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Nina Bohdan [a]
[a] Belarus State Economic University , Minsk , Belarus
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A Knowledge Generation System and Innovation Policy for countries of the Customs Union (Belarus, Kazakhstan, Russia)

Nina Bohdan*

Belarus State Economic University, Minsk, Belarus

This paper considers the problem of forming a Single Economic Area of the Customs Union (Belarus, Russia and Kazakhstan) from the perspective of knowledge generation. Based on the commonalities of knowledge generation and the characteristics of the post-Soviet development, there is the possibility of creating a supra-national innovation system. The general regularities of institution building and shaping the knowledge economy are established. Recommendations from the EU experience are made regarding the necessity of policy learning for the coordination of research and innovation policies.

Keywords: Knowledge generation; Innovation system; R&D; Integration; Customs Union; Human resources; Education

Introduction

The Customs Union of Russia, Kazakhstan and Belarus has been functioning since 1 July 2010. The goal of the Customs Union is to form a single customs area within which there are no customs duties or economic restrictions in place. The Single Economic Area (SEA) of the three member-states of the Customs Union started functioning on 1 January 2012.

The goal of forming the SEA is to create conditions for the stable and efficient development of the member-states' economies and to raise their population's living standards. The main principle of the SEA is to provide the freedom of movement for goods, services and workforces through the member-states' borders.

The political factor, which is usually an important motive of the regional groups, has played a decisive role in initiating the project in question. However, economic problems exist regarding the functioning of the new integration group.

1. The three countries' goals for the SEA are different. The main goals for Belarus are the opportunity of entry into an extended common market and getting preferences for Russia's fuel and energy goods. For Kazakhstan, the liberalization of access to Russia's transport infrastructure (pipelines and railway) is critical, and also entry into Russia's market with its services. Russia wants to expand its market for manufactured goods and solve a number of geopolitical problems.
2. There is a different degree of market transformation of the SEA countries' economies. According to the market reforms, Russia and Kazakhstan, with international statuses of market economies, are substantially ahead of Belarus, which is oriented towards maintaining a broad state presence in the economy, with slow implementation of market relations in place.
3. A growth of competition is observed in the domestic market of Belarus on the part of SEA member-states' goods and services, in addition to the competition of the Customs Union partners for the same foreign markets.
4. There is a lack of supranational institutions for the development of innovative collaboration in education, infrastructure, financing and statistics within the SEA.

This paper's conceptual analysis framework is based on traditional and innovative approaches to regional integration. The traditional approach is based on a free flow of goods, services, investments and people, as well as on the requirements for standardization. The innovative approach to regional integration presupposes efforts aimed at building human and social capitals, changes in behaviour and forming network interaction, which makes it possible to strengthen integration on the basis of knowledge generation, training, promising innovations and competence building. This approach forms new relations of transforming nature and contributes to the dynamics of the countries' innovative development on a new level.

*Email: bohdannina@gmail.com.

The paper's structure includes a literature review: conceptual framework: methodology: path dependency and shaping knowledge generation in innovation system: policy trends for innovation in Belarus, Kazakhstan and Russia; post-Soviet integration and innovation; the business sector in knowledge generation; the system of public funding of knowledge generation; some features of creating a knowledge economy in the countries of the Customs Union; human resources, education and skills; conclusion and recommendations.

Literature Review

Libman (2012) found that the number of studies on post-Soviet integration is very limited. As for the essential prospects, there are two directions used for the analysis of the post-Soviet area. First, one can focus one's attention on the interdependencies of the republics of the former Soviet Union (FSU). This type of study is most notably rooted in regional security complex theory. It often concludes that the FSU is still characterized by a very high level of interdependencies (Buzan & Weaver, 2003). The second approach suggests focusing on the homogeneity of the FSU countries. Here, once again, the results vary. There are those who concentrate their attention on the Soviet legacy, thus, on the possible homogeneity of the region (Jones Luong, 2002) and those who pay particular attention to the pre-Soviet legacies, and, therefore, they usually conclude that the FSU consists of highly heterogeneous countries (Gleason, 2010). This literature has been heavily influenced by political science and international relations. In scholarly research, little attention is paid to the peculiarities of integration in science and technology.

The development of the integration processes requires a study of the European Union (EU) experience, which has accumulated significant practical cooperation in science and technology. As McDonald & Dearden (1999) point out, the principle of subsidiary requires that the EU should pursue only those policies that it would be most efficient in governing. The main issue, if this principle is to be related to efficiency considerations, is to identify those national policies that have a significant spill-over effect into other countries. If the market fails to deliver an optimal allocation of resources because of externalities or monopoly power, there is a clear case for government action. Therefore, a case can be made for government policies in such fields as R&D expenditure, education and training, and environmental standards.

Gault (2010) concluded that with globalization, innovation has to be coordinated along value chains and within networks. There are knowledge flows to be coordinated between producers and users of the products manufactured, as well as suppliers. Knowledge markets also raise coordination issues. These are human issues, with implications for their education, training and lifelong learning activities. They go beyond coordination to the soft skills required to interact effectively in networks, and to capture knowledge from networks or knowledge markets and to convert that knowledge into value as part of the innovation process.

The resulting evolutionary theories of innovation systems consider innovation as an outcome of complex interactions among a variety of actors within an institutional framework (Freeman, 1987; Lundvall, 1992; Nelson, 1993). In this study a broader interpretation of the term 'innovation' is adopted from Nelson (1993). We agree with the view of Reddy (2011) that the focus on innovation is strongly connected to the broader issue of achieving economic growth, and some of the developing countries are not always required to be able to generate fundamentally new knowledge in order to achieve higher economic performance. Lall (1992) showed how firms move up the technology trajectory by learning initially simple and later complex technological capabilities before eventually participating in R&D activity.

The innovation systems framework provides helpful theoretical insights for developing countries. An important contribution of the innovation systems framework is its application for designing innovation policies and programmes (OECD/IDRC, 2010). Gault and Zhang argued that the complexity of innovation stems from fact that it is not an isolated event. Innovation is the result of a longer process and a broader picture involving education, culture and attitudes towards risk. It is also shaped by formal institutions, the rules of law and depends on stable economic and social environments. These framework conditions for innovation are necessary for the functioning of any economy, but they are often underdeveloped in developing countries. This largely explains why innovation is weak in these countries (Gault & Zhang, 2010).

In 2007, the OECD Council initiated the Innovation Strategy (OECD, 2010). The Strategy was formulated to include the following components: evidence-based analysis and benchmarking; a framework for dialogue and review; new indicators on the innovation–economic performance link; initiatives for innovation-friendly business environments; and the development of best practices and policy recommendations. The EU has developed Strategy 'Europe2020' (a strategy for smart, sustainable and inclusive growth) in a similar direction. The analysis shows that innovations are promoted at an international level through the innovation strategies; however, the coordination mechanisms differ.

If the interactions within integration unions take place on the basis of the static comparative advantage, where economies in the region interact by selling what they already produce, then the relationship is likely to be non-dynamic and non-transformative.

The recent restructuring of the world trading systems has resulted in poor results, especially for developing

countries (Chang, 2012) and is likely to produce poor incomes in the future. The importance of building capabilities for the purpose of long-term economic development needs to be recognized, and innovation can provide the area in which developing countries can do so on the basis of knowledge generation.

Conceptual Framework

The integration processes can be divided into two. The first one is regionalism: it is based on interstate relations and leads to the establishment of international unions, associations and, possibly, supranational institutions. The second one is regionalization, which is based on an informal interaction between companies, social groups and people in individual countries, as well as on the emergence of trade and investment relations which often exist without state support and sometimes even despite the obstacles on the part of the governments (Vinokurov & Libman, 2012). The Eurasian post-Soviet integration takes place in the form of interaction between the states of Northern and Central Eurasia, both formally (within the framework of various regional structures) and informally (at the cost of business processes, trade and migration). An important role in the dynamics of the Eurasian integration is played by the large-scale asymmetry of economic development and interdependency of the countries, which is currently implemented via trade and the movement of human resources and, to some extent, investments.

