Conceptual Economic Issues of Regional Innovations

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Abstract

This paper explores some conceptual issues of regional innovations, which are essential topics in innovation policy assessment. After review of theoretical approaches to innovations and regional development, it turns to empirical evidence on regional disparities in wealth and innovativeness in the EU-member countries. It further analyses approaches to regional policies aimed at fostering innovation in private sector and considers potential data sources for policy evaluation.

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Introduction

Economists have for long time tried to understand key factors of the long-term growth. Since 1980s the new growth theory (developed mainly by P. Romer, W. Grosmmann and E. Helpman) added knowledge as the another factor of production to labour and capital. Some authors (e.g. Drucker, 1993) argue that knowledge is considered as an only meaningful, resource and the capability to create and utilise knowledge are the most important source of a firm's sustainable competitive advantage (Nonaka et al., 2000). Lundvall (1992, p. 8) made direct link between economic development and transfer of tacit knowledge. He considered knowledge the most fundamental resource in the modern economy, learning the most important process and interactive learning the most important form of learning. Learning is not confined only to Universities and R&D units, but is also generated via interactions of institutions with the national system of innovations. These views were transferred to many economic policy documents.

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If knowledge is assumed to be main driving force and innovativeness major competitive advantage of a globalised economy, regions are considered key areas of innovation and socio-economic change. There were many attempts to conceptualise driving forces of regional development. Theoretical views on these issues moved from comparative advantages (based on natural endowments) to competitive advantages (based on Intra-industry trade and localized demand conditions for market competitiveness) and constructed advantages. While the former two concepts stem in neoclassical approaches, the later one refers to institutional and evolutionary concepts and is sometimes described as the 'Triple Helix' model. It embraces the surplus value of an overlay of relations among the three components of a knowledge-based economy: (1) the knowledge-producing sector (science), (2) the market, and (3) governments. Close interactions among these partners are supported via spatial proximity. 'Learning regions' became a came key concept when explaining transmission of knowledge to economic growth on both the national and global levels.

Almost every region in the enlarged Europe tries to foster innovative environments based on public or semi-public innovation infrastructure and private sector oriented policy measures. Innovation is seen key to rapid economic growth, higher levels of regional wealth and re-structuring regional economies towards environmental-friendly activities. Physical capital and natural endowments no longer are considered driving factors behind economic growth. The new competitive conditions favour social capital, formal and informal norms and rules, which can foster reciprocal understanding and mutual confidence among the agents of the regional economy. Modern regional policies pay much attention to innovation conducive infrastructure and networks of co-operation between companies. These are key elements that must integrate actions undertaken by the regional administration and supported by all the existing institutions in the region. Story of Finland in 1990s, which transformed itself from medium-tech, Soviet market-oriented economy to the top-notch technology performer has widely been admired and emulated. Yet, few countries were able to repeat success of Finland and another Nordic countries. By mid 2000s, particular regions in enlarged Europe accounted for very diverse performance in levels of innovativeness.

Innovation is both a very complex and subtle phenomenon. Many policy initiatives that are not explicitly branded innovation policies are vital for the diffusion of innovation. National and regional innovation systems are constantly changing in terms of their actors, policy instruments and challenges addressed. Impacts of innovation programmes and outcomes are hard to measure. Identification and evaluation of the results of innovation policies can be very challenging. It probably explains, while few countries in Europe have developed practices

aimed at evaluation of innovation policy impacts. Policy evaluation, however, is an extremely important process, as it enables improving coordination of the actors of the innovation system, aligning their interests and incentives, and redefining policy targets over time.

This paper considers conceptual economic issues in regional innovation systems. It starts with the review of theoretical approaches to regional development. Here it focuses on theories relating transformation of regional economics to forces globalisation and technology diffusion. Then it turns to empirical evidence on regional disparities in the EU-member countries and explores interaction between regional degrees of innovativeness and wealth. Evidence by the Community Innovation Survey (CIS) and case studies on highly innovative regions helps to understand driving forces of regional innovations. Next chapters analyse conceptual issues of regional policies aimed at fostering innovation in private sector and explore potential data sources for policy evaluation.

