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SOUTH EAST EUROPE INVESTMENT COMMITTEE

- DRAFT -

DEVELOPING LINKAGES TO ENHANCE INNOVATION: INTERNATIONAL EXPERIENCE AND RECOMMENDATIONS FOR THE WESTERN BALKANS

23 November 2010

EXECUTIVE SUMMARY

The following paper explores the linkages between the actors in national innovation systems. Based on policy experiences in the OECD area, this paper focuses on the various types of networks that have been developed to enhance innovation frameworks and offers concrete policy options to Western Balkan economies. It will serve as a discussion basis for the Regional Competitiveness Initiative Steering Committee meeting on November 22 and 23, 2010.

The main objective of the paper is to emphasise the importance of increased connectedness within innovation systems. Indeed, linkages between the various innovation actors including companies, universities, public research centres, and policymakers, are needed to ensure that innovative ideas are eventually brought to the market and materialise into economic growth. Networks facilitate the identification of innovation opportunities; help raise finance and pool resources; and increase the transmission and exchange of specialised knowledge. As the boundaries between producers and users of knowledge have become more flexible, networks make it possible to exploit the different comparative advantages of each type of innovation actor.

The paper details and analyses the following forms of innovation-oriented linkages: inter-firm networks; business clusters; foreign direct investment and technology transfers; and government-industry-university or 'triple helix' interactions. In addition, it highlights measures to foster access to finance for innovative firms and to boost connections between entrepreneurs and potential investors. It concludes on a review of the existing policy frameworks for innovation in the Western Balkans.

Governments have a significant role to play in promoting linkages. The paper analyses specific policy instruments and incentives to catalyse network creation, such as identification measures, labelling/accreditation, and direct financial support. It also reviews more indirect measures seeking to create an environment conducive to network creation. Yet, the role of government should be carefully delineated. Government intervention has not always proved necessary or beneficial to foster linkages and its effectiveness has depended on the existing institutional and policy framework. Innovation systems in Western Balkan economies often lack co-ordination between the various institutions. This results in a limited focus of innovation policy. In some economies, the innovation framework is largely undeveloped. Government in the Western Balkan economies should take measures to enhance linkages between the various innovation stakeholders. OECD good practices presented in this paper can serve as a guide to design an innovation agenda.

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INTRODUCTION

This paper aims at exploring key linkages that exist between the core actors in national innovation systems. It seeks to summarise lessons learnt from OECD countries in fostering these linkages and offers concrete policy options.

The paper was drafted in the framework of the Regional Competitiveness Initiative, a three year project that aims to enhance productivity and output in the Western Balkans by focusing on two core themes; innovation and human capital development. Although these two themes are mutually reinforcing, the focus in this paper is on the innovation dimension. The paper serves as a discussion paper for the RCI Steering Committee, which will meet in Paris on 22 and 23 November 2010.

The work conducted by the OECD through the Frascati manual (1963) and the Oslo manual (1995) has lead to a formal definition of innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations". Such a definition entails four types of innovations.

- Product innovation: This involves a good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.

- Process innovation: Process innovation involves a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.

- Marketing innovation: Marketing innovation involves a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

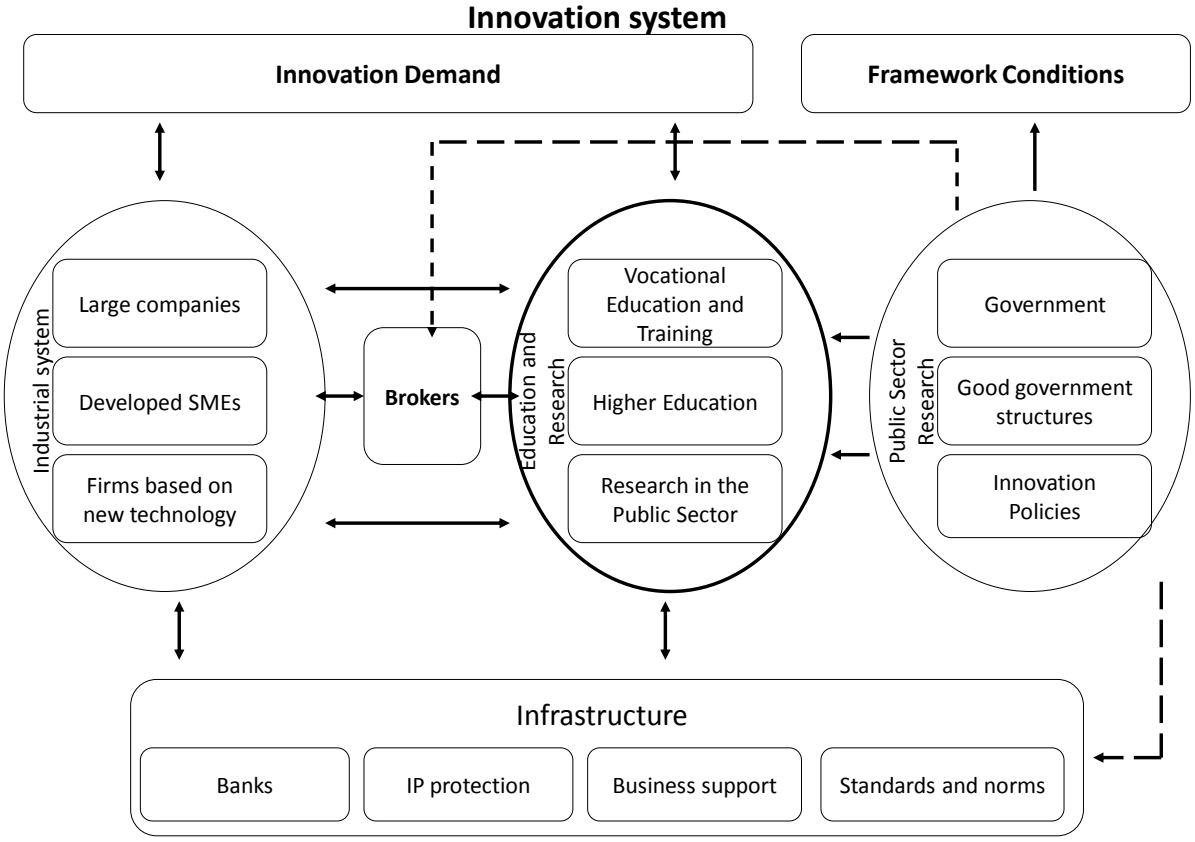
- Organisational innovation: Organisational innovation involves introducing a new organisational method in the firm's business practices, workplace organisation or external relations.

The Oslo manual identifies four factors that influence the effectiveness of the innovation process: framework conditions, science and technology institutions, transfer mechanisms and firm specific innovative drive. The general framework conditions such as the macroeconomic environment, the fiscal system, the access to finance shape the activities of companies and their ability to conduct innovative activities. The efficiency of science and technology institutions drives the accumulation of knowledge. The mechanisms to enhance flows of information and skills between the various stakeholders in the innovation system are crucial to ensure that innovative ideas are actually brought to the market and materialise into economic growth. Finally, firms need to seek, identify and exploit potential for innovations to reinforce the innovation process. These four types of factors correspond to specific areas of policy interventions. Governments need to design measures to address potential barriers related to each of these four domains and, most importantly, decide on the priorities that need to be set.

Within this framework, the inter-connectedness between the innovation actors, referred to in the Oslo Manual as transfer factors, is among the main determinants of the performance of innovation systems. These transfer factors ensure that innovation developed in a specific institution benefits the economy as a whole and also that the various stakeholders – companies; both large and SMEs; public research centres; universities and policy makers- participate in the innovation process.

Recently, the so-called 'Triple Helix' model has emphasised the importance of strengthened links between universities, government and industry to stimulate innovation. According to this model, industrial firms increasingly require the application of knowledge to enhance their production processes or to develop new firms on the basis of new knowledge. However, it is not expected that enterprises do this alone. Universities thus play a new role, not only in generating knowledge but also in ensuring that knowledge is put to good use. Finally, governments also perform an important function in encouraging co-operation between innovation actors as well as in solving the lack of early-stage business funding, through public venture capital entities (Etzkowitz, 2008).

Figure 1. Graphic Depiction of an Innovation System



Source: Lana Hopkinson (2010)

The OECD, through its innovation strategy has identified a number of areas that were essential for the design of successful policies to develop linkages between the various stakeholders and improve their access to adequate forms of finance. Lessons can be drawn from initiatives led by some OECD countries to further develop networks supporting innovation. In the Western Balkans, where examples of policy support to innovation have been developed, these lessons can contribute to the establishment of an institutional and economic framework that would be more conducive to innovation.

This paper will focus on the various types of networks that have been developed, the lessons that can be taken from OECD experience and will review the current situation in the Western Balkans.

Furthermore, measures to foster the access to finance of innovative firms will be assessed along with their applicability to the Western Balkan countries.