The problems with the development of the integration processes of Russia, Belarus and Kazakhstan show that what is required is a global competitive macro-strategy by the SEA in the field of technologies and innovative development. Regional integration can be reinforced on the basis of the innovative approach which is conceptually different from the traditional one rather than by means of using static comparative advantages that form a traditional approach to economic integration (free movement of capital, labour, goods and services).

The innovative approach to the development of regional integration is based on the objectives of forming the SEA countries' competitiveness in the global market. In modern conditions, when competitiveness is mainly determined by the technological level of production, competitive output can be produced only with competitive (high tech) equipment and competitive (highly qualified) personnel. The development and employment of high level technologies require a high level of education of the staff involved in production and management. A high level of education and its universal nature suggest a high level of expenses to create a qualified workforce as well as educated, highly technological consumers.

Thus, the processes of knowledge generation, knowledge and technologies diffusion, and development of absorption capacity, i.e. technological adaptive capacity, are becoming most relevant for the SEA countries. For Russia, Belarus and Kazakhstan, their industrial and cadre competitive potential has been practically created. However, as is rightly pointed out by Foray (2010), developing countries have formed knowledge ecology, not the innovation system. It is distinguished from an innovation system in that there are weak or no linkages among institutions and organizations and with the other actors in the system.

An innovative approach to regional integration is to ensure a systematic attention to building social capital for integration, growth of human capital, and innovative sensibility, i.e. it is aimed at promoting the Knowledge, Learning, Innovation and Competence (KLIC) building process. From a practical viewpoint, such an approach requires forming cross-border programmes of collaboration among various participants of the innovative process (companies, universities, research centres, government and non-government organizations), programmes of cooperation in the sphere of high technologies, inter-government cooperation in the financial sphere, and university exchange. An important role is played by the processes of harmonizing industrial, innovative and trade policies with a precisely developed and carefully coordinated system of recommendations for the SEA countries' sectors of industry and trade.

Methodology

Substantial efforts were made to organize the institutional element of the national innovation systems in the countries of the Customs Union. The roles of different levels of government as well as those of different governmental institutions at national and regional levels have been identified. The programmes of innovation development in the countries of the Customs Union have monitoring and evaluation systems with a system of statistical observations in place. Traditional S&T indicators constitute a poor basis for that analysis; moreover, statistics on innovation are far from complete in the developing countries. The national statistics in Belarus, Russia and Kazakhstan are considerably determined by the requirements of the OSLO Manual, which gives an opportunity to make an international comparison of innovation activities in the countries of the Customs Union and developed countries. We have analysed statistics from the EU, the World Bank, the OECD and national statistics information, which describe human resources, education, systems of funding R&D and generation knowledge, to develop new directions for innovation policy in the countries of the Customs Union and to develop a supranational innovation system.

Path Dependency and Shaping Knowledge Generation in an Innovation System

Problems with the modern process of knowledge generation are largely determined by the history of the formation

of scientific potential of the country. Historical experience allows the qualitative differences of two national innovation systems (administrative-command – AC and market) to be described and their advantages and drawbacks to be analysed (Dezhina & Saltykov, 2005). The chief economic, social and organizational characteristics of the national innovation system (NIS) in the USSR command system evolved in line with the fundamental principles of the prevailing paradigm: full state ownership of publicly produced property, including intellectual property; being closed and self-reliant; the mandatory type of development; the economy associated with militarization, and the ideologization of all activities, including the science and technology sector.

After two decades of transformation, the NIS of former Soviet countries suffers from a number of serious imbalances. Specifically, firms are not the central players they should be, and this distorts the balance in the public sector's contribution to innovation performance. Publicly owned branch research institutes and design bureaus are still the central players in the current innovation system. Weak knowledge flows and lack of interaction between technology developers and technology producers/users are a major problem.

At the same time, the USSR NIS model offered some advantages (Dezhina & Saltykov, 2005), in particular: the possibility of concentrating huge intellectual and material resources on tackling large-scale scientific and technological tasks required by the state, very favourable economic and social conditions for the scientific community itself to develop basic research and pilot studies, and the possibility of solving some complex problems with very modest means (thanks to inexpensive intellectual resources).

A modern market-type NIS is based on a fundamentally different economic paradigm, with a corresponding liberal-innovational NIS. In practice, this means: the openness of a national economy and its incorporation in the global economy; legislated private ownership, including that of intellectual products; equality of economic agents, including the state, in economic activities; and legal support of the competitive environment. This keeps producers targeted at consumer needs and stimulates continuous innovation.

The main problem of the current NIS is the shift away from the public research system, and notably the former branch research institutes, as the central players in the innovation system. Instead, this role should be carried out by production-oriented firms, whether public or private, whose innovation and research activities are enabled by much more favourable framework conditions.

Policy Trends for Innovation in Belarus, Kazakhstan and Russia

There is broad awareness and recognition of the importance of innovation for future growth and competitiveness by the authorities of Belarus, Kazakhstan and Russia. As a result, substantial efforts have been made to organize the institutional element of the national innovation systems. There have been also important steps to create essential elements of the innovation infrastructure.

Russia has adopted the Strategy of Innovative Development until 2020. This strategy continues the policies pursued over the last decade to encourage innovation. Overall supervision of the implementation of the strategy is provided by the Commission for Modernization and Technological Development under the President of the Russian Federation. The main department-coordinators are: the Ministry of Economic Development, the Ministry of Education and Science, and the Ministry of Industry and Trade of the Russian Federation.

Belarus has developed a wide range of initiatives to foster innovation, including the State Program for Innovative Development for 2007–2010, which is due to be followed by a new programme for the period 2011–2015. The coordination of the State Program for Innovative Development (SPID) is assigned to the State Committee on Science and Technology (SCST). The SCST, with the support of the Belarusian Institute of Systems Analysis (BelISA), is also tasked with monitoring and reporting to the Council of Ministers on the realization of the programme.

The Ministry of Industry and New Technology (MINT) has become increasingly responsible for innovation issues in Kazakhstan. It was appointed the coordinator of the Strategy of Industrial and Innovative Development of Kazakhstan for 2013–2015, the State Program for Accelerated Industrial Innovative Development of Kazakhstan for 2010–2014 and the MINT functions in the area of innovation include making proposals to the government in the area of innovation and monitoring the enforcement of the legislation on state support for innovation.

A major criticism of Russian S&T policy a decade ago was its inability to set and implement spending priorities. Funds were spread thinly across research-performing institutes which adopted, more or less successfully, preservation strategies. At the same time, the system had little stability. The situation today is markedly different, at least in terms of new funding. The results of the 2006 critical technologies exercise have formed the centrepiece of a federal targeted programme; and the establishment of the state corporation 'Rusnano' has given a strong boost to the area of nanotechnology. The use of foresight techniques, particularly technology road-mapping, is increasingly popular at many different levels and demonstrates the more strategic and future-oriented perspectives being adopted. The increasing use of federal targeted programmes (FTPs) is also a significant development, as they allow for targeted actions that transcend traditional administrative boundaries and their fixed duration provides a certain degree of adaptability.

Table 1. Sectoral structure of production of the Customs Union countries (%), 2010.

	Russia	Kazakhstan	Belarus
Agriculture	3.7	3.7	7.0
Mining	*7.0*	*28.1*	*0.4*
Food	6.4	4.1	7.9
Textiles and clothing	0.5	0.4	2.0
Wood, pulp and paper	1.5	0.6	2.6
Manufacture of coke, refined petroleum products and nuclear fuel	2.5	2.5	10.5
Chemical industry	*3.0*	*1.3*	*8.2*
Manufacture of non-metallic mineral products	1.1	1.3	2.5
Metallurgy	8.8	7.7	2.3
Engineering	*7.1*	*2.8*	*12.8*
Electricity	8.2	3.3	4.2
Construction	5.7	10.5	8.5
Transport and communications	8.0	13.1	10.4
Services	36.6	20.6	20.7

Source: Institute for Economic Forecasting, Russian Academy of Sciences (INP RAS).