1. Theoretical Approaches to Regional Development and Innovations

Economic development of the EU was accompanied by two contrasting trends in 1990s and early 2000s. The first one was convergence in national levels of GDP, with new members having higher growth rates and catching-up with the EU-25 averages. The second one was typical with widening regional inequalities within the new members. The 3rd Report on Economic and Social Cohesion (EC, 2004a) indicated that "the enlargement of the Union to 25 Member States, and subsequently to 27 or more, will present an unprecedented challenge for the competitiveness and internal cohesion of the Union. It will lead to the widening of the economic development gap, a geographical shift in the problem of disparities towards the east and a more difficult employment situation: socio-economic disparities will double and the average GDP of the Union will decrease by 12.5%". Why are European regions so different in terms of their economic development?

There are number of theoretical approaches toward role of innovation and knowledge diffusion in fostering regional development.

Neo-classical approaches start from selected assumptions, e.g. on smoothly operating labour, capital and information markets and benefit maximising strategies of the market participants. These assumptions provide for conclusions on gradual adjustment of market participants to the market situation and convergence of disparities due to inter-regional trade, mobility of labour, capital and information (Armstrong and Taylor, 1993). The capital is attracted by higher rates of return in regions with free labour force and low wages, while labour

force from peripheral areas is looking for better jobs in centres of economic growth. As for the regional policies, the neo-classical theories suggest a free interplay of market forces: removal of monopolies and oligopolies, deregulation of labour markets, promotion of labour, capital and information mobility and development of infrastructure, which connects developed regions with undeveloped ones. Neo-liberal agenda became central for design of market reforms in most new Member countries and was reflected in neoclassical approaches to regional development after 1989. Dismantling old system of central planning and establishing a free market economy were supposed to provide for higher mobility of production factors and, consequently, removing regional disparities. Neo--classical approaches suggest that liberalisation of factor moves should result in inter-regional knowledge diffusion and boost economic performance in recipient region. Major channels for inter-regional and international diffusion of knowledge include trade (via imports of technologically advanced inputs), foreign direct investment (FDI), and travel on the part of executives and technicians. In fact, neoclassical approaches had limited success in removal of regional disparities in most countries, as they had to cope with persistence of monopolies and oligopolies, externalities and mobility barriers. National economies were largely dependent on national social and institutional structures, which accounted for considerable degree of inertia. The inertia of institutional structures in particular proved a barrier for innovation transfer and knowledge diffusion.

Theories of regional polarisation (Myrdal, 1957; Hirschman, 1958) supposed growth in regional disparities due to existence of circular cumulative processes. Disparities do not balance via the inter-regional interactions, because of the heterogeneity and limited mobility of production factors. Agglomeration effects refer to institutional constructs of spaces and are another factor magnifying regional differences, as they provide for increases in aggregate demand in some regions. Regional disparities may increase or decrease, dependent on strength of particular trends over the time. Myrdal and Hirschman recognised two basic kinds of inter-regional interactions: spread (trickling-down) and backwash (polarisation) effects. The former ones tend to spread the positive development impulses from one region to another. The latter ones increase regional differences. Williamson (1965) suggested that the relationship between national growth and regional inequalities takes the form of an inverted U-curve. He argued that in the catching-up process of countries, interregional linkages, factor movements and public policies interact in favour of growth pole effects and the main agglomerations. Hence, more rapid growth in the growth pole areas (e.g. the capital city regions) leads to an increase of regional disparities. In later stages of development, however, regional disparities may decrease due to a higher aggregate level

of income and spread effects. The lagging regions of the by now mature country might benefit from technological diffusion. Growing regional disparities within the EU indicate that there may be some truth in polarisation assumptions. Some economies with low R&D intensity (e.g. Slovakia), however, were able to profit from technology diffusion and accounted for rapid growth rates. Evidence on growth rates from New Member States also seems to support assumptions by polarisation concepts.

