

SOUTH AND EAST BULGARIA – TOWARDS KNOWLEDGE-BASED ECONOMY: CHALLENGES AND PERSPECTIVES

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Summary

The paper reviews the recent economic evolution of South-Eastern Bulgaria and provides an in-depth and state-of-the-art analysis of how the region is seeking to emerge as new knowledge-based economy. It analyses the key factors determining the knowledge development, and describes the regional systems of knowledge flow and innovation. The paper focuses on the region's competitiveness and innovation performance and explains how this performance relates to the national economic framework and to the European policy agenda. Based on the statistical data and consultation process, some of the key actors of the innovation process as well as the interaction between them have been identified. The main aim is to give a complete picture of the different elements of the R&D and innovation system, and to outline the main problems to the innovation activities. As a broad conceptualization of knowledge process, a regional knowledge model has been built in the Triple Helix framework. The analysis of this model is concentrated mostly on the supply of the R&D and innovation support rather than on the demand of knowledge. It highlights the fact that currently Bulgaria has a two-tier knowledge and innovation system - old state research institutes and universities, and numerous newly established private universities, non-governmental institutions and firms.

Key words: competitiveness, innovations, R&D, knowledge supply, triple helix model

1. Introduction

Nowadays knowledge is well recognized as a key ingredient underlying the competitiveness of regions, states, sectors and individual firms. Innovation performance, the development of new markets, expansion of existing markets and increasing levels of productivity are central to the development of Europe's economy. The 2000 European Council in Lisbon highlighted the importance of knowledge creation and transfer to meet the challenges of globalization and raising competition in the world economy. It set up the strategic goal for the next decade: the Union to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion. EU spending on research and development is targeting 3% of GDP on average by 2010. Being EU member from the beginning of 2007, Bulgaria is facing the main challenge to ensure sustainable economic growth through discovering new sources of competitive advantages based on investment in new technologies, enhancement of innovation capacity and increase in total factor productivity.

The knowledge base of the economy can be defined as the capacity and capability to create and innovate new ideas, thoughts, processes and products, and to translate them into economic value and wealth (Huggins and Izushi, 2002). That is why the explanation of the process of knowledge creation, transfer and absorption is considered to be of crucial importance for the economic competitiveness. There is a wide range of drivers behind knowledge creation and transfer among which the availability of qualified human and social capital, the legal and institutional frameworks, the financing and governance schemes, and the level of national and regional economic development can be outlined. The main purpose of

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this paper is to map and identify the key actors of the research and development and knowledge transfer, and to analyze the interaction between them in the region of South and East Bulgaria, and thus, to gain a deeper understanding of the issues related to those activities. The analysis covers both actors based in the region and actors based outside the region and/or operating at national level. The regional actors are divided into four main groups: i) knowledge creators/producers; knowledge intermediaries that assist knowledge transfer/spillover and knowledge absorption in the region and iii) knowledge utilizes (firms) and iv) policymakers. In accordance to the supply-side oriented approach undertaken, much attention is paid on the behavior of the knowledge creators and intermediaries. The role of the innovation policy conducted is interpreted only in the framework of the knowledge flow model of Triple Helix type, constructed as a broad conceptualization of knowledge creation, demand, transfer and flow.

The methodology adopted involves the combination of quantitative and qualitative research techniques. The analysis draws on usage of the official statistical data, as well as on the results of face to face interviews with a cross section of relevant key actors and stakeholders in the region.

2. Competitiveness of the region

The South and East Bulgaria region includes four out of the six planning regions in Bulgaria – South-West region, South-Central region, South-East region, and North-East region.² It covers 74.2 % of the country territory and gives 79% of the total Bulgarian population. In 2005 the region as a whole provides the 83.3% of the country's GDP.³