Belarus and Kazakhstan have also changed the funding system of R&D. Now it will be implemented in three forms: grants, base and programme funding. The introduction of the grant system will significantly advance the integration of the international scientific community, where such a system prevails. Thus there is a fundamental innovation – grants will be given not only to research organizations and universities, as before, but also to individual scholars or their teams. Base funding is introduced to provide public research organization and university spending on infrastructure, utilities, administrative and staff costs, information provision, etc. A programme-target mechanism remains only to solve the strategically important public objectives enshrined in government programmes and other regulatory documents of a high level.

However, the focus has been largely placed on the administrative (institutional) element of the NIS rather than on the links and interactions between different subsystems (e.g. business, science, education and infrastructure). The prevailing understanding of the notion of innovation in Belarus, Russia and Kazakhstan, which is also embodied in the policy domain, puts the main emphasis on science-based technological innovation. As a result, this narrows the scope and coverage of the policy measures that fall into the domain of 'innovation policy'.

All the above indicate that presently a transitional innovation system functioning in Kazakhstan, Russia and Belarus combines elements of the old and new innovation systems. The old NIS includes the vast majority of scientific and technological organizations in the state sector or quasi-state, state research centres and organizations. The new NIS involves private scientific-technological and service-industry organizations, small innovative businesses, and some non-government, non-profit, scientific, analytical, consulting and other centres. All these NIS agents operate on the organizational and systemic principles of a market economy. Moreover, some of them are in fact components of the global innovation system.

Post-Soviet Integration and Innovation

Integration is becoming more realistic. In 2009–2010 there was a major breakthrough, namely the establishment and operationalization of the Russia-Kazakhstan-Belarus (RuKaBe) Customs Union, and a goal to move forward to the Single Economic Area (SEA) by 2012. Let us reiterate that these three countries form the integration core of the post-Soviet area according to the comprehensive System of Indicators of Eurasian Integration managed by the Eurasian Development Bank (Vinokurov, 2010).

The analysis, shown in Table 1, shows that the structure of the Customs Union' economies is complementary.

The creation of the Customs Union became the first major systemic integration initiative to be implemented. The package of documents was signed at the EurAsEC Inter-State Council in Minsk on 27 November 2009. The common external tariff became operational on 1 January 2010, and the common customs territory became functional on 1 July 2010. At this point, we are witnessing the process of expanding the cooperation and deepening the interaction within the Customs Union. President N. Nazarbayev proposed an economic rationale for the emerging Customs Union: 'We need to open up our market for each other to promote the innovational industrialization of our countries. Such cooperation is mutually beneficial' (Nazarbayev, 2009).

In the system of supranational regulation of the SEA, several new institutions have been established:

- The Supreme Eurasian Economic Council at the level of heads of states or governments, which considers the fundamental issues related to the common

interests of SEA member states and determines the strategy of integration.
- The Eurasian Economic Commission (EEC), an independent agency of the integration of building and economic management of the three countries, was established in February 2012.
- The business community of the three countries supported the idea of integration by signing the Memorandum of the Interaction SEA and the Belarusian-Kazakh-Russian Business Dialogue in 2012.

At present, 70% to 90% of all the engineering products are imported to Customs Union countries and Ukraine from third countries. So, in 2010, Russia imported 92% of all engineering products, Ukraine – 83%, Belarus – 75%, Kazakhstan – 72%. A key reason for the high proportion of third-country imports of machinery to Customs Union countries is due to the engineering and technological development sectors lagging behind in efficiency. Research findings show that an increase in trade integration within the SEA (between Russia, Kazakhstan and Belarus) due to the development of trade relations, cooperation and technology alignment could lead to a combined annual GDP growth of 2.5% by 2030.[1]

The purpose of the SEA is to allow free movement of goods, services, capital and labour in the three countries. In view of the existing structure of Belarus's economy and the direction of foreign economic relations, the integration with economies of the FSU countries is very important for Belarus. In the future, Belarus's exports to SEA countries could reach up to 35% of national GDP.[1]

The Customs Union has expanded its market for goods, allowing the decline in demand in world markets to be offset. However, as practice shows, the real effects on trade through membership of the Customs Union occur due to removing trade barriers on the movement of all the factors of production and the use of mutual benefits of deepening integration rather than as a result of an increase in bilateral trade.

Innovation integration has the following prerequisites:

- elimination via technical regulation of the technical barriers to trade between the countries, with universal technical regulations being applied throughout the SEA;
- establishment of common competition rules and regulations which will provide equal business opportunities, protection from unfair competition and abuse of dominant market positions;
- introduction of restrictions on government' influence on competition, such as the existing regulation of the government support of manufacturing and agriculture by introducing conditions similar to those adopted by the WTO;
- protection of trademarks and copyrights, with the parties agreeing on common principles of protection of intellectual property rights based on a common international framework.

Thus, the formation of a SEA requires research into the possibilities of cooperation in the field of science and technology as well as research into what is common and specific to the process of generating knowledge and what political mechanisms of interaction are possible and necessary in the partner countries.

The Business Sector in Knowledge Generation

Despite the reforms that have been implemented in the countries of the Customs Union for a long time, there has been no measurable progress towards the formation of an innovative economy. The key indicators, by which we can track the changes in scientific and technological potential, are the standard parameters used in similar studies in the international scientific community. They are as follows: the amount and sources of funding for science, the number of scientific organizations and institutions in the country, the state of their material technical basis, the number and qualifications of scientific personnel and the amount of R&D performed in the country. At the same time, the generalizing indicator of the country's level of scientific development is the Intramural Expenses for Research and Development (see Figure 1). The level of gross domestic expenditure on R&D (GERD) as a percentage of GDP remains critically low (0.16% in Kazakhstan, 0.7% in Belarus) and does not tend to increase. In Russia, the GERD in 2010 accounted for 1.16% of GDP, down from more than 2% during the late Soviet period. This recent decline can be explained by a robust growth of GDP, which has tended to outstrip the growth in GERD rather than by decreased spending on R&D. The amount of GERD per capita in Kazakhstan (PPP $22.9) nevertheless remains much lower than in the other countries of the Customs Union (in Russia – PPP $165.4, in Belarus – PPP $105.3). OECD data show that GERD per capita (2007) was PPP $177.7 in the world (in developed countries – PPP $712.8 and in developing countries – PPP $58.3).[2] The level of expenditure in Kazakhstan is insufficient to radically upgrade the quality of research equipment to compensate for years of neglect, even though this is a crucial factor in ensuring excellence in R&D.