New growth theories try to integrate some polarisation concepts into a formal structure of neo-classical theories. New growth theories identify the innovation process as the key growth element. They accept external character of innovations and recognise importance of externalities (e.g. innovation monopolies) for unbalanced development of regions. Regions with high volumes of innovation activities are more likely to absorb new innovation initiatives. The circular-cumulative processes may both increase and decrease regional differences. Some cross-country empirical analyses, for example (Barro, 1991), indicated that inter-regional disparities are eliminated by considerably slower rates than those expected by the neo-classical models. The new growth theories were completed by the *post-Fordist concepts of regional development.* These assume that regional economies increasingly are impacted by factors of globalisation (Lipietz, 1992). They recognise importance of technology and organisational innovation activities by multinational companies (MNCs) for formation of regional structures of production. By late 1990s, MNCs directly generated one third of the World trade. If product flows between branches of particular MNCs were added, share of MNCs in global trade increased to two thirds (UNCTAD, 2001). In small open economies, the MNCs became the most important economic agents. In these economies, the MNCs used to concentrate their activities in one or few selected regions, as to economise transport costs, rationalise utilisation of labour force and profit from agglomeration effects. Development of global networks of production and trade by multinational companies (MNCs) changed landscape of regional economies. New organisation of production structures requires reappraisal of the role of a national state in regional development. Some economic powers would pass to international institutions (e.g. European Union), while the other to regional governments. The latter should compete for location of MNCs with educated labour force, good infrastructure levels, tax incentives, etc. Regions developing a rich network of market institutions – including public-private partnerships in R&D sector – increase their ability to attract and retain sophisticated production activities. A well-operating „associational economy" (Cooke and Morgan, 1998) is far more flexible than industrial monostructure and can resist to abrupt moves by the branches of MNCs.

2. Innovation and Regional Disparities

Polarisation, new growth and post-Fordist approaches to regional development suggest importance of innovations and technology advances (either internally developed or appropriated via technology diffusion) for economic development. Empirical data from the Regional Innovation Scoreboard (RIS) indicate that about 41% of the variation in per capita regional income can be explained by differences in innovative performance.[1] This suggests a positive relation between a region's innovative performance and its economic performance. Innovative 'backwardness' may thus lead to regional income disparities.

European regions account for very diverse levels of innovativeness. Minority of regions engage in highly sophisticated knowledge-based productions. They have rich networks of R&D facilities, large stocks of human capital and are able to commercialise outputs of investments to R&D. In most EU countries, less than one third of the regions perform above the country mean. This confirms that national innovative capabilities tend to be concentrated in a few regions. The leading regions in the EU in terms of R&D expenditure and employment in knowledge intensive services (KIS) are Braunschweig, Oberbayern and Stuttgart (DE), Brussels (BE), Stockholm, Västsverige and Sydsverige (SE), Inner and Outer London and Surrey (UK), and Noord-Brabant (NL) (Table 1). Most of poorest performers, on the other hand, are located in the new Member Countries. The region of Stredni Cechy (including Prague) is a notable exception from this rule. Many regions with high shares in KIS employment and large R&D expenditure rank to the richest in the EU (Table 1). When evidence from the RIS and statistics on R&D is combined, the role of KIS for regional economic development is even more clear. All the RIS indicators show a significant correlation with per capita GDP, with the highest correlation coefficient for high-tech services employment.

There also are large disparities *within* the EU-member countries. Some European countries' top regions in terms of R & D intensity show ratios largely above the national level of R&D intensity, such as in the Czech Republic, Germany, Poland, the UK, Bulgaria or Romania. All this indicates that the R&D efforts are highly concentrated in economic clusters and in the top region(s) of these countries (Eurostat, 2006), as suggested by the polarisation and the new growth theories.

[1] The 2003 Regional Innovation Scoreboard used regional data for 13 innovation indicators plus per capita GDP at the regional level for 13 EU Member States. The regional innovation indicators provide good coverage of the innovation categories Human resources (4 indicators), Knowledge creation (4 indicators) and Transmission and application of knowledge (4 indicators). The coverage of Innovation finance, output and markets is limited to only one indicator. The NUTS classification has been used for determining the level of regional level analysis: NUTS 2 for Austria, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and Sweden, and NUTS 1 for Belgium and the UK.