Table 1: Key Competitiveness Indicators

Indicator	Bulgaria	SWR	SCR	SER	NER	EU-25
Summary Innovation Index, (2006)	22.0	n.a	n.a	n.a	n.a	50.0
GDP - (PPS) per inhabitant, (2004)	7133.9	10550	5509.3	6420.1	6299	22414.7
-PPS per capita, EU-27=100, (2006)	37.1	n.a	n.a	n.a	n.a	103.9
-mln. BGN*,(2005)	42 797	17 313	8 752	3 728	5 846	n.a
Labour Productivity per pers. employed -EU27=100, (2006)	35.3	n.a	n.a	n.a	n.a	103.9
-BGN, (2006)	10825	14250	9106	10475	9359	n.a
Unemployment Rate (2006, %)	9.0	6.5	7.6	9.8	12.6	7.9
Economic Activity Rate (2006)	64.5	69.5	61.7	63.4	63.9	70.6
Mean Gross Monthly Earnings (BGN, 2006)	355	421	309	331	329	n.a

Notes: * BGN in current prices; SWR - South West Region, SCR - South Central Region, SER - South East Region, NER - North East Region.

Source: National Statistical Institute, Eurostat, European Innovation Scoreboard (2006)

² The results presented are part of the research project “Managing and Infusing Research Investment and Development (MIRIAD)”, funded by the Framework 6 Programme of the EC under Regions of Knowledge 2 programme (FP6-2004-KNOW-REG-2) (project number: 029490), where the definition of the region was presupposed in order to cover Bulgarian borders with Greece, Turkey and Black Sea.

³ Sources of all data are National Statistical Institute and authors' calculations.

As shown in Table 1, Bulgaria as a whole and each one of the four studied planning regions lag far behind the EU average one. Bulgarian *GDP per capita* in PPS is almost 2.7 and 2.8 times lower than the EU-27 and the EU-25 ones correspondingly. At the same time, rather high inter-regional disparities are observed. The leading position belongs to South-West region, where GDP per inhabitant in PPS is 1.48 times higher than average one for Bulgaria. On the opposite position is South-Central region with GDP per inhabitant 5509.3 PPS, compared with 7133.9 PPS for Bulgarian economy.

Bulgarian *labour productivity per person* employed is also relatively low. It reaches 35.3% of the EU-27 level in 2006. In regional terms South-West and South-East regions report the highest levels, while South-Central region occupies the lowest level of labour productivity.

According to official statistical data, the Bulgarian *average gross monthly earnings* are many times lower than those in the EU. This fact and the observed wage dynamics cannot be interpreted as a sufficient condition for the low unit labour costs and thus for the competitiveness improvement. The combination between the low salaries and the relatively low labor productivity is not a good starting point for raising competitiveness. The regional disparities among the average wages are much smaller than the disparities in the regional GDP per inhabitant. What concerns the average wages by districts within a given region, a clear trend similar to GDP dynamics occurs.

The *unemployment rate* in Bulgaria is also relatively higher than the average in the EU member countries (in 2006, it was 9% compared to 7.9% in EU-25). At the same time unemployment is lower compared to some of the new member states as Poland and Slovakia. Since 2001 the rate of unemployment has been gradually decreasing, but with different dynamics across planning regions. Due to the capital of Sofia, the best results are obtained in South-West region, where the unemployment rate is even less than that of EU average, whereas on the last place one may find the North-East region with an unemployment rate of 12.6%. The *economic activity rates* also differ considerably among planning regions.

The above results indicate that improvement of regions' competitiveness becomes the main challenge for both national and local policymakers. Incapability of a large part of enterprises to meet the European standards and external competition in the exporting sectors, unfavourable demographic development, high emigration level, low proficiency in entrepreneurship, low speed of transition to knowledge based economy, low investments in R&D, growing regional disparities, insufficient capacity for absorbing EU funds, insufficient level of co-financing, other negative external economic shocks are among the most important obstacles to the improvement of economic competitiveness.

3. Innovation and R&D

The huge *R&D investment* gap is observed between the Bulgarian regions in comparison with the EU average. South-West region, including Sofia, confirms its leadership position in terms of R&D expenditure, as almost 84% of R&D expenditure in the country is observed there (see Table 2). Statistical data obviously display the main characteristic of the Bulgarian innovation system – the high centralisation and concentration of resources and activities in the capital of the country. The share of R&D in GDP of North-East region, South-East region, South Central region, and of the country as a whole lag far behind the EU averages with their levels of 0,18%, 0,14%, 0,12% and 0.5% respectively.