The major source of R&D is extramural R&D, i.e. R&D performed in specialized institutes is not enterprise-based. Intramural R&D organizations (business enterprises) accounted for 2.2% of the R&D undertaken in Kazakhstan in 2010.[3] Therefore, in Kazakhstan (as in Belarus and Russia) enterprises are not the major agents of the innovation process. The business sector, to a great

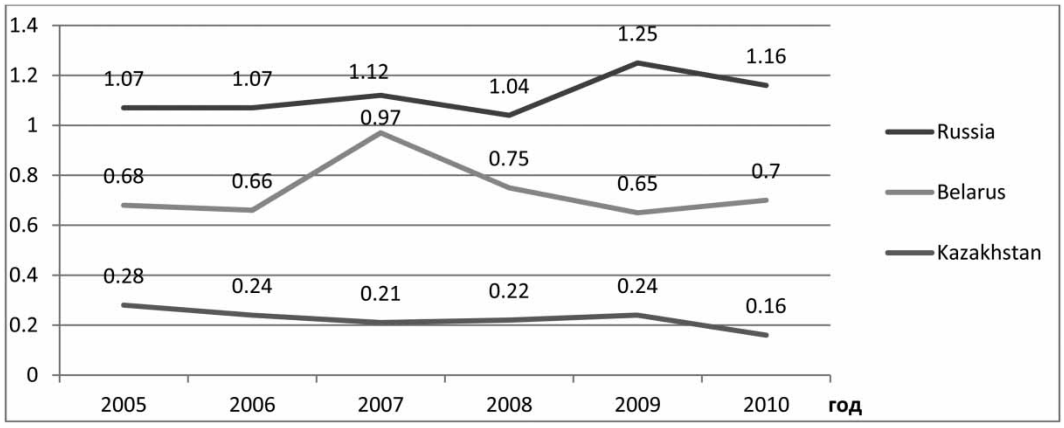

Figure 1. Intramural expenses for research and development
Source: Agency of Statistics of the Republic of Kazakhstan, Belstat, Rosstat.

extent, depends on the R&D system to solve major technological problems, and is in line with ministries or development institutions, such as the National Innovation Fund in Kazakhstan, to provide funding for innovation and modernization.

In 2011, 25.4% of innovation expenditure was spent on R&D in Belarus and 20.5% in 2010 in Russia (Table 2). The corresponding figures for Kazakhstan were half as high. In most advanced countries, internal R&D expenditures account for 40–70% of innovation expenditures.[4]

Activities in support of innovation are much broader than R&D. Firms can acquire innovative products and processes from sources external to the firm, with little or no further work required. Modifications can be made to both purchased products and processes or to technologies previously developed by the firm itself. These innovation activities are particularly common for the innovation process. Many activities aimed at replicating products or processes that are already available, including solutions to circumvent a patent, do not require R&D (Kim & Nelson, 2000).

Innovation surveys ask about the types of innovation-supporting activities carried out by innovating enterprises. The results of the latest surveys of Customs Union countries are shown in Table 3. As in similar surveys carried out in almost all tother countries, the acquisition of machinery and equipment is the number one activity carried out by a half to two-thirds of innovating firms, a figure broadly comparable to the levels reported by EU countries' enterprises in Community Innovation Statistics (2006).

Kazakhstan is different from the other countries of the Customs Union with its lower level of innovative activities (4%) and its low scientific potential of industrial enterprises. Largely this feature is determined by the structure of industrial production. The structure of industry in Kazakhstan is still resource-based. So far, the mining industry has been the basis of industrial production in the country – 61.6% (in 1998–24.3%), manufacturing – only 33.2% (in 1998–56.2%) (Suleymenov, 2010). Economic growth has been driven mainly by oil production, which makes the country particularly vulnerable to fluctuating oil prices. Russia has the same problem, but its scientific capacity is much higher.

Technological innovation activities in enterprises, by their very nature, require a mix of inputs, with R&D being just one of them and often not used at all. This has important implications for a supply-side innovation

Table 2. Innovation expenditures in Kazakhstan, Belarus and Russia (% by category).

Type of innovation expenditure	Kazakhstan (2010)	Belarus (2011)	Russia (2010)
Research and development	10.9	25.4	20.5
Acquisition of machinery and equipment	27.8	65.6	54.3
Acquisition of new technologies	6.7	0.1	1.3
Technological innovation-related personnel training	1.5	0.0	0.2
Technological innovation-related marketing research	0.0	0.3	0.5
Other expenditures	53.1	8.6	23.2
Total	100	100	100

Source: Agency of Statistics of the Republic of Kazakhstan; SCST, 2011; Belstat, 2012. Minsk: Indicators of Innovation Activity. Moscow: Higher School of Economics, 2011.

Table 3. Percentage of innovative industrial enterprises engaged in selected types of innovation-supporting activities.

Type of innovation activity	Kazakhstan (2009)	Belarus (2009)	Russia (2008)
Acquisition of machinery and equipment	51.2	57.8	66.7
Research and development	12.6	66.8	33.2
Acquisition of patent rights and patent licences	1.3	2.4	7.3

Source: Indicators of Innovation Activity. Moscow: Higher School of Economics, 2010; Science, Innovation and Technology in the Republic of Belarus, Minsk, 2010.

policy that seeks to build up the public research base in the hope that it will create a kind of a domino effect on the enterprise sector. While this may be helpful, it should be complemented by other more demand-side measures that address relationships with consumers and even competitors. The technology development process apart from R&D includes such non-R&D activities as: (i) skills for acquiring, using and operating technologies at rising levels of complexity, productivity and quality; and (ii) design, engineering, and associated managerial capabilities to acquire technologies, develop a continuous stream of improvements and generate innovations. Different skills are most relevant at different stages of technological development. However, in 2010 the share of training costs in the total innovation expenditures of Belarus was as little as 0.1%, and spending on marketing research was 0.2%, and Kazakhstan and Russia had 1.5%, 0.04% and 0.2%, 0.5%, respectively (Table 2), therefore much lower than in developed countries.

Innovation policy should recognize that a dense network of interactions and linkages – between enterprises and knowledge sources, on the one hand, and between enterprises and customers, on the other hand – are critical aspects of the technology development process. A key objective of the public policy should be to foster these linkages, interactions and feedback processes. A much broader focus is needed, with the stress on technology creation, including both R&D and design, as well as engineering skills, technology acquisition and technology use (OECD/IDRC, 2010).

The need for structural change was recognized by the government within the framework of the Strategic Development Plan of Kazakhstan until 2020. The State Program of Forced Industrial-Innovative Development for 2010–2014 was approved on 19 March 2010, and the Program of Innovation Development and Support for Technological Modernization in the Republic of Kazakhstan for 2010–2014 was approved on 30 November 2010. To implement the objectives of the State Program, specific programmes were developed: 'Investor 2020', 'Productivity 2020', 'Export 2020', and 'Business road map 2020'. The 'Productivity 2020' programme is aimed, among others, at conducting a technological audit of industrial enterprises and organizations in the priority sectors of the economy regardless of ownership, which will focus on broad support of technological modernization.

In the early 1990s, Belarus openly declared its strategic policy objective to develop an economy based on science and technology. Since then, more than 25 laws and presidential decrees have been passed, some 40 governmental decrees have been issued, and many other legal acts have been put in place to contribute to this stated aim. The whole set of innovation-related legal and regulatory acts put the main emphasis on science-based technological innovation. This type of innovation activity is not only assigned the highest policy priority in Belarus but, it seems to be taken as synonymous to innovation in the broad sense. Compared to the current prevailing understanding of the notion of innovation, this appears as a somewhat narrow interpretation in all the partner countries of the Customs Union.

The System of Public Funding of Knowledge Generation

A cornerstone of the innovation system in the countries of the Customs Union is public funding of R&D. According to statistics, in 2010 the budget funding for R&D expenditure in Kazakhstan amounted to 81%, whereas in Belarus and Russia it was 58% and 56% of GERD, respectively (Table 4). Lack of customer funds reiterates the previously expressed position of the weak connection between science and business. In Kazakhstan, the public R&D system has shifted more towards funding basic and applied research, as these are activities where state funding can be justified. The share of development (engineering design and technological work, prototyping, batch production) at the stage of market development in the form of finished products is half as high as in Belarus (58%) or in Russia (59%). In other transitional economies, such as Belarus, the R&D system has been subject to very strong commercialization pressures or the need to support innovation in the enterprise sector. This has led to changes in the structure of R&D activities towards development and service activities and to the relative decline of basic and applied research activities (16.5% in Belarus in 2010). This may seem appropriate in the short-term period, but in the long-term it may undermine research *per se* (Radosevic, 2011). The continuing large share of the state budget spent on R&D is a necessity

Table 4. Distribution of R&D expenditures by source of funds in 2010 (%).