Table 1
Top 15 EU Regions in Terms of GDP per capita, R&D Expenditure and Employment in Knowledge-intensive Services

	GDP per capita in PPS per capita in 2003		Total R&D Expenditure in 2002, in % of GDP		Employment in KIS in 2004, % of Total Employment	
1	Inner London (UK)	60 342	Braunschweig (DE)	5.25	Inner London (UK)	59.83
2	Brussels (BE)	51 658	Västsverige (SE)	5.19	Stockholm (SE)	54.74
3	Luxembourg	50 844	Stuttgart (DE)	4.42	Oslo og Akershus (NO)	49.76
4	Hamburg (DE)	40 011	Stockholm (SE))	4.37	Outer London (UK)	49.21
5	Île de France	37 687	Oberbayern (DE)	3.71	Utrecht (NL)	49.08
6	Wien (AT)	37 158	Střední Cechy (CZ)	3.18	Surrey, East, West Sussex (UK)	49.03
7	Berkshire Bucks, Oxfordshire (UK)	35 894	Sydsverige (SE)	3.10	Bruxelles-Capitale	48.68
8	Bolzano (IT))	34 792	Tübingen (DE)	3.06	Övre Norrland (SE)	48.65
9	Oberbayern (DE)	34 334	Pohjois-Suomi (FI)	3.06	Zürich (CH)	47.86
10	Stockholm (SE)	34 331	Noord-Brabant (NL)	2.82	Île de France (FR)	46.97
11	Åland (FI)	33 542	Östra Mellansverige (SE)	2.78	Trøndelag (NO)	46.92
12	Utrecht (NL)	33 148	Mittelfranken (DE)	2.62	Berlin (DE)	46.95
13	NE Scotland (UK)	32 683	Etelä-Suomi (FI)	2.60	Berkshire, Bucks, Oxfordshire (UK)	46.65
14	Southern and Eastern (IE)	32 446	Darmstadt (DE)	2.55	Nord-Norge (NO)	46.57
15	Darmstadt (DE)	32 251	Länsi-Suomi (FI)	2.38	Mellersta Norrland (SE)	46.47

Source: EC (2006).

What is behind the great differences between European regions in terms of R&D and innovation intensities? There are two basic kinds of drivers of regional innovation:

1. International: globalisation, exports, movement of production factors (capital and knowledge in particular)

2. Regional and local: agglomeration effects, cluster effects, regional policies aimed at innovation.

Evidence from the Community Innovation Survey supports this assumption. The Eurostat data (EC, 2004b) demonstrate that enterprises with innovation activity tended to be more focused on national/international markets, while enterprises without innovation activity tended to be more focused on local/regional markets. Within the EU, almost half (49%) of all enterprises without innovation activity reported that their most significant market was local or regional (irrespective of whether or not it was in the same or a neighbouring country). The same ratio among enterprises with innovation activity shows that less than one third (30%) reported their most significant market as being local or regional. Some 25% of enterprises with innovation activity indicated that their most significant market was an international market, compared to 13% for enterprises without innovation activity. Studies on top innovation regions in the UK (Simmie, 2003), Netherlands (de Bruin, 2004), Finland (Thomi and Böhn, 2003),

Sweden (Nählinder and Hommen, 2002) and USA (Porter, 2003) suggested that these regions benefited mainly from international trade and knowledge transfers. These regions are much more flexible, when responding to technology changes and demand by domestic and international customers. Innovation development was significantly related to growth in exports of goods and services, and international collaboration in R&D.

Suppliers of innovative firms, on the other hand, used to be of local/regional origin. Thomi and Böhn (2003), for example, hinted at the close interrelation between regional economic structure and corresponding structure of knowledge-intensive services (KIS). Especially the structure of technology oriented KIS is highly dependent on the dominant industries. The industrial structure gives way to technical oriented suppliers of industry specific knowledge. On the other hand, the large region-based industrial plants have their headquarters in the capital area or abroad.

Simmie (2003) suggested that major differences in drivers of regional innovations are generated by different importance of tacit and transferable knowledge in regional innovation systems. While formal knowledge is relatively easily to codify, share, exchange and transfer, tacit knowledge does not travel well. Tacit knowledge usually is attached to its bearers. Most common ways of transferring tacit knowledge are social networks and mobility of labour. Examples of tacit knowledge include:

- R&D cooperation among Universities, research facilities and businesses,
- movement of R&D personnel,
- interaction between public and private sector (industry-academia relations),
- interaction within the private sector, e.g. between firm's customers and/or competitors,
- technology diffusion.