Accordingly, the paper is divided into the following sub-sections:

- Inter-firm networks
- Business clusters
- FDI and technology transfers
- Government-industry-university interactions
- Access to finance in innovation
- Review of policies to foster innovation in the Western Balkans

SECTION 1: INTER-FIRM NETWORKS

Introduction

Private companies use networks as a strategy for resource acquisition to support firm performance (Hite and Hesterly, 2001). They develop a web of relationships with suppliers, customers and other types of partners. Most of these relations are informal forms of collaboration. However, in specific cases, a set of firms define a formal co-operation within a networking agreement. Networks can serve many purposes: they facilitate identification of business opportunities, help raise finance or pool resources to reach a common goal (OECD, 2003). As firms focus on a limited scope of activities and as international competition intensifies, inter-firm networks are playing an increasingly important role in the innovation process. Thus, improving the efficiency of innovation networks should be one of the main concerns of innovation policy.

Forms of networks

Within the national innovation system approach, the importance of networks relies on the related information flows between the various stakeholders. Relationships between firms can help overcome some of the failures that characterise the market for innovation. In particular, networks improve transmission of tacit knowledge and allow firms to generate economies of scale by sharing the cost of knowledge acquisition.

Networks can have strong or weak ties between their members. While strong-tie networks are important for the creation of knowledge (in the framework of R&D alliances), weak-tie networks are important in the acquisition of knowledge. A firm usually has a wide range of weak-tie network partners, originating in entrepreneurs' personal networks, and chance encounters at networking events, such as conferences. Some of these weak-tie links will evolve into strong links as parties get to know and trust each other, and see mutual benefit in enhanced co-operation.

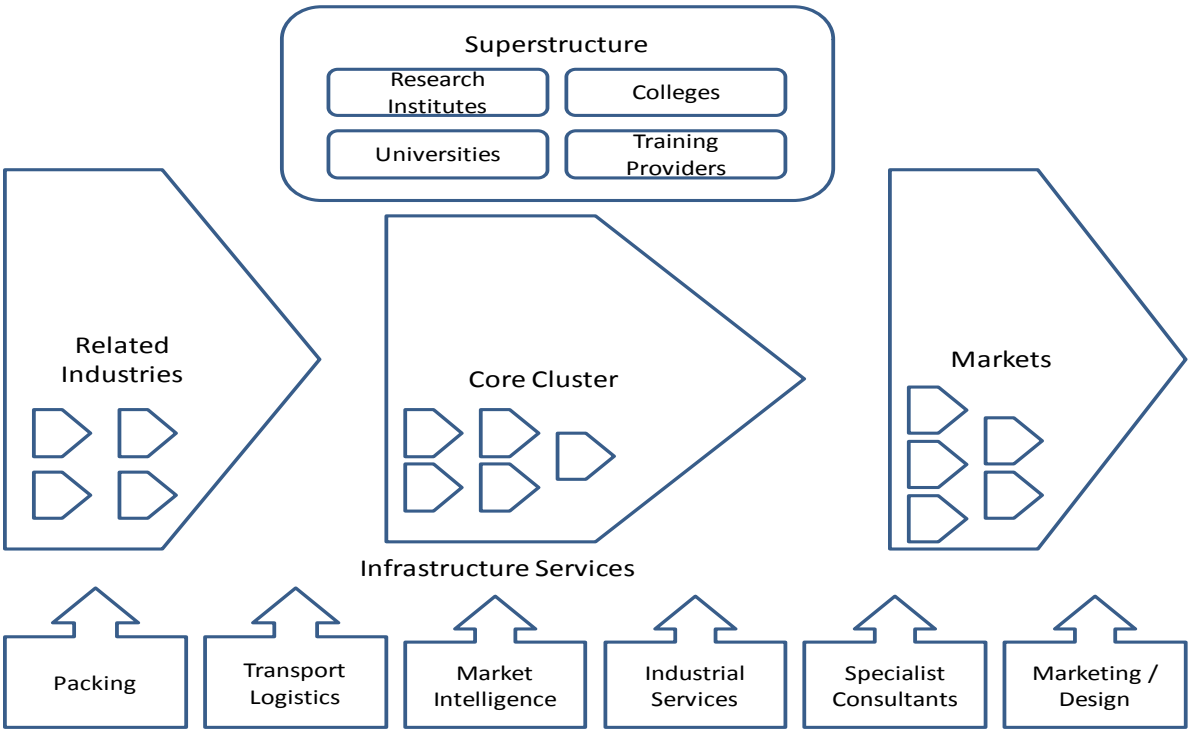
Both vertical and horizontal networks operate according to different principles.

- Horizontal networks group together potential competitors. These alliances are very common, for example in the car manufacturing industry where they allow OEM to generate economies of scale in the R&D process. As the partners still compete on the final products, horizontal alliances tend to have a very specific objective such as developing non-differentiating elements or defining common standards.

- Vertical alliances, which group together a company, its suppliers and customers, are routinely used in the innovation process. Research indeed demonstrates that companies that have developed extensive links with the other stakeholders in the supply chain have superior innovation output. Furthermore, the stronger the co-operation is, the higher the innovation performance (Gemünden et al, 1996).

- Networks usually develop into a combination of vertical and horizontal networks, as shown in the figure below:

Figure 2. An Example of Network Configuration



Source: Lana Hopkinson in "Innovation clusters" a presentation in the framework of the project for non financial assistance to SMEs in Serbia

Key Success Factors and Policy Implications

Although inter-firm networks are often operated by private initiatives, the public sector also has a critical role to play. By stimulating inter-firm networks, public authorities foster creation and the exchange of knowledge. However, most forms of support for innovation aim chiefly at improving the investment of specific firms in research and development. Specific operational and financial instruments are needed to support the set of inter-firm networks.

Intellectual Property rights

Intellectual property rights are an important component of the business environment for innovation. Low IPR enforcement may lead to sub-optimal investment as companies anticipate that they will not be able to fully exploit the market advantage of innovation. The various aspects of IPR enforcement and the role of policy makers are discussed in Box 1.

In order to be sustainable, inter-firm networks need to be based on trust between partners. Intellectual property rights are one of the elements that contribute to establishing trust between companies. If partners believe that other companies in the network may copy innovation they invested in, they may withdraw from the network. This can be a very powerful inhibitor of creation of relationships especially in the asymmetric case of an SME partnering with a large company. Such a partnership is essential to the development of the SME, since such partnerships establish its credibility in the marketplace; however, it can also be seen as the "kiss of death" whereby the large company will take away part or all of the competitive advantage brought by the innovative firm. This perception can be due to low IPR enforcement, but also to the asymmetry in legal protection between a large and resourceful company and an SME.

Brokerage services

In order to overcome potential resistance by firms, public authorities can help create informed demand through awareness campaigns on the benefit of inter-firms networks. Moreover, public brokerage services help companies identify the most relevant partners for potential co-operation. For example, in the United Kingdom, BusinessLinks has developed a number of guides to help innovators throughout the process of product development and help them identify the relevant partners. In particular, companies can access a database of high-quality intellectual services, an increasingly important partner in the innovation process for SMEs. Seminars and other networking events can also be important catalysts for the formation of networks.

Targeted financial incentives

The cost of networking and the uncertainty over the long term benefit can lead companies to under-invest in developing partnerships. Public policy may provide financial instruments to foster co-operation. These can include covering feasibility work for the alliance, and potential cost of brokerage services. Alternatively, governments can make innovation related subsidies conditional on a degree of co-operation between stakeholders. This is, for example, the case with the framework programmes operated by the European Commission, which explicitly elicits consortia from several countries.

Accreditation / labelling of innovative enterprises

Identifying particularly innovative enterprises and labelling / accrediting these as such can be a potent catalyst for innovative network creation. It gives a clear signal to the market that the enterprise in question is a trusted partner for innovation. France successfully introduced such a labelling system, the "jeune enterprise innovante" in 2004 for SMEs that are less than eight years old and invest at least 15% of their operational costs in research and development.

Box 1. Innovation and Intellectual Property Rights

Intellectual property rights (IPRs) are legal titles allowing their holder to bar other parties, for a defined period of time, from all or certain uses of the protected item, which can be an invention (protected by patents), a brand name (protected by trademarks), a creative or artistic work (protected by copyright), and industrial design or a trade secret (OECD, 2007b).

The primary objective of IP protection is to foster innovation in the private sector by giving inventors the opportunity to profit from their inventions. Traditionally, however, the positive effect of IPRs on innovation has been contrasted with their negative impact on competition and technology diffusion (OECD, 2004). Empirical evidence tends to confirm the effectiveness of IPRs in boosting innovation, even if there is noticeable cross-industry variation. IP protection acts as a particularly strong incentive mechanism in the fields of biotechnology, drugs, chemicals, and to a certain extent, machinery and computers (OECD, 2004). Based on the view that stronger IPRs encourage innovation, IP regimes have progressively strengthened the rights granted to IP owners and limited those of IP users: over the last few decades, the coverage of IPRs has been broadened and their enforcement has been facilitated.

However, IP protection may also obstruct further innovation, especially when it restricts access to fundamental knowledge, as may be the case when innovation is cumulative in nature and patents protect basic inventions. In this context, too extensive a protection can deter subsequent inventors if the holder of a patent for an essential technology refuses access to others under reasonable conditions (OECD, 2004). In fact, recent changes in innovation systems, characterised by larger knowledge flows between firms, and between firms and universities, have both amplified the need for protection and reinforced the potentially detrimental effects of excessive protection (OECD, 2007b).

Thus, from a policy-making perspective, there is a need to carefully balance IP protection to ensure a high level of innovation while at the same time limit the potentially damaging effect of IPRs on technology diffusion. By and large, weak and narrow patents might discourage private sector investment in R&D. Conversely, excessively strong and broad patents might lead to unwanted strategic behaviour by IPR holders and limited technology diffusion.

