scope for policy learning, including at the transnational level. It is therefore important to conduct targeted programme evaluation and policy research which could provide a solid foundation for the assessment of policy experiences and the identification of good practices. As the initiatives undertaken in this area are relatively recent, the available body of knowledge on their impact remains comparatively limited.

Given this background, the design and implementation of evidence-based policies would be greatly facilitated by the collection of case studies that provide illustrations and examples of successful experiences, both regarding policy measures and company activities.

As good local practices are identified, dissemination efforts should also be a policy target, in order to increase their adoption by business and policy makers. Case-based policies should be grounded on a deep understanding of the conditions required for success. International cooperation can facilitate the wide sharing of the results of these experiences, so to better inform future policy initiatives.

While international comparisons can help to identify good practices, policy approaches and the choice and design of instruments should be adapted to national circumstances, taking into account the specific institutional and socio-economic context.

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# **National Innovation Systems and Policies**

## Good Practices and Policy Recommendations

This publication is part of an ongoing series highlighting some of the results of the UNECE Subprogramme on Economic Cooperation and Integration. The objective of the Subprogramme is to promote a policy, financial and regulatory environment conducive to economic growth, knowledge-based development and higher competitiveness in the UNECE region.

It covers different thematic areas related to this objective including innovation and competitiveness policies, entrepreneurship and enterprise development, financing innovative development, public-private partnerships for domestic and foreign investment, commercialization and protection of intellectual property rights.