Tacit knowledge seems essential for fostering innovations in general and thus also for development of regional innovations. Building social networks requires frequent interactions between major stakeholders of innovation development. These interactions are much easier to happen in close geographical distances.

Abundance and configuration of these mechanisms translate to region's ability to create knowledge via dynamic interplays of various actors. Regional systems of knowledge significantly depend on existing physical infrastructures and socio-economic milieus, are unavoidably different and unequally distributed over space and thus becoming important factors in the reorganization of economic spaces (Park, 2004). Tacit knowledge seems essential for fostering innovations in general and thus also for development of regional innovations. Building social networks requires frequent interactions between major stakeholders of innovation

development. These interactions are much easier to happen in close geographical distances. Some regions account for agglomeration effects, which are substantial for building knowledge infrastructure. Rich texture of regional innovation infrastructure (Universities, R&D facilities, knowledge centres) is an important precondition for development of social networks. These networks, in turn, facilitate knowledge transfers and enhance economic growth and competitiveness of a region.

Two driving forces of regional innovations – internationalisation and globalisation on one hand and the regional agglomeration and clustering effects on the other hand – seem to contradict. Internationalisation and globalisation support rapid spread of knowledge explicit knowledge (directly via ICT – information and communication technologies, or indirectly via imported technology), while regional clustering favours transmission of tacit knowledge due to spatial proximity. Knowledge created in more distant regions is more likely to be different and its transfer offers potentially higher returns. Spatial distance, however, limits numbers of personal interactions, which are crucial for transferring subtle forms of knowledge. Firms enjoying spatial proximity can benefit from higher numbers of interactions by firms and knowledge brokers, and also from similar socio-cultural environments. Numerous face-to-face contacts support building trust and decrease transaction costs of knowledge transfer. Horizontal clusters of firms enable for mutual learning via monitoring and competition by cluster members, Vertical clusters provide for different type of learning based on specialisation and co-operation of complementary networks of suppliers and customers. Specialisation and physical proximity support economies of scale, decreasing transaction costs and more investment to innovative solutions by specialist firms. Similarity of socio-cultural environments, however, decreases likelihood of radical differences in knowledge levels. Process of 'knowledge homogenisation' is further supported via industry specialisation of regional economies on certain type of production. This assumption is supported by some empirical research. Few studies have actually found evidence of the superiority of local over non-local interaction, and even regions previously held for models of regional clustering (e.g. Oberbayern and Stuttgart) were actually highly engaged in international movements by production factors.

3. Assessing Impacts of Regional Innovation Policies

European Union Member States differ significantly in their institutional, infrastructure and economic conditions for innovations. Major differences are expressed in terms of: • patterns of technological specialisation • intensity of R&D investment • design of National Innovation System • structure of business

expenditure on innovation (expenditure by SMEs versus expenditure by MNCs)
• degree of openness of national innovation system – NIS (share of foreign R&D investment, number of foreign R&D ventures, etc.).

All these differences essentially happen on regional levels and make any comparisons and benchmarking difficult. Disparities in regional economic and social environments are no less important. Rather an "universal benchmarking tool" for all regions, typology of regions should be developed, with their own benchmarking and evaluation approaches.

Before the regional innovation policy impact assessment and benchmarking process starts, the policy makers should ask some very basic questions:

What is the likely source of regional wealth to be in the period under review? As mentioned above, differences in innovative performance explained for some 41% of the variation in per capita regional income in 13 EU member countries. If innovativeness seems greatly important for generation of wealth, it also hints that some 59% of variation was generated by other factors, let it be natural endowments, location, national economic strategy, etc. While it is tempting to emulate success of the Uusimaa or Oberbayern regions, there is no guarantee that using the same policies would lead to the same outcomes. Success or failure of innovation policies is determined by a much greater array of factors the regional government is able to manage.