Country	Budgetary sources	Extra-budgetary funds	Own funds of research institutes	Customer funds	Foreign investment
Kazakhstan	81	1	17	–	1
Belarus	58	1	12	15	13
Russia	56	2	9	28	4

Source: Science of Kazakhstan figures for 2000–2010. Almaty, 2011; *Science and Innovation Activity in the Republic of Belarus*, Minsk, 2011.

Table 5. Distribution of intramural expenditures on R&D by sectors of performance in 2010 (%).

	Government	Business	Higher education	Non-profit organization sector
Belarus	26.7	60.7	12.6	–
Kazakhstan	37.0	36.6	17.7	9.2
Russia	30.9	60.6	8.3	0.2

Source: Agency of Statistics of the Republic of Kazakhstan, Belstat, Rosstat.

to a certain extent, reflecting the weakness of all the other sources of funding.

The business sector provides 37% of GERD in Kazakhstan, a share that is even lower than in Belarus and Russia (Table 5). Although it is by far the largest funder of R&D, the government sector is not the main performer of R&D. The business sector carried out 60% of Russia's and Belarus's R&D in 2010. The government sector performed 30% of Russia's GERD, and around 8% of higher education institutions' GERD. In the countries of the EU and the OECD, a third of expenditure on R&D is performed in the higher education sector.

This unusual, almost inverse, relationship between R&D funding and performance is mostly accounted for by the large share of government funding spent in the business sector. The explanation lies in the ownership of R&D institutes and assets. Public ownership extends to almost three quarters of R&D institutes. This highly unusual arrangement – at least by OECD country standards – is a legacy of the Soviet science system and its relation to industrial production. During that period, R&D was organizationally segmented according to fundamental, applied and developmental research and was largely separated from production.

Kazakhstan, in contrast to the other countries of the Customs Union, has a high proportion of R&D expenditure by non-profit organizations. There are a number of public organizations involved in the financing of R&D and other innovation expenditures, in accordance with government priorities.

A well-developed financial system, which reduces the cost of external financing, is an important catalyst of innovation activities. The financial system of Customs Union countries, despite rapid expansion in recent years, is still relatively underdeveloped, with considerable scope for financial deepening to further long-term growth. A large majority of firms rely on retained earnings to finance investment and innovation, and enterprise surveys almost always report the shortage of own funds and the cost of borrowing as the principal barriers to investment and innovation (Aghion et al., 2010; Belstat, 2012). This emphasizes the importance of strengthening the banking sector and non-banking financial institutions. In Kazakhstan and Belarus, the development of risk capital markets is still impeded by the overall underdevelopment of financial markets. A lack of venture capital, which is an important resource for innovative businesses, especially at their early stages, can hinder the rejuvenation of the economy through the activities of dynamic entrepreneurs and innovative start-ups.

Some Features of Creating a Knowledge Economy in the Countries of the Customs Union

Knowledge has been increasingly recognized in the countries of the Customs Union as a critical determinant of economic growth, good governance and improvements in the quality of life, even though there are contestations and contradictions within the paradigm of development and the field of economics on the whole.

About 61% of researchers in Russia and 62% in Belarus worked in the engineering field in 2010, showing a slight decline since 1995. Natural sciences account for about one-quarter of researchers in Russia and 19% in Belarus, showing a slight increase over the last 15 years. The dominance of engineering reflects the specialization of the Soviet legacy of a research system geared to the needs of the military-industrial complex. Scientific publication data by fields of subjects confirm a strong bias towards the physical sciences (physics, chemistry and earth sciences) and mathematics (Table 6) and a relatively weak presence in economics and social sciences.

Over the period of 1990–2009, science staff in the countries of the Customs Union fell three times. At

Table 6. Publications by subject field in Belarus, Kazakhstan and Russia in 2010 (%).

Subject area	Belarus	Kazakhstan	Russia
Biochemistry, Genetics, Molecular Biology	6.07	4.91	7.81
Chemistry	5.70	15.72	13.4
Engineering	13.71	4.91	8.39
Materials Science	11.47	12.57	9.28
Mathematics	8.80	9.43	7.99
Physics and Astronomy	21.3	16.11	22.47
Share of these subject areas in the total amount of publications	67.05	63.65	69.34

Source: Own calculation by SCImago (2007). SJR – SCImago Journal & Country Rank. Retrieved 9 April 2012 from http://www.scimagojr.com.

present, Belarus and Russia have stopped reducing R&D staff. Currently, the number of employees in the scientific sphere tends to decrease in Kazakhstan. For example, in 2008 the number of employees engaged in research and development relative to the economically active population of Kazakhstan amounted to 0.19% against 0.21% in 2000. Currently, 26.1 researchers are in place per 10,000 of the economically active population of Kazakhstan, 42.9 in Belarus and 49.2 in Russia. Most of the employees engaged in R&D are still concentrated in research institutions and universities.

The research activity of local scientists in international publications has increased 3-fold in comparison with 1996 in Kazakhstan and 2-fold in Belarus (Figure 2). The main partner countries of Kazakhstan in the sphere of science are Russia, the USA, Germany, Japan and the United Kingdom (50% of joint publications). Scientific works in various fields of knowledge, most of which (56%) belong to chemistry and physics, are found to have been published in international journals. Most cited scientific works are those in physics, biology, space and ecology. The most cited articles are published in the field of high-energy physics by international teams of collaborators. An international co-authorship in the Kazakh publications is more prevalent than in Belarus and Russia, which testifies to an openness of the scientific community of Kazakhstan to an external world.

At the same time, Kazakhstan (2.1) essentially lags behind Russia (28.5) and Belarus (17.3) by the amount of publications per 10,000 of population, according to 'Scopus'. Russia and Belarus are characterized by a high patent activity of national applicants (Figure 3).

However, they significantly lag behind even developing countries by the number of international applications in the Patent Cooperation Treaty (PCT) system (Figure 4). This suggests a weak international competitiveness of scientific and technical products of the Customs Union countries.

Knowledge is the key input to innovation. It can come from a formal process, such as R&D, or it can be local knowledge which may or may not work. Innovation is

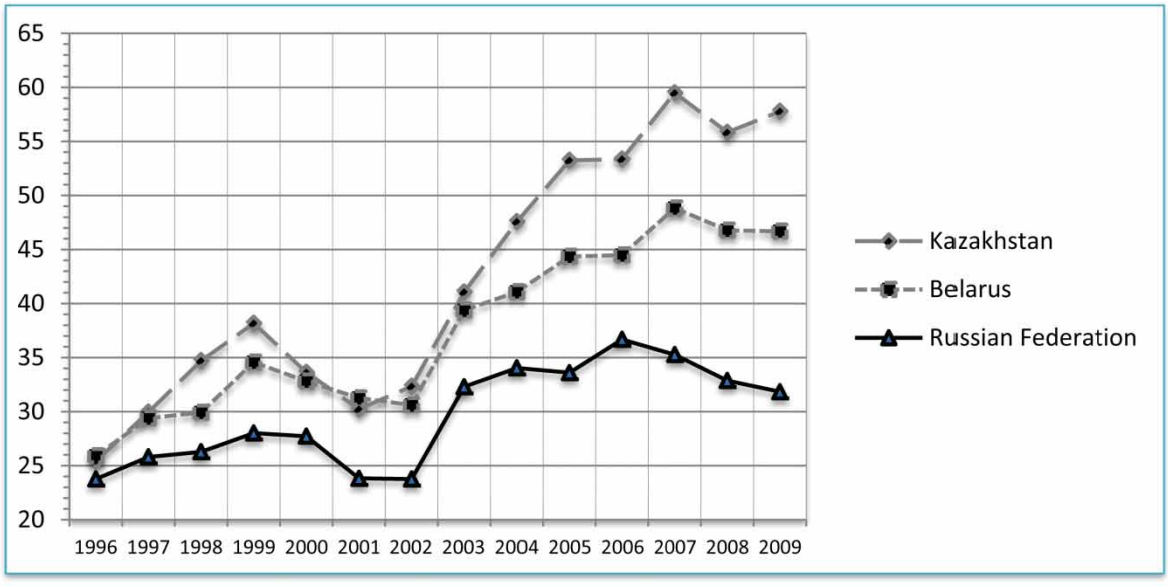

Figure 2. International cooperation in publications (percentage of documents with authorship from more than one country)
Source: Author's calculation from SCImago Journal & Country Rank http://www.scimagojr.com.