Table 2: Regional R&D Performance in Bulgaria in 2005

Region	R&D expenditure by regions (%)	Share of R&D in local GDP (%)	Value added per employee (BGL)
North-West	2.2	0.2	9089
North Central	1.6	0.07	8939
North-East	5.0	0.18	9359
South-West	83.9	1.01	14250
South Central	4.8	0.12	9106
South-East	2.5	0.14	10475
National level	100.0	0.49	10825.0

Notes: The shaded regions are the planning regions under consideration.

Source: National Statistical Institute

Regarding the *knowledge creation and supply*, the main elements of the national research and innovation systems are universities and other research institutions. According to the Accreditation Agency of the Ministry of Education and Science the total number of the universities and other high schools in the country is 43, and 21 or approximately half of them are concentrated in the capital Sofia. The most significant player in the group of research institutions is considered to be the Bulgarian Academy of Sciences, which comprises 51 scientific institutes, one national and 12 regional laboratories, 8 research centres, 3 technical support facilities and 10 auxiliary units. In addition, there are 18 state research institutes located within different ministries and agencies that are specialized in conducting research in specific fields.

Table 3 presents distribution of R&D personnel and researchers by planning regions. The South and East Bulgaria region covers 93% of the employees involved in such activities in the country. Within the region the South-West planning region concentrates more than 80% of the R&D personnel and researchers.

Table 3: R&D personnel and researchers in 2003

Region	Number of R&D personnel and researchers
North-West	91
North Central	1101
North-East	1578
South-East	504
South Central	1718
South-West	12408
National level	17400

Note: The shaded regions are those included in the region under consideration.

Source: National Statistical Institute

Bulgarian R&D system has a public sector dominated structure. In 2003 44% of the Bulgarian R&D infrastructure operated in the public sector, 27,6 in the higher education sector, 26,5% in the business sector and 1,9% are non-profit organizations. Private sector research and innovation infrastructure is rudimentary. The most prominent private R&D

organizations are either privatized structures of the former state infrastructure or were established within the EU-funded projects.

The SWOT analysis shows that region as a whole manifests its potential for development of a sound research and innovation infrastructure. The qualification of the researchers is rather high, and the knowledge creators located in the region are in the fields identified as priority sectors for economic development. Simultaneously the innovation activities of researchers are limited to the development stage only, and there are not enough investments in research infrastructure. The other weaknesses of the knowledge supply process are insufficient funding of R&D activities, as well as the highly centralised old system that does not correspond to the needs of business sector.

At a regional level, the best available indicators for *knowledge demand and absorption* refer to industrial structure and the human capital capacity of the existing labor force. As shown by the data in Table 4, the major part of the medium- and high-tech manufacturing in the country is located in South-West planning region although with significant variations across sub-regions.

Table 3: Key Knowledge Demand and Absorption Indicators (%)

Region	Employment in medium and high-tech manufacturing	Employment in high-tech services	Population with tertiary education	Live-long learning
North-West	2.3	2.0	17.5	16.5
North Central	6.6	2.2	21.0	18.5
North-East	4.6	1.9	18.2	18.2
South-East	3.4	1.7	17.8	18.9
South Central	6.1	1.9	16.5	17.3
South-West	3.4	4.4	31.1	25.3
National level	4.7	2.7	21.7	19.9

Note: The shaded regions are those included in the MIRIAD region.

Source: National Statistical Institute

The share of persons with tertiary education ranges from 16.5% in South-Central region to 31.1% in South-West region, whereas the average national level is 21.7% (see Table 4). The leading position in the live-long learning is again for the South West region, where the indicator's level of 25.3% is far above other regions and country as a whole. On the opposite site, the North West and South Central regions are in the worse position among all Bulgarian planning regions, because there live-long learning education reaches only 16.5% and 17.3% correspondingly.