Which drivers are more important for regional innovations, regional or international? This issue is very important for developing policy mix. Benchmarking innovation policies must adopt a systematic perspective and asses both the

• explicit (interventionist) innovation policies (grants, subsidises, loans, training programmes, tax instruments, etc.), and

• framework-supportive policies creating competitive business environments (reform of labour markets, removal of administrative burdens, etc.).

Which policies suit best to support innovations? Which policies are most popular by governments of highly innovative regions?

Firms are driven into innovation investment if they assume there is an interesting market niche (lead market) of certain critical size. Since local markets are inevitably smaller than national and international ones, export-oriented firms used to be more innovative then those serving local markets. Fostering lead markets via framework supportive policies therefore seems to be more efficient than direct interventionist policies promoting particular technologies with no markets defined. It follows that the principal factors affecting company decisions are proximity to key markets and the availability of the knowledge infrastructure in general and large stocks of human capital in particular. It indicates that regions competing for location of R&D investment (including that by the MNCs) should prefer policy measures aimed at removing barriers to business, promoting mobility of human capital and investments in advanced R&D activities.

Every country and region depends on the resources available in other countries/regions. But it still remains in the interest of each country/region to develop some distinctive innovative activities to compensate for fields in which it is dependent on knowledge and technology generated abroad. Factors such as the presence of multinational firms, the degree of labour mobility between universities and firms or across countries, or the openness of an economy, are important determinants of the absorptive capacity of a country and of the extent to which spillovers can successfully take place. A representative survey of MNCs (Edler, Meyer-Krahmer and Reger, 2002), for example, showed that the three strongest motives for the European companies to invest in R&D abroad are to take advantage of technology developed by foreign companies, to learn from lead markets/customers and to adapt products to local needs. Answering these questions enables to say, if regional innovation policies were properly constructed and implemented.

Particular issues explored when assessing impacts of regional innovation policies include:

1. Design of policy mix

- Is there a regional approach to innovation policy?
- Does it take into account specific regional differences in innovation performance?
- Are there any programmes designed and managed at national level but which address specific regions or regional challenges (e.g. national operational programmes under the Structural Funds)?
- Is there any mechanism for the coordination of innovation policy between the national level and regions.

2. Structure of innovation governance

Innovation policies account for multi-level governance structures. They involve stakeholders on European, national and regional levels. It is important to assess:

- Powers (legislative and budgetary) relevant to innovation policy devolved to particular stakeholders ranging from, for instance, economic development (e.g. infrastructure such as industrial parks), (higher) education/universities, funding of business development, research policy, etc.).
- Modes of interplay between particular actors (e.g. subsidiarity versus complementarity, vertical versus horizontal cooperation).

3. Stakeholders

- Who are the main stakeholders in regional policy-making?
- Are there any partnerships developing regional innovation strategies?
- Who implements regional policies of innovations? Are there regional agencies, funds, etc. responsible for implementation? If yes, are they public or non-governmental organisation?

4. Challenges addressed by regional innovation policies

• What are the current stated objectives of regional policy related to innovation (whether these have been defined in a stand-alone policy or as part of a more general document)?

• To what extent are these objectives quantified or specific targets set – if they are quantified or explicitly stated in qualitative terms.

5. Benchmarking

• Do the regional innovation policies use indicators and benchmarks?

• What is frequency and system of policy reviews? Are evaluations carried out systematically?

• Which evaluation methods are used (internal report by regional government, evaluation commissioned to an independent expert, opinions by consultative bodies, own initiative reviews...).

4. Data Sources

Diversity of regional typologies suggests potential problems with data sources needed for policy evaluation and benchmarking. The data sources, on one hand should provide information on different driving forces and policy components in regional innovation, and, on the other hand, guarantee that information is reasonable standardised as to enable for cross-regional comparisons and assessment. While quantitative indicators may assist analysis of the innovation drivers, qualitative indicators are of major importance when evaluating innovation policies. There are several potential sources of data on region-firm interaction level, which can provide for interesting insights into regional innovation policy impacts:

1. *European Innovation Scoreboard* (EIS). While providing some essential data on regional innovation levels, the EIS accounts for some notable drawbacks:

• It reports data on the administrative, rather then economic regions. The EIS database refers to NUTS 2 and NUTS 1 levels and does not allow for disaggregating data in smaller, or purpose-drawn regions (e.g. urban versus rural, transborder, metropolitan, etc.).