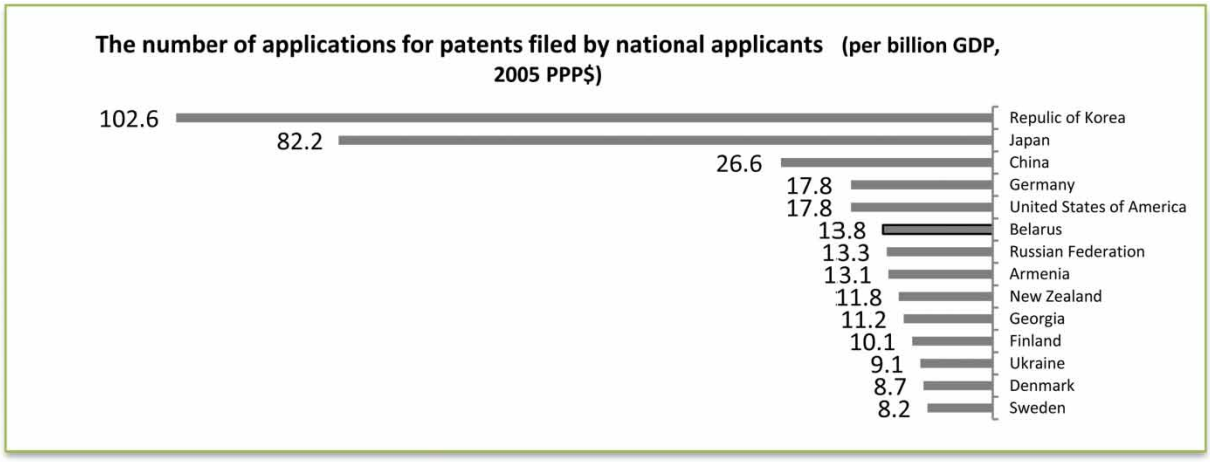

Figure 3. Intensity of patent activity in 2008.
Source: World Intellectual Property Report, 2010, WIPO Statistics Database.

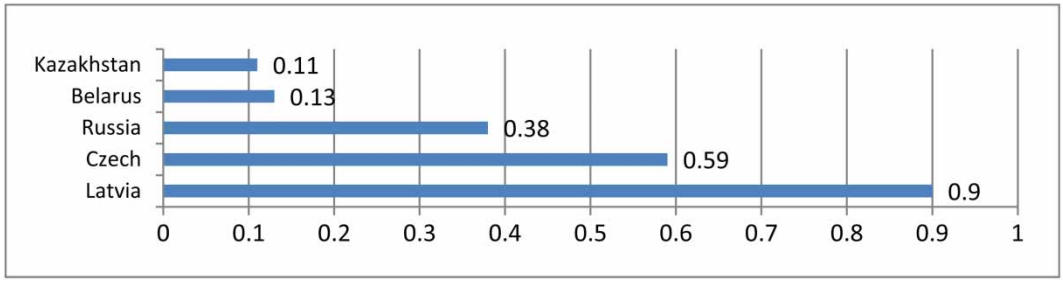

Figure 4. The number of international patent applications filed by residents through the Patent Cooperation Treaty (PCT) (per billion GDP, 2005 PPP$), 2010.
Source: World Intellectual Property Organization, WIPO Statistics Database; World Bank and OECD GDP estimates; World Bank World Development Indicators database; author's calculation on Belarus.

driven by entrepreneurs who take risks and change things. It is part of a longer process and a bigger picture involving education and culture and it depends on a stable economic and social environment with a sound governance mechanism (Gault & Zhang, 2010).

The Knowledge for Development (K4D) Program at the World Bank Institute works to raise awareness among national policy makers of the powerful growth effects of knowledge, encourage economic actors, combine global and local knowledge, accentuate comparative advantage, and help leaders build institutions that foster rather than discourage individuals' attempts to exploit the competitive opportunities available to knowledge-powered enterprises. The Knowledge Assessment Methodology offers a holistic view of the wide spectrum of factors relevant to the knowledge economy. It also provides a basic assessment of countries' and regions' readiness for the knowledge economy. Knowledge Assessment Methodology (KAM)[5] as the first step in building a national knowledge economy is the understanding of a country's strengths and weaknesses, as well as those of actual and potential competitors. The K4D Program operates within a four-pillared framework that expresses the prerequisites for the effective use of knowledge for economic growth. The Knowledge Economy Index (KEI) is given for the Customs Union countries (Table 7).

Kazakhstan has the weakest potential among the countries of the Customs Union in the innovative component of the Knowledge Economy Index (KEI). However, it is the strongest for shaping the institutional environment, which creates prerequisites for successful development. Economic Incentive and Institutional Regime is defined on the basis of quality (expert) indicators of estimation: Regulatory Quality, Tariff & Nontariff Barriers and Rule of Law. Over the previous years (since 1995), all the countries of the Customs Union declined the Knowledge Economy Index, and for all of them the Economic Incentive and Institutional Regime is the most vulnerable component of knowledge economy formation in comparison with the other Europe and Central Asia (ECA) countries.

A modern and adequate information infrastructure will facilitate effective communication, dissemination, and

Table 7. Countries of the Customs Union in Readiness to Knowledge Economy, 2012.

Country ranking (out of 145 countries)	KEI	Economic incentive regime	Innovation	Education	ICT
Kazakhstan (73)	5.04	3.96	3.97	6.91	5.32
Belarus (59)	5.59	2.5	5.7	7.37	6.79
Russia (55)	5.78	2.23	6.93	6.79	7.16
Europe and Central Asia	7.47	6.95	8.28	7.13	7.5

Source: Knowledge for Development (K4D) Program of the World Bank Institute (www.worldbank.org/kam).

processing of information and knowledge. Information and communication technologies (ICTs) can considerably reduce transaction costs by providing access to information. ICT-related policies cover telecommunications regulation as well as the investments needed to build and exploit ICTs throughout the economy and society through various 'e-applications' – e-government, e-business, e-learning, and so on. A recent report on ICTs and economic growth in transitional economies strongly indicates that ICTs are a major contributor to productivity, profitability and growth at the level of the firm (World Bank, 2005).

The percentage of IT expenditures in relation to GDP in 2009 was 0.74% in Kazakhstan, 1% in Belarus and only 2.9% in Russia, which is close to the average European level (EU27–2.7).

In the countries of the Customs Union, innovation policy should draw attention to the issue of 'innovation complementarities'. It should not aim just at increasing R&D, but to do so in a way that encourages local innovation and local spillovers rather than global R&D and leakages, which develop the absorptive capacity and ultimately affect the productivity of a wide range of sectors in the local economy.

The World Bank puts two fundamental determinants of technology diffusion in developing countries at the centre of its framework of analysis (World Bank, 2008). The first involves three main channels by which developing countries are exposed to external technologies: trade, foreign direct investment (and licensing which can substitute for FDI) and highly skilled diaspora. The latter acts as a useful starting point for the design of policies for more effective technology transfer and knowledge spillovers. The second is the country's absorptive capacity or technological adaptive capacity. This can be increased by policy interventions which lead to improvements in governance, business climate, human capital (increase in basic technology literacy), technological capacities of firms and access to loans on capital markets. These two determinants are clearly related. They create mutual externalities and thus form a dynamic system with feedback (Foray, 2010).