Creating networking opportunities

Organising seminars and conferences helps create a weak-tie knowledge network. Growth of networks is limited by the limits in the firms' relational ability. Therefore lowering the cost of adding weak ties to firms' networks may help. For instance, a simple fiscal measure such as making conference fees tax-deductible may give a boost.

SECTION 2: BUSINESS CLUSTERS

Introduction

Business clusters are geographic concentrations of interconnected businesses, suppliers, and associated public institutions (such as universities and research institutes) in a particular field that compete but also co-operate. They exist across the full array of tradable and non-tradable sectors although they often do not correspond to a single manufacturing or service sector as recorded by standard industrial classifications. They have relationships based on supply chain interaction and/or complementarity of product and service offerings; they share the same infrastructure, a common client base, knowledge and skill base. The relationships they foster enhance their competitive advantage through a unique sharing of tacit knowledge which can only be transferred through face to face contact. This is the fundamental

difference to networks which may be global, and rely on more sporadic contacts and distance communication.

Due to the potentially large beneficial effects of clusters on local and national economies in today's increasingly knowledge-based world economy, policy interest in supporting clusters has been important over the past few years. In OECD countries policy approaches have varied in approach, scope, and success.

This section aims at summarising the lessons learnt from these policies[1]. It begins with a brief depiction of the economic impact of clusters as well as the role of clusters as drivers of innovation. It subsequently examines the role of public policy in supporting clusters and highlights its limitations. The final sub-section explores key success factors for cluster development and corresponding policy measures, based on OECD country experience.

The economic significance and benefit of clusters

By clustering together, firms may in some cases achieve enhanced productivity due to the sharing of specialised knowledge and increased diffusion of tacit skills. Geographic proximity enhances human relationships, and these relationships develop embryonic ideas during informal exchanges (the so-called cafeteria effect). To synthesise this concept of geographical proximity as an advantage, one can say that in proximity, relationships give rise to ideas whereas at a distance, ideas give rise to relationships.

They also may experience economies of scale, through cost-sharing for example, and lower their transaction costs due to geographical proximity and increased interaction often based on trust. Industry concentrations can lead to the appearance of localisation economies reducing costs through the availability of specialised labour and business services, public sector investments aimed at satisfying particular industry needs, as well as financial markets geared towards satisfying cluster firms' demands (OECD, 2005).

From the local perspective, the economic benefit of clusters may come from their strong competitiveness, their generation of higher wages and profits, their attraction of new investment and the spread of benefits to the rest of the local economy. From a national perspective, the benefit may come from the specialisation of places in activities within which firms can gain higher productivity through accessing external economies of scale or other comparative advantages and the trading of this higher quality and lower cost output with other places (OECD, 2009a).

An example of a cluster that brought significant local and national economic benefits is the high-tech cluster of Oxfordshire in the United Kingdom. It grew from 190 firms employing 2 000 people at the end of the 1980s to 543 firms employing 19 465 in 1997. By 2002, the number of high-tech firms had risen nearly threefold to 1 400 high-tech and employment slightly less than doubled at 36 700, representing about 12 per cent of all employees working in the county. The most recent estimate is of approximately 3 500 businesses employing around 45 000 in 2004 (OECD, 2009a).

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[1] The content of this section is based in particular on the recent OECD publications *Clusters, Innovation and Entrepreneurship* (2009), *Business Clusters: Promoting Enterprise in Central and Eastern Europe* (2005), and *Competitive Regional Clusters* (2007a). In preparation for the 2000 OECD Ministerial Conference in Bologna, Italy, the OECD also developed a set of guidelines for cluster development.

Clusters and innovation

Clusters have also been identified as motors for innovation, as companies co-operating and competing in geographical proximity can learn from each other, developing unique local knowledge and creating knowledge spillovers[2] in the process. Much of this learning occurs through the exchange of tacit knowledge through personal contact and trust, which is abundant in a cluster environment. The introduction of new technologies is favoured both by the element of competition as well as the possibility of cost-sharing among cluster participants (OECD, 2005). Clusters are thus sites of localised positive externalities in labour market pooling, input-output linkages and knowledge spillovers.

There is significant empirical evidence pointing to the existence of such benefits. Aharonson et al. (2004), for example, demonstrate how clustered biotechnology firms are eight times more innovative than geographically remote firms within that sector. The study is based on detailed data collection over nine years of 675 biotechnology firms operating in Canada.

The role of public policy in facilitating the emergence and growth of clusters

Research shows that clusters are difficult to 'construct' and top-down policies aiming at building clusters from scratch are often unsuccessful. One of the most prominent examples occurred in the late 1950s when Soviet-Russia decided it should have its own Silicon Valley. Accordingly, Akademgorodok, the 'City of Science' was built in the middle of the taiga of Siberia. This government-planned cluster, however, failed to produce the favourable economic Silicon Valley-effect the Soviets had hoped for (Sautet et al., 2008).

Rather, public intervention should play a catalytic role, supporting existing or emerging clusters by enhancing their enabling environment. Clusters stem from particular historic, cultural and social contexts. Even clusters that have experienced important government intervention and support have commonly unfolded long before.

The microelectronics and nanotechnologies of Grenoble "pôle de competitivité mondial" is a telling example. It has benefited from considerable support from the French Government only recently, which adopted an industrial strategy based on the introduction of "competitive clusters", earmarking €1500 million over the years 2006-2008. Yet, the development of electronics and microelectronics activities in the area can be traced back for at least 50 years to the development of hydroelectric power in the surrounding Alps and the location of a branch of the government's atomic energy agency undertaking industrially relevant research in the city (OECD, 2009a). In France 71 "pôles de competivité" exist to date, grouping together 9000 researchers working on 1000 registered projects. Their support is part of a wider national strategy to foster national competitiveness, which is a trend also noticeable in other OECD economic strategies. For example the European Commission's Europe 2020 Strategy envisages the development of "a framework for a modern industrial policy", which will include "the promotion of clusters" (European Commission, 2010: 15)[3].

Although clusters may be supported by a specific cluster initiative or programme, they may also sustain themselves, without policy intervention: through market processes new actors move into a cluster

[2] A knowledge spillover is an exchange of ideas among individuals. From an economic point of view, a knowledge spillover is a non-rival knowledge market externality that has a spillover effect of stimulating technological improvements in the process in a neighbour through one's own innovation.

[3] The Europe 2020 Strategy is also key to the wider theme of innovation across the EU. It includes the concept of Innovation Union, which strives to create framework conditions conducive to innovation across Europe.

to gain the benefits of greater productivity and existing actors grow through their greater competitiveness. There are also potential economic costs that should be taken into account in considering whether to support clusters. For example, if the productivity gains within the cluster may be lower than the productivity losses in other places. Another obvious cost is increasing congestion as clusters grow, in the form of roads and hospitals or rising housing prices. Thus the role of a specific cluster policy has to be carefully assessed.

Key Success Factors and Policy Implications

Clusters require a unique operational environment to thrive, based on factors such as deep and diverse inter-firm co-operation or a sufficiently high quality of life. Public policy has a role to play in enabling such an environment, eliminating barriers for cluster development and thereby facilitating the emergence and growth of clusters. This sub-section aims at exploring the key success factors for cluster development and corresponding policy measures, based on OECD countries' experience, particularly a recent OECD study (OECD, 2009a).

Match of skill needs with skill supply

The availability of adequate skills is the base for the emergence and development of clusters. Yet skills needs evolve with the growth of a cluster or changing demand patterns in local and international markets (OECD, 2009a).

Governments can foster clusters by matching the education supply and cluster demands in order to avoid a shortage of skilled labour and therefore a flight of financial capital and know-how. Skill gap analyses predict the availability and necessity of qualified people at various levels so that the cluster can evolve at the same pace as innovations. Governments can also help out by establishing a continual dialogue between industry and universities so as to better understand those needs. Updating education and training in line with these skills gap analyses is key in order meet the requirements of the cluster.

Special government efforts might also be needed to ensure availability of talent locally. This can be done by attracting talents from abroad to come to work in the cluster through the implementation of programmes which target foreigners or expatriates. In the Biotechnology Cluster of Vienna for example, Brain Power Austria is a programme carried out by the Austrian Research Promotion Agency (FFG) on behalf of the Ministry for Transport, Innovation and Technology. It has the goal to attract talented Austrian scientists from abroad. Scientists who are currently living or working in foreign countries are assisted in looking for career opportunities in Austria. The main activities in this respect include amongst others the provision of financial support, relocation services and coaching but also a promotion of Austrian job opportunities (OECD, 2009a).

High quality of life

A high quality of life has also proved to be an important factor in retaining, renewing and growing the critical mass of human capital in clusters. Public policy can ensure the appeal of an area and a good quality of life by tackling problems affecting the quality of life in a region, such as road traffic, high housing prices, scarcity of international schools, poor quality public services, etc. For example the Grow Wisconsin Initiative in the Madison high-tech cluster is one of the approaches recently adopted by the regional government to guarantee a high quality of life and an environment attractive not only to talents but also to new enterprises. This initiative aims to create an environment that encourages business development by creating a competitive business climate, investing and reforming regulations. The plan laid out by the governor in September 2003 focuses on four key areas:

- The creation of a competitive business climate

- Investment in the people of Wisconsin
- Investment in Wisconsin businesses
- The reform of regulations and increased government responsiveness (OECD, 2009a)

Strong entrepreneurial culture

For clusters to survive in the long-term, it is crucial to actively foster entrepreneurship in order to promote the creation and growth of start-ups that can contribute to the cluster's development as suppliers, partners or clients. The enterprise fabric of clusters needs to be supplied and renewed with highly innovative enterprises issued from the universities, research centres or other large companies.