• Explanation power of the EIS data further is obscured by discrepancies in location of innovation origin and innovation reporting.

• The EIS does not allow going to the firm-level of innovations.

• It includes only 13 EU Member Countries

2. Trendchart on Innovation databases of innovation policy measures across 33 European countries. The Trend Chart on Innovation has been running since January 2000. It now tracks innovation policy developments in all 25 EU Member

States, plus Bulgaria, Iceland, Israel, Liechtenstein, Norway, Romania, Switzerland and Turkey. It also provides a policy monitoring service for three other non-European zones: NAFTA/Brazil, Asia and the MEDA countries. The Trendchart provides a wide array of services and publications related to innovation. Except for the abovementioned EIS database, the Trendchart produces annual policy monitoring reports for all countries and zones covered. Most of the policy monitoring relates to the country-level policy initiatives. The annual reports, however, bring also some information on regional innovation policies directed towards private sector. It, in particular:

- discusses developments in the implementation of regional innovation policies during the past 12 months. It identifies the extent to which Structural Fund support has led to new measures or initiatives being taken;
- gives an idea of the budgets consecrated at regional level to implementing innovation policy and the sources of funding (national, regional, Structural Funds, private sector);
- highlights examples of new policy measures taken at regional level to address challenges specifically faced by one or more types of regions (e.g. regions facing industrial decline, more rural regions, etc.);
- discusses the policy mix at regional level and to what extent national and regional measures are complementary (or not);
- lists any relevant evaluations of regional innovation policies.

Regional pages of the Trendchart policy monitoring are rather concise. They, however, provide snapshots of relevant issues in regional innovation policies over last five years in a large sample of countries.

3. Regional statistics on innovation and regional innovation surveys in particular EU member countries. Most EU members disaggregate their national statistics on R&D financing, supply and output to regional levels. Some national agencies responsible for promotion of innovation track impacts of their policies via surveys carried out on representative numbers of firms. While potentially interesting, these national reports use different methodologies and are not comparable across the EU. Except for datasets available at Eurostat, there are data sets developed by individual projects funded by the six EU Framework Programmes. These would in many cases be relevant for other projects as well, yet they are hardly available. This means they are used at a sub-optimal level. To make such data sets available to external users (in the right format and with user-friendly documentation) further processing is often necessitated (Pohoryles, 2003).

4. The Community Innovation Survey likely is the most important source of information on region-firm interaction level. The CIS is undertaken jointly by the European Commission and the statistical offices of the European Economic

Area's Member States (EEA). It assembles information on technological innovation in Europe, as a contribution to the development of effective policies supporting innovation and the spread of new technologies. Using a common methodology, CIS gathers internationally comparable data on the resources devoted to innovation at firm level, as well as its impacts on competitiveness. Consistency, comparability and periodicity are main advantages of CIS as main source of data for assessing impacts of regional innovation policies.

The CIS generates data broken down to particular NACE industries in manufacturing and services sector. While it was not intended as source of regional information on innovative firms, the structure of the CIS data allows for their regional disaggregation. Each firm reporting to the CIS bears its local identifier. This fact is of potential great value, as it enables for drawing purpose-constructed regions, rather then relying on administrative ones. The CIS also has some drawbacks:

- It is carried out one in 3 years. As data processing takes some time, information obtained by CIS does not necessarily be fresh. This may improve in the future with implementation of new information technologies. Regional authorities may conduct their own CIS-like surveys in time period needed.
- Till now, some 3 CIS were conducted in the EU-member countries, which does not allow for building representative time series. This drawback is less important for the methodology development than for the actual policy impact assessment.
- Some national statistical offices may be reluctant to provide the project participants with the regional data. Here the project participants hope to obtain help by regional authorities and European Commission.