The apparent available evidences suggest that the region faces a number of problems in this area that require solid efforts to be solved. At present, however, there is a little substantive information of the complexity and peculiarities related to these problems. In accordance with the SWOT analysis, the principal weaknesses of the knowledge demand and absorption appear to be the low wages in the SMEs, which do not stimulate productivity and quality of manufacturing, as well as the old and obsolete infrastructure, machinery and equipment.

Knowledge demand and absorption is largely lies with the strategies pursued by the region's business community. This community is represented by a number of 'umbrella' institutions, the most important of which are the Chambers of Commerce, various branch associations, regional development agencies and business incubators. At both national and regional level, the policies relating to knowledge demand and absorption tend to be an

implicit feature of other policies targeted at the private sector, rather than explicit policies in themselves.

A large group of indicators, measuring *knowledge transfer and flow* are still unavailable in Bulgaria. That is why the needed information for transmission and application of knowledge is gathered mainly through interviews. The results indicate that intermediary organizations have a good network with the other innovation actors, and good traditions to work with them. At the same time they do not have a clear idea about their specific role in transfer of knowledge and the innovations to the enterprise sector. Currently there is a relative plethora of stakeholders with some form of responsibility for knowledge transfer and flow within South and East Bulgaria. A large number of private non-profit organizations that help in knowledge transfer and absorption have been operating at both national and regional level. Among all regional development agencies, commercial chambers, regional and branch associations, technology transfer centres, business innovation centres, business incubators and other organizations supporting SMEs have been the most active in the field of knowledge transfer.

4. Results from the interviews

On the basis of 20 in-depth interviews with 10 knowledge producers, 5 intermediaries and 5 policymakers confirm, the following conclusions can be drawn:

First: Universities have been traditionally viewed as a source of human capital, future employees and, secondarily, as a source of knowledge useful to the firm. Therefore they are focusing on their traditional missions of research and education. All of the interviewed universities, both public and private, mentioned educational and training activities as their core service rendered to the business sector. Almost all of the interviewed public institutions that produce knowledge rely fully on the state financial support. Despite the tendency of increasing share in the total budget, income from other sources, mainly international projects still plays a complementary role.

Second: Personal contacts are the most important driver behind matching demand and supply side of research and innovations. Almost 2/3 of the respondents mentioned also participation in the conferences and internet pages as the most frequently used and the most efficient ways of finding clients of their production and services. There was a common opinion that most of the research projects are supply rather than demand driven. The main part of the research ends up with the development stage. Despite most of the research organizations have introduced market oriented changes in the management; they view the lack of management acumen and skills, ageing and insufficient motivation of the personnel as the main barriers to intensifying relations with enterprise sector and commercialization of knowledge.

Third: Senior management within their organizations are generally positive towards commercialization of research but at present are failing to fulfil their potential due to both internal and external reasons. The most significant perceived problem to knowledge commercialization activities is considered to be the improper legal framework, which does not stimulate if not hindering knowledge commercialization and capitalization. At the same time it has to be mentioned that the knowledge suppliers have no clear strategies of research commercialization and are lacking significant and relevant expertise in the field. The interviewees shared the view that it is too costly to establish a market-oriented research centre within the organization and to develop it. The lack of proper equipment and physical infrastructure and communications are also frequently mentioned as barriers to the commercialization of research.

Fourth: Local universities are more advanced in respect of knowledge commercialization compared to those situated in the capital. In addition private newly

established universities are more flexible than the old large state ones obviously reflecting better internal capacities to administer research activities, stronger intra-regional networks and more motivated faculty and management. It is much more difficult for knowledge producers located in the capital to get a complete view of all relevant actors at regional level and thus much of the regional networks remain uncharted.

Fifth: The lack of transparent and visible networks and communication channels, and arising from these information asymmetries are perceived are accepted to be the serious barriers to more active relations between academia and business sector. In addition there is no state policy aimed at enabling universities and research institutes to establish knowledge-base venturing. Innovations happen mainly at companies and clusters. And though the national innovation environment is key to having vibrant cities and regions, it is usually local networks, connected to the national and international markets that matter most in to the development of sound innovation practices and systems.