Specifically, governments can support the launch and growth of start-ups by promoting a culture of entrepreneurship in the clusters, implementing specific programmes to finance enterprising projects, and fostering the emergence of skills pools to support and work with these new enterprises (OECD, 2009a). Programmes that facilitate the possibility to take unpaid leave from a workplace for the purpose of starting up a company are also a policy option.

Deep and diverse co-operation between and amongst cluster stakeholders

Deep co-operation between and amongst cluster stakeholders, such as universities, research centres, and enterprises is a key factor in successful innovation. By working in partnership, stakeholders learn from each other, develop unique local knowledge and create knowledge-spillovers in the process. Furthermore, the introduction of new technologies is favoured by the possibility of cost-sharing. Strong ties are of utmost importance for the creation of knowledge.

On the other hand, creation of new weak ties is of capital importance. Weak ties (such as casual relationships) can help the acquisition of knowledge from a broader base of partners. On the other hand, those weak ties serve as a pipeline for potential future strong ties: some casual relationship may transform into deep co-operation over time.

There are several ways in which public policy can promote and foster intra cluster collaboration. One is to promote the development and transfer of technologies within clusters through technology transfer centres, neutral agencies or networks serving as brokers. Another is to encourage mobility among professionals between industry and the academic world. Subsidies for common research programmes between enterprises and public institutions are a very potent incentive for such co-operation. This is shown by the European Framework Programme experience, which is the European Union's chief instrument for funding research over the period 2007 to 2013. It brings together all research-related EU initiatives under a common roof playing a crucial role in reaching the goals of growth, competitiveness and employment.

Furthermore, by introducing SMEs into formal networks or by providing regular platforms for social meetings a "cafeteria" effect is generated, and the creation of weak links is supported. The goal of these initiatives is not only to bring stakeholders together but to get them organised around key issues by industry or a common theme that cuts across several industries.

Ability to commercialise research

It is crucial for successful spin-off activity to identify the market for an innovation. However, this is not always simple and its importance is often underestimated. Students need to be taught and researchers advised on how to commercialise their innovative product to make a profit. Furthermore, the identification

of the market is a key step in attracting private investors in high-tech sectors and ensuring the investment to build clusters, notably venture capital (OECD, 2009a).

Governments can assist students and researchers through the establishment of marketing centres for products resulting from academic research located in universities. An additional option is the approach taken in the Madison High Tech Cluster in the US where 12 MBA students are selected each year to work with a new local firm. The students get experience while creating comprehensive strategic, operating and financing plans for the firm. In return, the firm may benefit from the student's knowledge, a set of skills very different from those of the professors who are developing the technology (OECD, 2009a).

Certification as a form of reputation signalling

In order to have visibility within an ever more globalised industry, a cluster needs to create a reputation and a brand name which is going to establish it as a key player in its sector, Public policy can help in this respect, by identifying and certifying the most prominent clusters. For example, the German government has launched an initiative called the "Spitzencluster" (top-cluster) competition. Such a selection can also help prioritise the co-ordination with investment promotion activities which can promote those top clusters to foreign investors.

Creating international cluster networks

Public policy can also play a role in linking different international clusters with each other, to foster know how and information exchanges. The basic idea of meta-clusters is to create the equivalent of a large multinational company, but keeping the flexibility and reactivity of SMEs. European Framework Programme, referred to above, is one example, which encourages transnational co-operation.

Providing adequate physical and data infrastructure

A robust body of international evidence demonstrates that achieving rapid economic growth requires sustained investment in infrastructure. Infrastructure is considered one of the main drivers of competitiveness (Önsel et al., 2008) and can sometimes be the most important link in a value chain. Good data connections are essential not only for the IT sector industries, but for all sectors since business communication and promotion increasingly relies on the Internet. Likewise, without good transport infrastructure, congestion problems will soon limit the growth of the cluster. The Smart Growth Initiative in the Oxfordshire cluster is one of the approaches recently adopted by the regional government to address the congestion resulting from the emergence of the cluster. The traffic congestion has been reduced with the establishment of the "park and ride" scheme whereby car parks are built on the outskirts of the city and served by regular bus services to the city centre.

Encouraging sharing of resources, infrastructures and services

Sharing certain assets, such as office or storage space, specialised equipment, and ancillary services such as reception, security, cafeteria, and others, can create savings and enhance the competitiveness of the cluster. The same is true for sharing some functions, such as grouped purchasing. Usually these savings occur spontaneously through market mechanisms, without the intervention of the public hand. However, this aspect should be taken into account in fiscal policy and when attributing subsidies. For instance, in France, the depreciation of equipment can be accelerated if it is bought jointly by two enterprises or more. When subsidising research programmes, if specific equipment needs to be purchased, there should be an investigation to find out whether this purchase can be shared with other players in the cluster. If additional workspace is needed, it should likewise be investigated if it can be shared with other players.

Conclusion

Business clusters can have significant beneficial effects on local and national economies. They can be places of particular competitiveness and productivity, which attract new investments. Public policy has a role in identifying key success factors for the development of a specific cluster and enhancing the enabling environment for its various actors. These factors range from sufficient entrepreneurial activity to sufficient access to finance and co-operation between the different actors. However, public policy intervention is neither always necessary nor beneficial for cluster development and many clusters are fully self-sustainable. Furthermore, the economic benefit of a cluster does not always outweigh its costs. Thus the role of a specific cluster policy has to be carefully assessed.

SECTION 3: FDI AND TECHNOLOGY TRANSFERS

Foreign Direct Investment (FDI) by multinational enterprises (MNE) is a particular form of linkage. FDI, which has been rising rapidly in the last decades, is an important channel for technology transfer at the international level (OECD, 2005). Accordingly, a large number of countries have developed strategies to attract FDI with the conviction that a higher volume of investment by MNE would translate in technological transfer and positive spill-over for the economy. In several cases, these hopes have failed to materialise as foreign companies, while benefiting from access to new distribution channels or from low-cost labour force, did not make significant research investment in the country, and in some cases, depleted existing R&D capacities. International experience confirms that technology transfer does not automatically stem from openness to foreign trade and foreign capital inflows. Instead, policy makers have a role in ensuring that foreign investments generate benefits for the domestic economies.

Impact of FDI on innovation capabilities

Foreign Direct Investment by MNEs in developing countries is considered one of the main avenues for technology transfer. Three main forms of technology transfer through FDI have been identified.

- Vertical transfer relates to the transfer of know-how from the domestic subsidiary of an MNE to other parts of the value chain. Vertical transfers can be backward, from the MNE to its local suppliers, or forward, if the MNE manufactures intermediary goods to be used by domestic companies.

- Horizontal transfer relates to the impact of the entry of foreign companies on their domestic competitors. It is generally considered that FDI is competition enhancing, be it because it increases the number of players in the market or because MNE introduces more productive technology, raising the competitive intensity.

- Labour migration of former employees of the MNE affiliating with domestic companies can foster the transfer of tacit knowledge that is necessary to adapt innovative processes.

FDI between countries with a similar level of development and capabilities is considered to have an overall positive impact. Indeed, within countries with similar levels of development, FDI can be used as a channel for new ideas. Using data on Germany and the United Kingdom, Barrel (1997) shows that increasing FDI in these two countries has a positive impact on technological change. Similarly, FDI

inflows have benefited developing economies. However, where the technological gap between the recipient of FDI and the home country of the MNE is important, this impact has been much more limited (OECD, 2002). Indeed, in certain countries, MNE have operated in isolation from the rest of the economy, generating only marginal spill-over. FDI inflows have been driven by low cost of factors and because domestic companies failed to benefit from knowledge spill-over, impact on innovation and productivity has remained marginal. For example, Gallagher and Shafaeddin (2010) show that, despite very high FDI inflows linked to the creation of NAFTA, Mexico failed to establish linkages between international companies and local suppliers. As a consequence, productivity did not increase significantly, which led to a gradual decrease in competitiveness compared to other developing economies, such as China which put a strong emphasis on developing the absorptive capacity of domestic companies and establishing linkages with MNE. International experience suggests that FDI level does not automatically translate into technology transfer. Indeed, public policy has a role in supporting domestic companies' technology absorption capacity.

Key Success Factors and Policy Implications

A number of conditions are needed for FDI to generate spill-over in the host economy. Reviewing empirical literature on the issue, OECD (2002) finds that statistical evidence on the link between FDI and economic growth is mixed. In particular, an effective FDI strategy will not necessarily contribute to higher innovation output. In developing economies, growth from FDI often results from capital accumulation rather than from increase in productivity. Comparative analysis of the development processes in several countries suggests a number of policy measures that can help develop absorptive capacity by companies. In particular, human capital and domestic innovation support appear to be particularly important component of effective technology transfer through FDI. These policies improve the general framework for innovation and are not specific to FDI. However, the magnitude of their impact on the effectiveness of FDI requires that they be taken into account in FDI strategies.