The issue of diversifying FDI sources remains a priority for many economies of the Central Asia region. In Kazakhstan, for example, 70% of all FDI inflows to the country in 2009 went to the energy extraction sectors and related geological services – approximately twice the ratio level of the mid-1990s. The share of the manufacturing industry in FDI was only 7.84% in 2009. Yet, the country has other high-potential sectors that could be developed to increase its wider competitiveness.

The countries of the Customs Union have only limited learning through FDI and other mechanisms, such as direct learning, by the labour force working in foreign firms; learning by domestic suppliers and buyers from interactions with foreign firms; and learning through imitation, observation, demonstration effects and competitive pressures. Subcontracting represents an alternative channel of access to technology that could play an even greater role than FDI.

Technology balance of payments (TBP) may indicate the degree of openness of the country's innovation system. In 2009, royalty and licence fees payments plus royalty and licence fee receipts (per popular) were 8.5 USD in Belarus, 4.05 USD in Kazakhstan and 32.43 USD in Russia. Kazakhstan, just as Russia and Belarus, is a recipient of the process of scientific and technological knowledge exchange (Table 8). The payments for the

Table 8. Exchange of scientific and technological knowledge – comparison of the Customs Union countries (million USD).

	2006		2007		2008		2009	
Countries	Royalty received	Royalty payments	Royalty received	Royalty payments	Royalty received	Royalty payments	Royalty received	Royalty payments
Kazakhstan	–	48.4	–	67.9	–	86.7	–	64.4
Belarus	5.9	50.5	3.1	52.5	6.4	79.0	9.3	72.8
Russia	299.3	2002.1	396.4	2806.1	453.4	5945.4	493.7	4106.9

Source: Data from worldbank.org/indicator.

Table 9. Expenditure on education as a percentage of GDP and expenditure per student (2009).

Countries	Total public expenditure on education as % GDP	Total expenditure per student (Tertiary-ISCED 5–6)	
		as % of GDP per capita	in US dollars PPP
Kazakhstan	2.8	7.9	865
Belarus	4.5	15.0	1957
Russia	4.1	14.2	2889

Source: Global Education Digest, 2011. Comparing Education Statistics across the World. UNESCO Institute for Statistics, pp. 226–228.

scientific-technological exchange in Belarus over the period shown in Table 8 have risen 1.5-fold, and in Russia – two-fold, but they still remain insignificant.

Effective absorption depends on many interacting factors, but it generally requires a broad base of skills and a critical mass of technical expertise. This focus on human resources is pivotal for the assimilation of foreign innovations and has driven innovation strategies in developing countries, based on the establishment of centres of excellence to enhance the scientific capacity of developing countries and initiatives promoting technical training. However, assimilation not only requires sufficient technical skills but also implies deliberate and explicit investments and efforts in the context of domestic firms, such as on-the-job learning and knowledge-sharing. The process and efforts leading to the development of 'absorptive competencies' within firms are crucial.

However, a gap remains between policy objectives and the instruments of integration into global production and technology networks. The integration and coordination of R&D and innovation policy with FDI and subcontracting policy could face numerous challenges in terms of the administrative capacity for implementing such policies, as well as in terms of the differing objectives that would need to be reconciled in attempting to coordinate these policies.

Human Resources, Education and Skills

Innovation requires people who are able to generate and apply knowledge and ideas in the workplace and in society at large. Though many skills are needed for innovation, individuals, firms and industries require different skill mixes at different times. These skills can raise economies' absorptive capacities and their ability to perform incremental innovation by enabling people to better understand how ideas or technologies can be improved or applied to other areas. More skilled users and consumers of products and services can also contribute to the adaptation of existing offerings by providing the supplier with ideas for improvement (OECD, 2011). General skills thus become more useful than specialization. As a result, and because skills and knowledge can become quickly outdated, a person's capacity and potential are valued over his or her academic specialization and qualifications (World Bank, 2010).

Education is recognized as one of the top priorities of a long-term strategy in Belarus, Kazakhstan and Russia. The overall goal of education reforms is an adaptation of the education system to the new socio-economic environment. The objective of adaptation is improvement in education competitiveness and human capital development by providing access to quality education for sustainable economic growth. Urgent action to upgrade the quantity and improve the quality of tertiary education to a level adequate for the knowledge economy has therefore become a top priority for national governments.

Formal education and training are an important source of skills. They require significant financial expenses. Table 9 shows that now Kazakhstan spends less on education than Russia and Belarus in terms of the proportion of the GDP, and its expenditure per student is less than half in comparison to the other countries. At this point in time, the funding mechanisms for state support of educational services are insufficient.

As pointed out by Aghion (2010), who investigated expenditure and enrolment rates across different groups of transition economies as well as OECD over the period of 1999–2006, the proportion of expenditure on tertiary education has decreased over the past decade in all the transition regions, but has remained virtually constant for the OECD countries.

Transition countries spend less per student than the OECD average, and they also have lower enrolment rates. Expenditures per student in primary and secondary education (percentage of per capita GDP) have mostly remained the same or increased over the same period, although CIS resource-rich countries (Kazakhstan, Azerbaijan, Turkmenistan, Uzbekistan and Russia) reduced spending on each student between 2003 and 2006. There are also large differences across the transition subregions: resource-rich countries allocate the least expenditure to tertiary and primary education, and they also have much lower enrolment rates at tertiary level than non-resource-rich countries. This implies that countries with sharply rising resource flows have as yet failed to use those new resources to raise funding for education and, therefore, risk missing an opportunity to address shortcomings in their educational systems.

One indicator that is comparable over a large set of transition and non-transition countries is the PISA (Programme

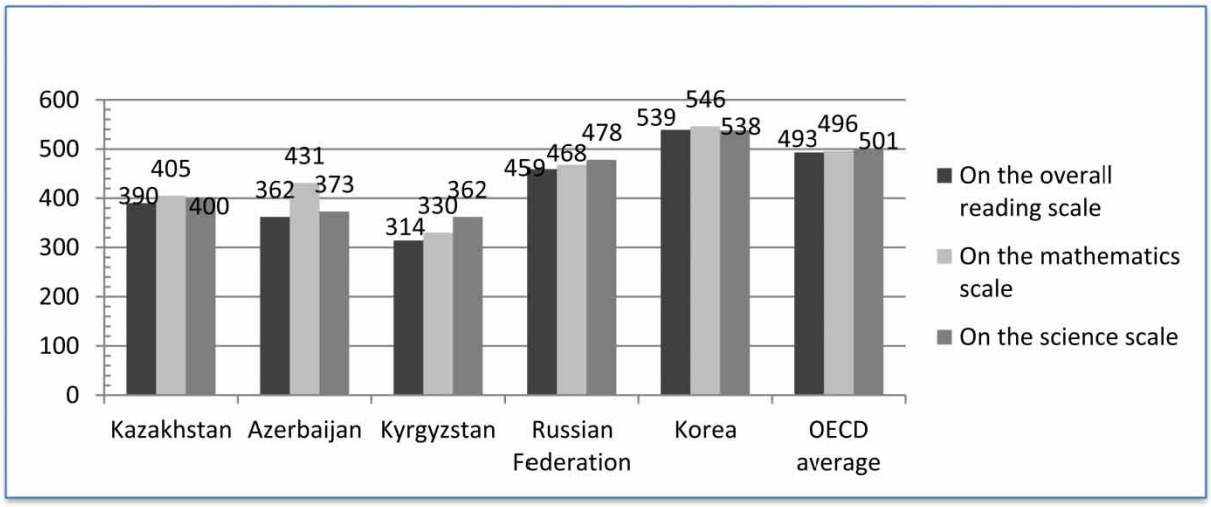

Figure 5. What students know and can do: student performance in reading, mathematics and science
Source: OECD, PISA 2009 database.