Sixth: There is a weak relationship between knowledge intermediaries and knowledge producer organizations. The protection of intellectual property rights of SMEs has been identified by all respondents as one of the most underdeveloped areas in the field of research and innovations.

5. Regional Knowledge Model

The knowledge model presents the representation of knowledge flow within the region based on conceptualisation set within the framework of the Triple Helix model. Its construction and development has been strongly affected by the radical social and economic transformations in the last 18 years.

Under *central planning* the national research and innovation system included research institutes, universities, R&D units located at large production conglomerates and the state sponsored scientific and technical intelligence agency. The system ensured country's specialization in specific areas of fundamental science and in reverse engineering in certain industries, e.g. electronics. It concentrated significant human and financial R&D resources and produced a fairly large volume of scientific and technology production although part of it with limited market value (ARCF, 2006). Most of the research institutes and higher education institutions were located in the capital. The "bottom-up" initiatives were very limited.

During *economic transition* to a market oriented economy Bulgarian R&D and innovation system has been left to its own development. No systematic efforts have been made to reform it with a clear vision about its future mission and its role in the national development. Many activities were disrupted and certain divisions closed or depleted from human resources. A large part of Bulgarian scientists and R&D specialists have emigrated in the first 2-3 years after the beginning of changes. Gradually the key knowledge producers have lost contact with market reality and business and have closed themselves in the rein of basic research. Most of the research institutions and R&D have lived on edge of surviving and have covered only operational costs. In the last 10 years the share of capital investment in total R&D expenditure did not exceed 4% in Bulgaria. More than 95% of total R&D expenditure was spent on covering current operational costs. As a result of strongly reduced state funding and the negligible support by private sector the country end up with dilapidated and obsolete R&D infrastructure that does not allow for carrying out contemporary research and innovations. Continuous underinvestment in science, research and technology has led also to the depreciation of human capital.

The *current model* of the knowledge production and transfer in the country consists of separate institutional spheres with strong borders dividing them and highly circumscribed relations among spheres. This configuration resembles the "laissez-faire" model of university-industry-government relations (or Triple Helix II). In other words during the transition period through reducing the role of the state the national research and innovation system has shifted from Socialist type of Triple Helix model to the a "laissez-faire" type of model. The model has also to be described as non-linear one that takes both interactive and recursive terms into account.

Figure 1 presents a broad *conceptualisation* of knowledge creation, demand, transfer and flow based on the evidence collected to date. In summary, it highlights the following:

a) Currently Bulgaria has a two-tier knowledge and innovation system - old state research institutes and universities on the one hand and numerous newly established private universities, non-governmental institutions and firms on the other. The two tiers fail to synergize on scarce public and private resources in the country;

b) The old innovation infrastructure has not been reformed to address new and emerging needs of the economy and has remained primarily government financed without private support. Companies and newly emerging innovation structures on the other hand respond to international competitive pressure and trends and have established parallel innovation efforts, which usually are isolated and small scale;

c) Traditionally the knowledge creation and transfer system in Bulgaria has been highly centralized with the dominant role of the state in governing the process. This model resembles the characteristics of the “Triple Helix I” (Etzkowitz, 1998) and has been observed in other former socialist economies as well;

d) During the transition period through reducing the role of the state the national research and innovation system has shifted from Socialist type of a Triple Helix model to a “laissez-faire” type of model. The model has also to be described as non-linear one that takes both interactive and recursive terms into account;

e) Universities have been traditionally viewed as a source of human capital, future employees and, secondarily, as a source of knowledge useful to the firm;