High level of human capital

The skills of the labour force are among the main criteria considered by MNEs when reviewing potential investment location. As such, a higher level of human capital contributes to increasing FDI. However, human capital development does not only increase the quantity of FDI, it also improves its economic impact. Borensztein et al (1998) found that in the countries where human capital (approximated by schooling) was higher, FDI had stronger effects on economic growth. In particular, tertiary education enrolment and resources have a strong impact on the absorptive capacity of economies. A highly skilled local labour force will facilitate the absorption of innovative technologies by domestic companies and generate higher spill-over.

Research capabilities in domestic firms

Besides developing skills of the labour force, governments have encouraged direct transfer of knowledge between MNEs and domestic partners through joint ventures. However, co-operation is not sufficient per se to generate larger spill-over. In order to improve the competitiveness of domestic firms, governments have developed programmes to support local R&D capacity. Such programmes support domestic companies' capacity to make the R&D investments that are necessary to benefit from knowledge spill-over. These programmes also provide an incentive for MNE to pursue R&D in their local subsidiary. China provides an example of active involvement of the government in supporting technology transfer through development of domestic companies' research capabilities (Gallagher and Shafaeddin, 2010).

To build and sustain innovation capacity in domestic companies, government have in particular established market-based public research programmes and set up strong links between private companies,

universities and public research centres. Such programmes combine the research capabilities of the public research institutions with the commercial reactivity of private companies.

Investment promotion

Governments can actively encourage FDI into their country through targeted investment promotion and facilitation activities. At the heart of such activities is a well-functioning institution implementing these activities (usually and investment promotion agency (IPA)). It can have several functions, including that of an investment facilitator (e.g. helping foreign investors navigate through regulatory procedures) and a demand generator (e.g. image building, marketing and promotion) (OECD, 2010). For example, Denmark's IPA, Invest in Denmark, has units dedicated to the following activities and sectors: one-stop-shop services; business development; information and communication technologies; life sciences; renewable energies; maritime services; marketing and communications; and quality assurance. In order to foster FDI technology transfers, IPAs can also specifically promote domestic R&D skills.

SECTION 4. GOVERNMENT-INDUSTRY-UNIVERSITY INTERACTIONS

Both government and private companies have increasingly acknowledged the benefits of co-operation. Public authorities have the long-term horizon and independence that is required to conduct the fundamental research needed to fuel the innovation process. Public research institutions also represent a pool of diverse skills that can be used to develop a multi-disciplinary approach, a factor that is increasingly important in the innovation process (Box, 2009). On the other hand, private companies have the necessary resources to fund capital intensive research and their intrinsic market orientation help drive the relevance of the research conducted. Therefore, new forms of public-private linkages have emerged. As detailed below, public-private linkages relate to operational partnerships as well as to the overall governance of the national innovation system.

In recent years, a new and broader innovation model – the so-called Triple Helix model – has gained prominence. Instead of focusing simply on bilateral public/private interactions, it encompasses trilateral relationships among industry, government and universities in the process of knowledge capitalisation (Etzkowitz, 2002). In this model, universities, industries and government constitute interdependent and relatively equal institutional spheres. Indeed, the dynamics of society has evolved from one of boundaries and hierarchy between separate institutional spheres to a more flexible overlapping architecture. In addition, the Triple Helix model departs from the traditional distribution of roles in which each actor in the innovation process performs its own tasks. Each institution increasingly takes the role of the others: Universities become firm founders through incubator facilities, industries play the role of an educator through company universities and the government becomes a venture capitalist (Etzkowitz, 2002).

Governance of the National Innovation System

As governments move away from funding exclusively basic research to supporting R&D, in particular industrial R&D, the governance of the innovation system needs to be adapted. Indeed, public authorities need to ensure that the work funded is relevant and will generate spill-overs in the economy. While potential for spill-over is clear in basic research, as it has the properties of a public good, it becomes less obvious in the subsequent phases of the innovation process. Governments need to establish systems and structures to increase the relevance of publicly-funded applied research. In order to better reflect the

increasing number of actors that influence the innovation process, governments should also continue to develop informal and formal mechanisms for consultation with the various types of stakeholders.

For countries that have a market-based approach, private sector consultation tends to be informal. In some cases, consultation occurs through external bodies and committees. For example, in the Netherlands and Norway, such committees usually support policy formulation and implementation. Private sector representatives typically play a prominent role in these committees (OECD, 2005). Similarly, although no formal committee has been set up, the agency TEKES which is in charge of innovation funding in Finland interacts on a regular basis with the private sector and aligns its strategic orientation with the needs of companies.

In other countries, formal consultation mechanisms are routinely conducted in the innovation policy-making process. For example, New Zealand has conducted extensive formal stakeholder consultation on innovation policy as part of the implementation of its Growth and Innovation Framework. The private sector has been extensively involved in the resource allocation decisions in specific domains. In Australia, the consultation process with the private sector helps determine the priorities and orientation of future research. The objective of the government is to ensure that final users of research can contribute to the allocation of public funding for research (OECD, 2003).

Finally, in some countries, formal governance structures have been set up to include the various stakeholders of the innovation process. Several OECD countries have established central advisory councils on science and technology which involve ministers, experts from the public and private sectors as well as employers and employee organisations. Specific examples of such institutions include the Finnish Science and Technology Policy Council, the German Science Council and the Italian National Assembly for Science and Technology. These councils ensure that policies in the innovation area are adopted with a sufficient level of consultation and take into account the expectations of a large number of stakeholders.

'Triple Helix' partnerships

Innovation takes shape through triple helix relations. Triple helix development can occur from the bottom up, through the interactions of individuals and organisations from different institutional spheres, or from the top down, promoted by policy measures (Etzkowitz, 2002). In general, however, both processes tend to go hand-in-hand and complement each other. In the United States, the government has played a critical role in setting the stage for triple helix interactions through modifications in the patent law and through provision of public venture capital for start-ups (Etzkowitz, 2008).

Triple Helix partnerships contribute in many ways to the enhancement of innovation capabilities. For instance, in the *Robotdalen* (Robot Valley) of Central Sweden, companies' collaboration with academic and public institutions has helped consolidate the region's leading position in the R&D and manufacturing of robot-based automation.

Joint research programmes and networks

A number of public initiatives have aimed at fostering participation of public, private and academic players in joint research programmes. Such programmes have demonstrated that they can bring benefits to all players. Academia benefits from larger sources of funding with business and government sharing the burden and from the training of highly qualified personnel in industry-related research. The government benefits from new industries and new products which might in turn lead to higher employment. Finally,

industry gains from reduced cost of innovation, the expansion of long-term and risky research activities and access to new recruits through collaborating research laboratories[4].

Moreover, the process of innovation includes a significant phase during which the potential market outcome of the work conducted is at best uncertain. In these phases, the ability of the private sector to finance the relevant research activities is limited. Therefore, links with public and academic research institutions are often needed for the conduct of the initial stages of research activities.

From a policy perspective, governments have encouraged joint research programmes by providing financial support specifically targeted to collaborative research between universities and industry (e.g. PROFIT in Spain, TEKES in Finland). In fact, the general trend in EU countries has been to limit direct research subsidies to targeted programs to support SMEs and collaborative research projects.

Science parks are crucial in strengthening collaborative innovation. Their goal is to encourage new linkages between industry, universities and research institutes. To promote technology transfers from universities and research institutes to the business sector, and stimulate the establishment of science and research-based firms. Science parks have been in operation in most EU countries to bridge gaps between public and private sector knowledge creators.

Promotion of the role of industry in education and training

Universities, research institutions and private companies use complementary forms of knowledge. Tertiary education institutions and public research institutions mainly focus on transferable research. Private companies, although they also use formal knowledge, often develop tacit knowledge specific to a particular activity or industrial process. As both forms are essential, bi-directional flows of information are needed.

Private companies can help provide students in tertiary education institutions with practical skills as well as ensure the relevance of the subject taught. Accordingly, education systems in the OECD generally seek to foster the inclusion of the private sector in education, through courses taught by practitioners, internships, and broader university/industry personnel exchange schemes for R&D staff. Because practitioners have a direct appraisal of market requirement, they can streamline the syllabus of courses based on market-relevance. Furthermore, internship schemes have been set up to allow students to develop practical and industry-oriented skills. Some schemes, such as the STEP experience in the United Kingdom, also placed emphasis on the theoretical skills that small businesses may access, by facilitating short term internships for graduate students within small businesses.

Promotion of the role of universities as business service providers

Although companies develop a particular expertise in their own field, they sometimes need access to specific skills that they do not have in-house. In such a context, services from academic staff in universities or government laboratories can represent an efficient way for companies to access world class expertise. Universities, such as Oxford in the United Kingdom, have developed consultancy facilities that offer a broad range of services based on the expertise of their various departments. These services can allow companies to gain knowledge on leading-edge innovation in a particular domain and increase their absorptive capacity. Universities can also offer training services in order to improve the general knowledge of employees. In the Netherlands, the Ministry of Economic Affairs has developed "knowledge vouchers" which allow SMEs to obtain support from universities and other types of institutions. This system provides

[4] http://www.ontariopdma.ca/events/documents/4.Dr.BillDavidsonpresentation.ppt

an incentive for firms to benefit from the expertise of academics and can help bridge the gap between the two types of stakeholders.