Table 10. International exchange of students in the Customs Union countries.

	Students from abroad studying in a given country		Students from a given country studying abroad	
Countries	Persons	Inbound mobility rate,(%)	Persons	Outbound mobility rate (%)
Kazakhstan	10 458	1.6	30 077	3.9
Belarus	5 909	1	14 804	1.8
Russia	60 288	0.6	43980	0.5

Source: Global Education Digest, 2010

for International Student Assessment) test score which measures reading, science and mathematics achievement in a standardized fashion. The latest round of PISA carried out in 2009 shows Kazakhstan's performance to be below that of most OECD countries and Russia (Figure 5).Belarus didn't take part in the PISA test. Just 0.4% of students in Kazakhstan achieved proficiency levels of 5 or 6 in reading scale and 73.7% level 2 and below (whereas OECD had 43%). PISA measures the capacity of students to identify scientific issues, explain phenomena scientifically and use scientific evidence as they encounter, interpret, solve and make decisions in life situations involving science and technology. This is important, since if students learn merely to memorize and reproduce scientific knowledge and skills, they risk being prepared mainly for jobs that are disappearing from labour markets in many countries.

The State Program of Development of Education of the Republic of Kazakhstan for 2011–2020 envisages the raising of the PISA test to 50–55 by 2015 and 40–45 by 2020. The number of universities in Kazakhstan in the ranking of the world's best universities will reach two, with a prestigious world-class university – the Nazarbayev University – being in the process of formation. These ambitious goals should be supported by increasing the financing of education. The results of active international cooperation in the field of education in Kazakhstan are obvious. Kazakhstan considerably exceeds the level of university exchange in Russia and Belarus (Table 10).

Steps are being taken to create conditions to increase the attractiveness of higher education for international students. In the institutions of Kazakhstan, more than 10,000 foreign nationals are currently studying, which is more than in Belarus (8705 foreign nationals in 2010–2011).

The rapid structural changes affecting the economy over the last decade have meant equally rapid changes in the structure of labour demand. This has resulted in qualification mismatches that need to be corrected through retraining, mobility and life-long learning. There is a need to ensure the balanced development of the innovation system and, consequently, balanced support to all the components of the education system that underpin it in countries of the Customs Union.

Conclusion

At the present stage of development of the countries of the Customs Union (Belarus, Kazakhstan and Russia), the task

is set to create a common economic area and to establish a Single Economic Area. There is a broad awareness and recognition by the authorities of the importance of innovation for the future growth and competitiveness of Belarus, Kazakhstan and Russia. In essence, there is a question of harmonizing all the conditions for economic activities in the countries, which is caused by the different economic interests of the states determined, primarily, by differences in the structures of their economies. Despite the fact that the countries differ in sizes of economies and levels of development, they have more in common than differences in the knowledge generation.

An objective basis for the integration of the SEA countries' national innovation systems (NIS) includes the following:

- member states had the subsystems for research and development in the past, as well as production based on division of labour and complementary specialization;
- a common system of institutions that regulate interpersonal interaction as well as the lack of language barriers;
- accumulated professional and academic contacts, particularly among the leading scientists, heads of academic schools, networks and a proven scheme of international cooperation.

The following structural problems and imbalances between member states can hinder the SEA cooperation in innovation development:

- the economic dominance of Russia in the SEA: more than 85% of the territory and population, almost 90% of total GDP and 80% of the total foreign trade turnover;
- an extreme imbalance of trade and economic cooperation within the SEA: 99% of intra-regional trade and investment is formed with the participation of Russia, while Belarus and Kazakhstan have very weak interactions between each other;
- a less developed structure of mutual trade within the SEA consists of two thirds of primary sector trade (fuel and raw materials and metals) in comparison with the other countries' trade agreements, whereas at least two thirds of the bilateral trade occurs in the manufacturing sector (in the developed countries).

In Russia, Belarus and Kazakhstan, the R&D expenditures of the business enterprise sector are largely funded by government, not – as is the practice in high-performing economies – by the business sector itself. This highlights the continuing dominance of the mostly publicly owned former sectoral institutes and design bureaus in performing business R&D. R&D carried out in higher education has several benefits, the most prominent being the close connection to training and the knowledge diffusion to other parts of society and the economy that the mobility of graduates brings. However, the Customs Union has a relatively weak HEI research system. The trend which causes concern is the reduction of expenditure on education, which affects the quality of education.

Despite the political goals of building a knowledge-based economy, the countries have not increased the research intensity of GDP in recent years. R&D and technology policies should recognize that a dense network of interactions and linkages (between enterprises and knowledge sources, on the one hand, and between enterprises and customers, on the other hand) are critical aspects of the technology development process.

Given these considerations, the governments of the countries should adopt a more nuanced approach to evaluation, with less reliance on quantitative indicators and greater appreciation of evaluation as a tool for learning as much as a tool for accountability.

Recommendations

The quality of framework conditions is essential for achieving strong innovation performance. The framework conditions include macroeconomic stability, many aspects of the regulatory regime and the tax system, competitive markets, openness to international trade and foreign direct investment, as well as an intellectual property rights regime that fulfils its function to provide incentives for innovators while not unduly impeding the diffusion of ideas. Future development of technical cooperation in promising areas requires political decisions to revise the national laws.

The countries' politicians, being aware of the integration problems, need to form large joint projects which will become the first step on the way to establishing Belarusian-Russian transnational corporations (TNCs). The format of integration via TNCs will enable, on the one hand, fruitless competition to be avoided within the framework of the SEA, and, on the other hand, an increase in competitiveness in the foreign global market. In its turn, the competitiveness of the integration association of Belarus, Russia and Kazakhstan is determined, to a great extent, by the technological level of manufacture.

The countries need to work towards the creation of a supranational system of innovation on a strategic basis. The solution to this problem involves searching for common interests and harmonizing national legislation on this basis. The following practical steps could be taken to start the process of establishing the supranational innovation system:

(i) Creation of a network resource – the Internet portal 'Science of the Single Economic Area' – built on the basis of the network resources of the Academy of Sciences, the formation of common databases available to scientists, including regulations in the innovation sphere, research organizations, participants of the innovation infrastructure, innovative companies, implemented research programmes, and the results of R&D;

(ii) Unification of legislative acts and a system of research management, including a typology of programmes and projects as well as procedures for their establishment, assessment, implementation and acceptance of results, development of legal conditions for possible defence of dissertations of scholar non-residents, and mutual recognition of diplomas;

(iii) Drawing up common plans for sabbaticals of scholars, co-authored publications, research and organizational activities;

(iv) Exchange of graduate and doctoral students within research centres with access to theses in accordance with nostrification/validation procedures established by the Supreme Certification Commissions of all countries involved;

(v) Innovation and R&D policies that place public institutions at the centre of the technology development process should gradually be replaced with policies that place industrial firms at the centre of this process.

All these steps can be implemented using the available potential of the partner countries. It is advisable to use the experience of the EU countries in creating a European Research Area.

Notes

1. www.eabr.org/general/upload/reports/Ukraina_doklad_rus.pdf
2. Science Report 2010, UNESCO. *The Current Status of Science around the World.* Sources: for GERD: UNESCO Institute for Statistics estimations, June 2010; for GDP and PPP conversion factor: World Bank, World Development Indicators, May 2010, and UNESCO Institute for Statistics estimations; for population: United Nations Department of Economic and Social Affairs (2009) World Population Prospects: 2008 Revision, and UNESCO Institute for Statistics Estimations.
3. Science of Kazakhstan figures for 2000–2010. Almaty, 2011, p. 11.
4. Eurostat (2008), Science, Technology and Innovation in Europe.
5. Knowledge for Development (K4D) Program, The World Bank Institute (www.worldbank.org/kam).

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