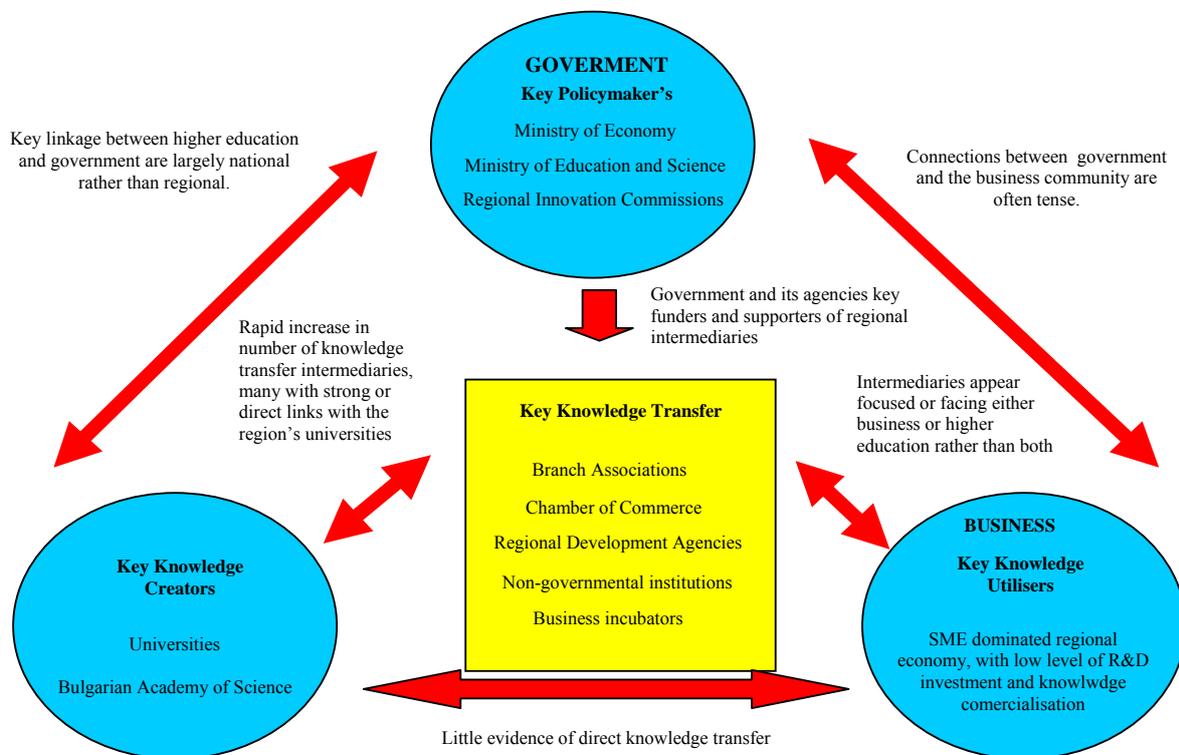
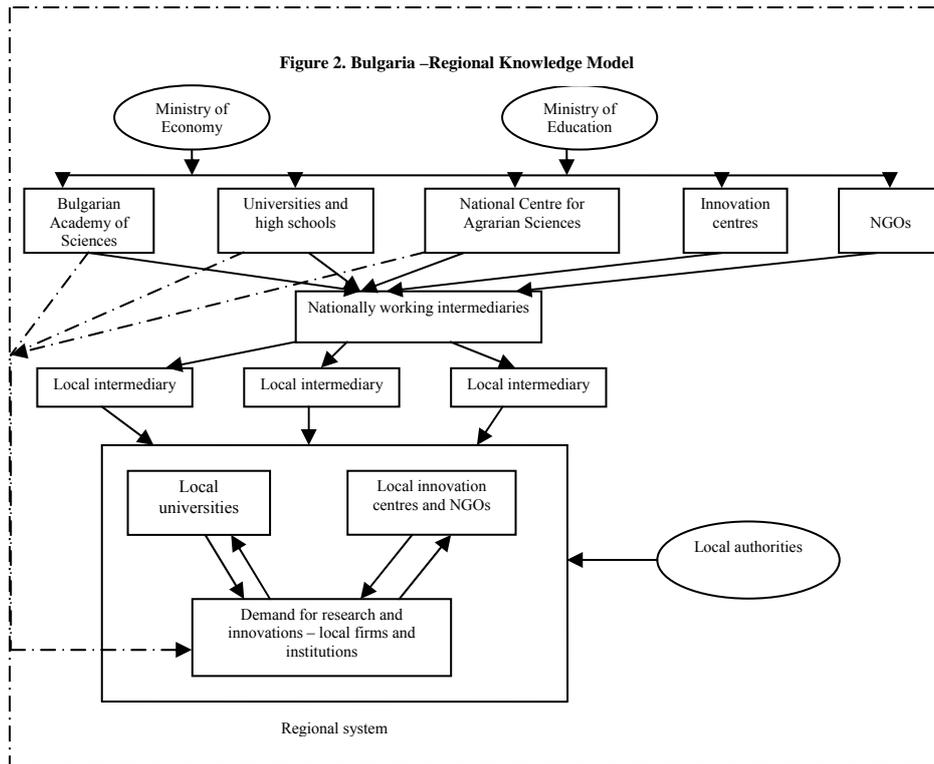
f) Demand for research and innovations by private firms are described as rudimentary and scarce. Unrecognized importance of innovations for sustainable development among SMEs managers is as important factor explaining low demand as the lack of financial resources;