Support to spin-offs

Some of the largest and most innovative companies, in particular in the United States, started as university spin-offs. Policy makers and university leaders have taken measures to ensure that researchers are able to create their own companies. While many of these measures consist merely in traditional support to start-up companies, some specific measures can help academics and researchers launch innovative companies.

In order to support the possibility for researchers to exploit the results of their work within public institutions, countries have reformed the intellectual property rights framework of public organisations. The Bayh-Dole act in the United States provided a model for most other jurisdictions in that area. While the outcome of public research was previously owned by the federal agency that had commissioned the research, the Bayh-Dole act transferred ownership to the institution that had carried out the work. It also allowed the institutions to grant exclusive ownership to private companies. Such an arrangement made it easier for researchers to set up private companies to exploit the commercial outcomes of their research. It also made it possible for a private company developing a product based on public research to benefit from exclusive rights to cover investment costs. Although the patentability of publicly-funded research encountered some criticism, the Bayh-Dole act is generally credited for the important surge in innovative activities around American universities. It provides an example of the profound impact regulatory frameworks can have on the innovative activities of public research institutions.

In addition to the reform of intellectual property rights, some more direct forms of support to the creation of spin-offs can be put in place. For academics who may be tempted to set up innovative firms, rigid regulations on employment of university staff can constitute a significant barrier. A way to reduce this barrier may be to give scientists the possibility to find employment in the private sector, and return to academia afterwards. In France, for instance, employees are entitled to up to two years leave of absence to create their company. This scheme, also available to civil servants, allows employees to take back their position if needed after the two years period. Other forms of direct support to spin-offs include business incubators set up within universities.

Key success factors and Policy Implications

High absorptive capacity of firms

Based on studies in four economies, Ternouth (2009) finds that two considerations are paramount in the choice of private partners to engage or not in research partnerships. The first one is the distance to market which relates to the research effort that is needed before a product is developed. The second consideration is the absorptive capacity of the firm, which corresponds to its ability to recognise the market potential of the research outcome, to assimilate it and apply it to commercial ends (Cohen and Levinthal, 1990).

There is an urgent need to complement increased investment in education and research with the strengthening of the private sector's absorptive capacity. Efforts to increase firms' absorptive capacity include subsidising hiring highly educated personnel, supporting the establishment of private-public innovation structures, and providing information on projects to help companies understand potential commercial outcomes.

Strong academic research capabilities

Strong academic research capacities are essential conditions for a successful Triple Helix regime. Consolidation and expansion of academic research to provide an improved knowledge base is recommended for countries lacking strong research universities (Etzkowitz and Ranga, 2007). Governments can play a significant role by funding university research facilities and promoting the development of science parks. More attention should also be paid to the upgrading of teaching to produce research and entrepreneurial universities.

Intermediate research institutions

Despite their usual under-estimation and relatively low status, intermediate research institutions, including applied research institutes and research associations, as well as other public and private intermediaries, are significant components of national innovation systems. Typically functioning thanks to a mixture of state money and contract work for businesses, these intermediate institutions carry out applied R&D and important technical support activities (European Commission, DG Research).

Adequate allocation of public funding

Public-private partnerships involve some elements of cost-sharing between the public research organisation and the private companies, and sometimes financial incentive for the latter. The distribution of costs needs to be set to reach a good level of incentive for the private partners while maintaining economic efficiency. If the criteria for funding allocation are not restrictive enough and expected private returns for the projects are too low, there is a risk that the supported projects will fail. Failure can be either failure to find a private partner or failure to launch the project. In both cases, public money has been wrongly spent. The symmetrical case is that of projects whose expected private returns are higher than the opportunity cost of capital even before government subsidies. In that case, government will end up supporting projects that would have been conducted anyway (Stiglitz et Wallsten, 1999). This latter case is more difficult to assess in practice as, from the private company‘s point of view, the outcome of the initiative may seem very positive.

Another issue with public funding for research is that, for political reasons, policy makers may be tempted to subsidise potentially successful projects, even though welfare impacts may be limited. Guellec and Van Pottelsberghe (2005) indeed found evidence that the effectiveness of government subsidies follows an inverted U-shape, with both too high and too low levels of public research being relatively inefficient. Governments must therefore ensure that they carefully review the impact of their public-private partnership schemes to maximise welfare.

SECTION 5: ACCESS TO FINANCE IN INNOVATION

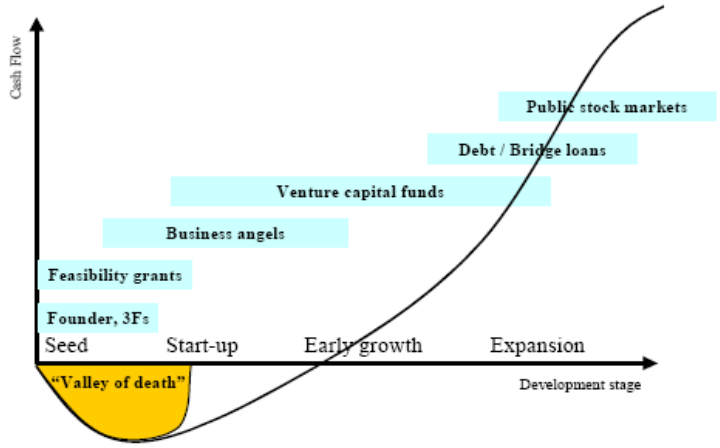
Innovative firms face high financing constraints in the early stages of their development. Uncertain prospects of success; long time-horizons; lack of tangible assets that can be used as collateral, and limited operating history, severely constrain their access to bank lending. Therefore, until they are sufficiently large to cover innovation through internal funds, innovative companies need to rely mostly on equity finance.

Several forms of equity financing exist and vary according to the different development stages of firms. The lack of seed financing is particularly detrimental to firm creation. At that stage, companies rely

mainly on equity provided by the founders themselves, family and friends. Business angels who generally intervene during the start-up phase can also contribute to offer seed funding. However, because of the high risk and the uncertain profit expectations associated with seed and start-up financing, public co-funding is generally necessary for companies' early development. Venture capital investment intervenes in later stages of business development. Venture capitalists support the marketing phase of the innovative product and early growth of the company (Figure 2).

Following the global financial crisis, access to finance has become particularly difficult for these firms. Risk aversion and limited exit opportunities for investors have led in particular to a decrease in sources of innovation financing (OECD, 2010). In such a context, it has become crucial to devise and implement policy responses to innovation financing difficulties.

Figure 3. Business Development Stages and Sources of Finance



Source: UNECE (2009)

Financing instruments for business innovation

Government financing

The public sector plays an important role in guaranteeing access to finance for innovative SMEs, especially in their early development stages. For seed-stage financing, feasibility grants have been provided by some governments to support concept development and exploratory market research. Such funding can also provide positive certification when the beneficiaries later seek to raise private capital. However, these schemes can prove very costly for governments if they do not rely on a set of clear selection criteria to ensure efficiency (UNECE, 2009).

In many countries, more broadly-encompassing programmes have been set up including both seed capital provision and advisory/support services to start-ups. The Austrian government launched a *Seedfinancing* programme to encourage the establishment of innovative SMEs via mezzanine capital paid in the form of a loan of up to EUR 1 million (OECD, 2010c). The money is disbursed in different phases and can be used both for research and commercialisation. The programme also offers management coaching and connections with private venture capital funds. A 2004 evaluation revealed that about 50 per cent of the firms selected for the programme fail. However, private venture capital funds are characterised

by a similar failure rate. So, given the earlier development stage of the firms supported by the programme, this can actually be viewed as a positive result (OECD, 2010c).

Government financing for innovation has taken many forms such as vouchers for market research; IP protection; equipment purchase or subsidies for the employment of a professional manager. In the Netherlands, a very successful voucher programme allows SMEs to pay for university or innovation centres' services to help them with feasibility studies and specific technological issues. Similar innovation vouchers were set up in Greece at the end of 2008 to support SMEs in the manufacturing sector and software industry (OECD, 2010c).

Finally, publicly-funded venture capital funds have been established to finance innovation. These funds typically provide capital or grants to SMEs in their start-up phases in return for ownership equity. Yet, their activities are not uncontroversial as the venture capital community considers that VC investment should remain purely private.

Business angels

Business angels have become an increasingly significant source of equity capital for small high-potential firms, especially in the seed and start-up phases. In the United States informal equity investment is thought to be at least twice the size of the formal venture capital pool, with some estimates ranging significantly higher (OECD, 2003). In addition to providing a substantial portion of the seed and start-up capital, business angels can offer managerial and technical expertise and exposure to other networks. Angels may also be helpful in introducing young firms to major stakeholders such as customers and suppliers (UNECE, 2009). Finally, informal equity investors can play a role in improving the quality of investment proposals, as business angels screen projects and, through intensive contact with entrepreneurs, contribute to resolve design and presentational weaknesses that might discourage formal investors (OECD, 2003).

A rising number of business angel investments are made through *business angels' networks* (BANs), which pool the financial, knowledge and information resources of groups of angels. BANs provide significant influence to individual angels allowing them to gain exposure to a large number of deals and to diversify their portfolios by taking part in a vast number of syndicated deals (UNECE, 2009). More generally, BANs allow for a better matching of investors with potential opportunities. Whereas BANs are well-developed in the United States, and to a lesser extent in Western Europe, they tend to be scarce elsewhere (OECD, 2010).