The listed drawbacks of the CIS are significantly outweighed by its advantages. CIS data for the countries participating in EUROCOOP Project can provide invaluable insights into these topics

- How far is innovation development embedded in economic and social structures of a region?
- Is it local/regional environment or international flows of production factors, which shape patterns of regional innovation development?
- How the formal and tacit knowledge is transferred to and used by firm?
- What is the role of local/regional, national and international customers, suppliers and competitors in developing innovative products?
- Is there significant degree of industry-academia co-operation in the region analysed?

These issues have major consequences for evaluating European, national and regional innovation policy mix and the mode of interplay between those (subsidiarity and complementarity).

Conclusions

Enlarged Europe accounts for a great disparities in terms of regional wealth. While there was some cohesion on the national levels, regional economies accounted for growing polarisation in terms of per capita GDP and employment levels. Economic disparities are by a significant degree generated via differences in regional innovative performances. Each regional innovation system consists of a large number of actors (universities, research facilities, private enterprises, regional and local governments, etc). The system's performance depends to a large extent on how these actors relate to each other as elements of a collective system of knowledge creation and use as well as the technologies they use.

Innovation process is subject to knowledge generation and diffusion. Both the codified (transferable) and the tacit knowledge are needed to build innovative capacities within a region. The tacit knowledge, however, seems essential. It usually is bound to its bearer and could be diffused only via face-to-face contacts. Geographical proximity of knowledge bearers and users leads to clustering of people, companies, and institutions. The most powerful mechanisms for transferring and augmenting tacit knowledge include labour mobility by the highly skilled, industry-academia cooperation and interaction of innovative firms with their customers and competitors. It follows that regional innovation policies should concentrate on instruments supporting generation and diffusion of tacit knowledge, rather than codified one.

There is a great variety of policy instruments available to regional governments when fostering innovation. The direct measures (grants, loans, subsidises, equity financing, etc.) are most common innovation policy instruments applied both on the national and regional levels. While very important, the direct support measures may bring expected effects only when a framework conducive to innovation has already been established and the firms recognise that investment in innovation would provide them with high returns and sustained profitability. Framework-supportive policies should be accompanied by the demand-side policies intended to foster the lead markets for innovation. Most important demand-side policies (EC, 2003) include:

- *Cluster policies.* The most common policies in this field embrace providing strategic information through technology foresight studies, building brokers and networks agencies (innovation centres, technology parks, business angels networks, etc) and establishing joint industry research centres.
- *Public procurement of R&D, innovative goods and services.* Regional governments should set targets for innovative component in the public procurements and produce regular plans of innovation and technology development involved in their procurement practices.

• *Technology platforms to coordinate development of technology.* These platforms are excellent forums for combining strategy and foresight elements and transforming these to direct measures supporting innovations. Regional innovation systems engage multiple actors in building up the area of competence. Regional government acts not only as a sponsor of direct innovation policy measures, but also in its capacity as regulator and standard setter.

There is no policy evaluation and benchmarking without reliable, accurate and internationally comparable data. Assessing impacts of regional innovation policies, however, is difficult due to great diversity of European regions in terms of their economic and social environments and innovation development systems. Measuring impacts of these policies further is obscured by the immature level of most of the statistical indicators published by the EU and national statistical agencies. There is a lack of consistent data and information regarding some types of innovation policy issues, e.g. challenges addressed, involvement of various stakeholders and structure of policy mix. Some information on these topics can be extracted from the Trendchart on Innovation Country reports. The European innovation Scoreboard, on the other hand, can be more useful when assessing traditional indicators of R&D, innovation and technology policies (e.g. R&D expenditures, patents, production and trade in high-technology products). These indicators tend to be more robust than "soft information" on innovation policies. They, on the other hand, can provide only for a rough picture of innovative capacities of particular types of regions. The Community Innovation Survey is the main statistical instrument of the Union that allows the monitoring the innovation process and analyses the effects of innovation on the economy (on competitiveness, employment, economic growth, trade patterns, etc.). The CIS has some major advantages over other potential data sources, as it allows for drawing purpose-built regions of evaluation. It also enables for answering some fundamental issues, notably embeddedness of innovation in economic and social structures of a region, driving forces of regional innovations and transfers of tacit and codified knowledge to/from the private sector.

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