g) Traditional forms of academic-industry relations still prevail. They include rendering personal or team consultations and services to the firms and participation in liaison programs. The more intensive and formal institutional ties between universities and firms are still missing;

h) Real estate development and formation of spin-off firms are still in embryonic phase. Some isolated and separate initiatives related to the extension of university research into development took place mainly confined to the establishment of applied research centres, NGOs and private firms by academics.

Figure 2 presents a further representation of knowledge flow within the region based on conceptualisation set within the framework of the *Triple Helix model*. From this conceptualisation the following peculiarities are apparent within South and East Bulgaria:

- *Government* – key policymakers are the Ministry of Economy, Agency for Support of SMEs, Ministry of Education and Science and at regional level – Regional Innovation Commissions and Regional Development Councils;
- *Business* – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation;
- *Knowledge producers* (Universities and Higher Education and Bulgarian Academy of Science) – large-scale knowledge creation appears mainly restricted to a small number of higher education institutions.
- *Government-Knowledge Creators Interface* - key linkages between higher education and government are largely national rather than regional. The linkages primarily involve the National Science Fund for Bulgaria.
- *Knowledge Creators -Business Interaction*– little evidence of direct knowledge transfer. Intermediaries act as key facilitators of this interaction, with government and its agencies being a key source of funds and supporters of regional intermediaries. In general, there has been a rapid increase in number of knowledge transfer intermediaries, many with strong or direct links with the region’s universities. Many intermediaries appear focused or facing either business or knowledge producers rather than both.
- *Government-Business Interaction* - connections between government and the business community are often tense.



Conclusions

The key conclusions coming from the above analysis undertaken is that innovation is a result of co-operation, interaction and mutual learning between different actors within the region rather than a result of linear process where knowledge actors receive support from the state and the local authorities. Staying in line with this conviction and having in mind the main characteristics of the innovation system, the future policy directions considering R&D investments might be summarized.

First: Future R&D and innovation policy has to be addressed to fulfill both quantitative targets and qualitative targets, related to improving the overall organization of national and regional innovation systems. The qualitative targets will manifest themselves through changing the role of different actors in the innovation process, as well as through encouraging the network between them. The important step in these lines is to convince all knowledge related actors SMEs, intermediaries and knowledge creators that R&D and innovation investments have to be accepted as important factors affecting their medium-run and long-run growth and competitiveness;

Second: The R&D and innovation policy should target also the main tasks of the universities and the other research institutions. The knowledge creators have been traditionally viewed as a source of human capital, future employees and, secondarily, as a source of knowledge useful to the firms. Since the legislation that currently regulates research does not stimulate its commercialization and capitalization, the first step towards the commercialization has to be changing the legal framework. As far as the educational system is concerned, the next step could be redesigning the curricula in order to meet the firms' demand;

Third: The policy should help the intermediary organizations to become aware of their own capacity to induce more active innovation collaborations between knowledge creators and SMEs, as well as to initiate such collaborations by themselves. The common impression is the intermediaries are being able to use more intensively their closer relations to business in order to promote the knowledge flow. The policy incentives could range from giving more information about the good practice to involving intermediaries in the discussions serving policy developments.

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