Venture capital

Venture capital investment is largely oriented towards the activities of small high-technology companies. It is a significant source of business finance in the later development stages, as companies' innovative potential grows and requires larger sources of capital. Indeed, most formal equity investment is made by large venture funds in the form of large investments in later stage deals (OECD, 2003). Venture capital firms play an essential intermediary role: they channel capital from institutional investors to these high-potential businesses[5]. Venture capital firms also provide companies with strategic or managerial expertise and network contacts (UNECE, 2009). In many OECD countries, the growth of the venture capital industry contributed to the increase in private sector innovation (OECD, 1996).

[5] Corporate venture capital also allows non-financial corporations to finance innovative companies.

Stock markets

Well-developed stock markets encourage the development of innovative firms because they offer investors the opportunity to trade their stakes, realise capital gains, and eventually redirect their capital into new investments (UNECE, 2009). Initial Public Offerings (IPOs) are a particularly relevant component of stock exchange activities for innovation financing (UNECE, 2009). Indeed, IPOs allow firms to tap a large pool of investors which provide them with significant volumes of capital for future expansion. However, public stock markets only intervene as a source of finance in the late expansion stages of innovative firms.

Key success factors and public policy implications

Investors' access to funding

The existence of an active stock market is widely viewed as crucial for the development of venture capital. Venture capital can thrive if venture capital investors can exit from a successful portfolio company through an IPO, which necessitates an active stock market (Gilson and Black, 1999). Policy makers can support the development of transparent and efficient stock markets by implementing sound and independent financial market regulation.

Other successful policy efforts to promote the venture capital industry include government fund-of-funds initiatives under which public money is indirectly channelled to innovative firms through private venture capital funds. One of the most successful government fund-of-fund initiatives was the Yozma programme set up in 1993 in Israel. Yozma was a $100 million, government-owned VC fund, whose main role was to invest $80 million in ten private VC funds. In each fund, public funds had to be complemented with $12 million in private funds as well as funds from a foreign VC fund or a foreign financial institution. The remaining $20 million were used to establish the Yozma Venture Fund directly making early-stage investments (Carpentier and Suret, 2006). The Yozma programme was a success in large part because it had drawn lessons from the failure of the preceding programme, the Inbal Program. Indeed, contrary to the Inbal Programme, the Yozma initiative had a well-defined strategy, serious selection criteria for projects and contained an obligation to use private capital to finance the expansion of funds (Carpentier and Suret, 2006).

Investment Readiness Schemes

According to Mason and Kwok (2010), access to finance is also constrained by demand-side weaknesses. Most businesses are not 'investment ready'. Mason and Kwok (2010) show that entrepreneurs are not informed about the role of equity finance and interpret the high rejection rates of business angels and venture capital funds as an indication that most businesses do not meet the requirements of external investors.

To tackle these issues, investment readiness schemes usually cover three elements:

1. Getting informed - information seminars on the different types of finance and the importance of equity finance;

2. Becoming investment ready – workshops and support to allow entrepreneurs to understand what investors are looking for; how to perform market research; how to write a convincing business plan; and how to manage their teams;

3. Attracting investors – training in presentation skills and connections with potential investors (Mason and Kwok, 2010).

The United Kingdom government launched a set of investment readiness demonstration projects, covering most aspects of investment readiness. Information seminars on investment were organised; reviews of proposals and support to improve specific aspects of pitches were set up for potential entrepreneurs. This project was positively evaluated in 2004 and generally deemed a success (SQW Limited, 2004).

Policy efforts to enhance the investment readiness of small firms include business incubators. These seek to address the difficulties that small firms may stumble upon in the access to industrial real estate and business development.

Connections between entrepreneurs and investors and within the investor community

For policymakers, supporting business angels and improving the conditions in which they operate is likely to have the greatest payoff (OECD, 2003), in particular in reducing the seed-stage financing gap. From a policy standpoint, intervention is justified. Information and search-cost barriers are present in the market for informal venture capital (OECD, 2003). For instance, business angels are usually hesitant to make public their willingness to invest and entrepreneurs are reluctant to disclose innovative ideas. These information and search-cost barriers can be reduced through policy support for BANs.

There is indeed room to improve business angels' visibility and effectiveness through the development and formalisation of BANs. Within BANs, policy efforts can also focus on technical or financial support for business angel training, especially for novice or 'virgin' angels (UNECE, 2009). Many governments subsidise the activities of national BANs. In Europe, in 2007, 30% of BANs reported that they received national funds, a figure equivalent to that observed in North America (EBAN, 2009). Governments should also link BANs to existing public programmes: deal flow through BANs can be improved if they are connected to public venture capital programmes and start-up initiatives.

Policy efforts have also revolved around tax incentives for business angel investments. Indeed, business angels often mention taxation as one of their most important concerns (UNECE, 2009). Possible instruments comprise income tax rebates and exemptions or deferral of capital gains taxes. For instance, the Enterprise Investment Scheme was introduced in the UK in 1994 to help certain types of higher-risk SMEs to raise capital. It has provided a range of tax reliefs for investors who subscribe for qualifying shares in qualifying companies, including income tax rebate equal to 2 percent of investments up to £500,000 and exemptions from capital gains tax on angel investments. However, it is important to take into consideration a country's general tax policy context before devising tax incentives for business angels.

SECTION 6: REVIEW OF POLICIES TO FOSTER INNOVATION IN THE WESTERN BALKANS

This section aims at succinctly reviewing innovation systems in the Western Balkan economies. It draws on several studies of innovation systems in the region[6] and will focus specifically on policies that support inter-firm networks, clusters, FDI linkages, access to finance and public/private interactions.

Inter-firm networks and clusters

Policies to support networks are synonymous to cluster policy in the Western Balkans. Whereas cluster development is relatively well embedded into the SME policy landscape of the Western Balkans, few additional policies exist on fostering other forms of SME networks.

Most economies in the region have an active cluster policy and have attracted substantial donor support. Croatia can be highlighted as the most advanced, with Bosnia and Herzegovina and Serbia also shaping up their clusters policies.

Nevertheless, when looking at the economies one by one, a number of questions can be raised about the approach adopted by the Western Balkan governments and the sustainability of donor-funded programmes.

Croatia is a relative success story. Progress in cluster and enterprise network development has been based on the dynamic combination of a well-defined government strategy, defined broadly in the national strategy for economic development (2006-2012) and more specifically in the strategy for clusters and business incubators (2007-2010). It is built on the participation of local administration, broad consultation with stakeholders and well-structured donor-supported programmes. Fourteen clusters have been established to date in five industries.

In the case of Serbia, the Ministry of Economy and Regional Development has registered 20 clusters and is providing support to 14 of them, operating in wood processing, building materials, metal processing, shoemaking and textiles, automotive components, agro-business and agricultural machinery. All of these sectors already had a relatively high level of agglomeration. The European Commission and USAID have been the lead donors supporting cluster development. Their activity has been mainly directed at providing quality services at single enterprise or network level, while government support has mainly focused on infrastructure and human capital development.

The same combination of factors has been at play in Bosnia and Herzegovina, with a significant difference. State support has been negligible, while the role donors play (especially GTZ, USAID and the EC) has been more substantial. Bosnia and Herzegovina has active clusters in wood processing, automotive components, plastic components and tourism. The automotive cluster, supported by GTZ, had led to the establishment of a dynamic enterprise network and schemes to share R&D, product testing and marketing activities. Yet, the reliance on donor support raises questions about the sustainability of the cluster support programmes.

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[6] These studies include first and foremost OECD (2009) SME Policy Index 2009, OECD, Paris, but also Dahl, E. (ed.) (2006) Science and Technology in the Western Balkans, Barrister and Principal, Brno; Machačová, J. and Dall, E. (ed.) (2008) Innovation Infrastructures in the Western Balkan Countries, Centre for Social Innovation, Vienna.

In Albania, Kosovo under UNSCR 1244/99 and the former Yugoslav Republic of Macedonia, a cluster and network policy is largely lacking. It can be attributed to the lack of synergies among government action, donor-funded initiatives, and support by local stakeholders and authorities.

Public/private interaction

All across the region, there are still major obstacles to co-operation among universities, research centres and SMEs. Those obstacles are related to the poor overall conditions of university research facilities, the lack of financial incentives for universities and research centres for engaging in enterprise consulting activities, and the presence of cultural differences between the academic and the business worlds.

However, several governments in the region have started to launch initiatives favouring technological innovation in enterprises, with specific schemes aimed at SMEs. At regional level, two main programmes are under implementation. The first one, the WBC-Inco-Net, focuses mainly on research activity, and contributed to the establishment of a network among universities and research and development centres in the Western Balkans. The second programme, the Business Advisory Service, a programme led by the EBRD and active in all the Western Balkan economies, provides consulting and technological development services to SMEs.

One of the most advantageous components of the EIP for the Western Balkans is the participation in the Enterprise Europe Network (EEN). This network is constructed on the basis of the existing European Information and Innovation Relay Centres, and includes consortia from five economies in the region (Croatia, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, and Bosnia and Herzegovina). These will facilitate the integration of Western Balkan companies in the exchange of technology and co-operation in R&D networks.

Croatia is still leading the Western Balkan economy in terms of policy framework, number of active programmes and pilot projects. Over the last two years, BICRO, established in 1999, has been expanding its activities and support programmes.

In the former Yugoslav Republic of Macedonia, there are four technology transfer centres (three in Skopje and one in Bitola) established with the support of GTZ, the German technical co-operation agency. Another nine centres are planned, under the USAID-funded Competitiveness Project. In addition, a local consortium formed of the Ss. Cyril and Methodius University, the Foundation for Management and Industrial Research, the Agency for the Promotion of Entrepreneurship and the Economic Chamber of the former Yugoslav Republic of Macedonia is providing technology transfer services in the context of the Enterprise Europe Network since the beginning of 2008, through the European Information and Innovation Centre in the former Yugoslav Republic of Macedonia (EIICM). A new law on supporting and facilitating technological development opens the door for enterprises to apply for government co-financing for up to 50 percent of research and development project costs. In 2008 for example, 57 projects proposals were under evaluation. However, budget allocations are relatively limited.

Serbia has made progress on the implementation of the Innovation Law, introduced in 2005. In line with the requirement of the law, three innovations centres, 20 research and development centres, 39 research and production centres, two technological parks and three technological incubators had registered with the Ministry of Science and Technology by 2009. These entities became eligible for financial support covering up to 50 percent of their R&D projects, with a pre-determined cap. Budget allocation in 2008 amounted to EUR 4.7 million. Additional funding has been provided by the EC-funded the Enterprise Development and Innovation Grant Scheme mostly channelled through cluster development. Part II of this

report contains a comprehensive review of the innovation supporting measures introduced by the former Yugoslav Republic of Macedonia and by Serbia.

In Bosnia and Herzegovina the elaboration and implementation of technology and innovation policy remains under the entity domain with no significant actions taken a state level. However, at entity level, some progress on pilot project implementation has been made. For instance in the Republika Srpska, the Banja Luka University has established a co-operation agreement with the Agency for SME Development. Technological parks have been established in Zenica and Tuzla (Federation of Bosnia and Herzegovina) and a Business and Information Technology Centre has been established in Tuzla, operating in close co-operation with Tuzla University (particularly in the fields of ICT and electrical engineering).

No major developments have taken place in Montenegro over the last two years, although several active business incubators exist, for example in Bar and Podgorica. The main initiative is the establishment of a University Centre for Design and Development, based at the University of Montenegro. The centre, planned in 2006, is not yet operational.

In Albania, the government has designed an innovation supporting programme, to be financed by IPA funds. It includes the establishment of a Business Innovation and Relay Centre in Tirana, the training needs analysis, the development of an Innovation and Technology Strategy, and the establishment of a scheme of support to innovative SMEs. Programme implementation is expected to start in early 2009.

FDI and technology transfers

SEE countries have made important progress in developing and implementing policies to attract FDI. The OECD Investment Reform Index 2010 illustrates the scope of reforms that have taken place in the region, ranging from specific investment promotion initiatives to efforts enhancing the investment climate as a whole through infrastructure or human capital developments, for example. The region has attracted significant FDI during the years preceding the economic crisis, yet technology transfers and knowledge spillovers have often appeared to be limited.

Some evidence exists of the positive effects of FDI on growth in the SEE region (Sapienza, 2009) and on sectoral productivity in economies such as Croatia, the former Yugoslav Republic of Macedonia and Serbia. Nevertheless, much FDI has occurred in the context of privatisations whereas greenfield investments have been limited. While investment in machinery and equipment is positively associated with technology spillovers, much investment in the SEE region has occurred in real estate and construction. There has also been little FDI in export-oriented activities (OECD, 2010).

Furthermore, although SEE governments have been active in implementing policies to attract FDI, specific policy measures to generate technology and knowledge spillovers have been rare. Few initiatives exist, for example, to facilitate joint-ventures between MNEs and domestic partners.

Access to finance

Banking finance is dominant in the Western Balkans. As a result, and also due to the limited sizes of the various economies in the region, private sources of finance for innovative companies are very scarce in the Western Balkans. Also some venture capital funds and business angels network exist, they are still at a very early stage of development and public support is rare.

Venture capital funds operate only in Croatia and in the former Yugoslav Republic of Macedonia. Examples of such funds include among others Horizonte Venture Management and Poteza Ventures in Croatia, and SEAF which operates both in the former Yugoslav Republic of Macedonia and in Croatia, In Croatia, the various funds operating have formed a professional association that should contribute to

mutual learning. The government has made efforts to support the venture capital industry. The government has endorsed the Croatian Private Equity and Venture Capital Association and has sought, unsuccessfully so far to establish specific funds targeting innovative companies. In other economies in the region, limited initiative to adapt the legal framework or to elicit venture capital activities have been conducted. However, these have had limited results so far.

Business angel networks are even scarcer than venture capital funds in the Western Balkans. Here again, only Croatia has significant programmes. The Croatian Business Angel Network was set up in June 2008 by the national investment promotion agency, the professional association of private equity and venture capital funds. The network aims at raising awareness of the concept of business angels and has established numerous links with international networks of business angels. In the other economies, although individual angels may be active, no network seems to be operating and they do not benefit from particular government support.

Conclusion

Innovation policy is still in its infancy in the Western Balkans. Although specific measure may exist in particular in Croatia and in Serbia, public institutions remain quite cut-off from the private sector and the connections between the various stakeholders in the Western Balkans have been extremely limited so far. Moreover, their current capacity makes it challenging for them to really co-operate with the private sector, especially since the outset of the economic crisis. A re-organisation of aspects of public research institutions may be needed before effective co-operation can be expected. Another concern is the heavy reliance on donor initiatives, which raises questions about the sustainability of many programmes. As far as clusters are concerned, cluster policy is well embedded in the policy landscape of several economies, were a strategy is in place. In most economies, however, cluster initiatives are based on unfocused measures, predominantly funded by donors.

SECTION 7. CONCLUSIONS

Innovation has become a key driver of economic growth and competitiveness in today's increasingly knowledge-based world economy. The inter-connectedness within innovation systems between the various actors including companies, public research centres, universities, and policy makers is critical to ensure that innovative ideas are eventually brought to the market and materialise into economic growth.

Based on policy experiences in the OECD area, this paper has focused on the different types of linkages that have been developed to foster innovation. The first section has emphasised the role of inter-firm networks in facilitating the identification of business opportunities, helping to raise finance or pool resources, and improving tacit knowledge transmission. Although inter-firm networks typically emerge from private initiatives, specific public instruments have been set up to catalyse network creation. Indeed, successful practices have included awareness campaigns on the benefits of inter-firm networks, support for partner identification, targeted financial incentives and labelling/accreditation of highly innovative enterprises.

Section 2 has highlighted the importance of business clusters in innovation policy. Clusters have been identified as motors for innovation, as they constitute sites of localised positive externalities in labour market pooling, input-output linkages and knowledge spillovers. Yet, public policy intervention is neither

necessary nor intrinsically beneficial for cluster development. In fact, research shows that top down policies aimed at building clusters from scratch have often been unproductive. Public policy efforts should instead concentrate on creating an environment conducive to cluster development. Appropriate initiatives have revolved around the matching of the education supply with clusters' skills demands, the identification and certification of the most successful clusters, measures fostering intra-cluster collaboration and the provision of adequate physical and data infrastructure.

Section 3 has confirmed the role of FDI as a specific type of linkage essential to technology transfer. Yet, as evidenced by international experience, technology transfer does not automatically stem from openness to foreign investment. In fact, policy makers have a role to play in ensuring that the conditions needed for FDI-related spillovers are in place. These can take the form of enhancing research capabilities of local firms or conducting targeted investment promotion activities.

An increasingly central type of innovation network has been 'Triple Helix' linkages. As detailed in Section 4, the 'Triple Helix' model encompasses trilateral relationships among industry, government and universities in the process of knowledge capitalisation. Policy efforts in that area have primarily aimed at promoting joint research partnerships and networks, encouraging the role of industry in education and training, supporting the role of universities as business service providers and fostering spin-offs. In addition, in order to better reflect the increasing number of actors that influence the innovation process, formal and informal governance mechanisms involving these various stakeholders have been set up.

The fifth section has stressed the importance of access to finance in innovation. Financing constraints, especially in the seed- and early-development stages of firms, constitute a major obstacle to the innovation process. Equity – mainly through venture capital funds and business angels – is a crucial source of finance for innovation and many government programmes have therefore sought to stimulate equity investment. Investment readiness schemes and increased connections between potential investors and entrepreneurs through support for business angel networks have been among the most promising government initiatives.

Finally, the policy review in Section 6 provides evidence that policies to foster such linkages are still in their infancy in the Western Balkans. Although specific measures may exist in particular in Croatia and Serbia, public institutions are relatively cut-off from the private sector and the connections between the various innovation stakeholders have remained extremely limited so far. As far as clusters are concerned, some economies have elaborated cluster development strategies. However, in most economies, cluster initiatives remain based on arbitrary and incomplete measures. Besides, innovation programmes are largely dependent on donor funds, raising concern about their sustainability.

Importantly, however, given the variety of linkages and policy measures reviewed here, policy makers in the Western Balkans need to select priorities based on a detailed account of their existing policy frameworks, and carefully assess the needs of the various stakeholders as well as the impact of potential policy measures.

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