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INNOVATION ENVIRONMENTS OF OPPOSITE NATURES: COMMERCIALISATION OF INNOVATIONS THROUGH FINNISH-RUSSIAN COOPERATION

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Title

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Abstract

Many countries in the modern world seek economic growth through innovation development. The Russian Federation has recently announced its aim to become an innovational economy where growth is gained through technologic development. However, Russia has been recently ranked quite low in the indices measuring innovation capabilities, while its neighbouring country Finland has ranked well in similar indicators. This difference has caused some Russian innovators to migrate from Russia to Finland to develop their innovations in a more supportive economy.

The goals of this study were to determine the factors affecting Finnish and Russian innovation commercialisation, to find out the reasons for Russian patent holders' migration to Finland, and consequently to reveal the push and pull factors affecting Russian innovators' movement between Finland and Russia. To conclude all the factors, a qualitative research approach was used in the study and the material was collected by interviewing two Russian patent holders who have established business based on their patents in Finland.

The study discovered significant differences in the innovation environments, and that the reasons behind the patent holders' migration to Finland were interrelated to them. The dominant reasons were concluded to be innovation funding, legislative environment and technological level of the economies. The reasons behind migration were clear, yet migration due to these has remained rather low, partly because of bureaucratic, cultural and cost level issues in Finland. Tackling these issues in Finland could result in more commercialised innovations, technological advancement and wealth generation through Finnish-Russian collaboration.

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Tekijä

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Nimeke

Vastakkaisluontoiset innovaatioympäristöt: Innovaatioiden kaupallistaminen suomalais-venäläisen yhteistyön tuloksena

Tiivistelmä

Useat valtiot pyrkivät taloudelliseen kasvuun innovaatiokehityksen kautta. Esimerkiksi Venäjä on vastikään ilmoittanut pyrkimyksistään tulla innovaatiotaloudeksi, jossa kasvua luodaan teknologisen kehityksen avulla. Venäjä on kuitenkin sijoittunut verrattain alhaisille sijoille innovaatiopotentiaalia mittaavissa indekseissä, kun taas naapurimaa Suomi on sijoittunut vastaavilla mittareilla korkealle. Tämä eroavaisuus on aiheuttanut joidenkin venäläisten keksijöiden muuttamisen Suomeen, jossa innovaatiotoimintaa tuetaan voimakkaammin kuin Venäjällä.

Tämän opinnäytetyön tavoitteena oli kuvata tekijöitä, jotka vaikuttavat innovaatioiden kaupallistamiseen Suomessa ja Venäjällä. Tavoitteena oli selvittää venäläisten patentinhaltijoiden syitä maastamuuttoon sekä määrittää työntäviä ja vetäviä tekijöitä, jotka vaikuttavat venäläisten keksijöiden liikkumiseen Suomen ja Venäjän välillä. Opinnäytetyössä käytettiin kvalitatiivista tutkimusmenetelmää ja aineisto kerättiin haastattelemalla kahta venäläistä patentinhaltijaa, jotka ovat perustaneet liiketoimintaa patenttiensa pohjalta Suomeen.

Opinnäytetyössä löydettiin merkittäviä eroavaisuuksia innovaatioympäristöjen välillä, jotka vaikuttivat patentinhaltijoiden syihin muuttaa Suomeen. Voimakkaimmiksi syiksi ja eroavaisuuksiksi määriteltiin innovaatiorahoitus, lainsäädännöllinen ympäristö ja teknologinen taso. Vaikka syyt maasta muuttoon olivat selkeät, moni Venäläinen patentinhaltija ei ole muuttanut Suomeen. Asiaan voi vaikuttaa Suomen byrokratia, kulttuuri ja hintataso. Näiden kysymysten ratkaiseminen voisi johtaa suurempaan määrään kaupallistettuja innovaatiota, teknologiseen kehitykseen ja varallisuuden tuottamiseen suomalais-venäläisen yhteistyön kautta.

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Asiasanat
innovaatio, ympäristö, teknologia, kehitys, Suomi, Venäjä, yhteistyö

CONTENTS

1 INTRODUCTION

1.1 Study background

In the Soviet Union the urge to match the capacity of research and development (R&D) capacities to those of Western nations was predominant. The nation boasted an extreme number of scientists and was able to compete with the United States and the rest of the West by many indicators. However in the 1990s, after the collapse of the Soviet Union, the R&D sector suffered from the lack of functioning markets and the fact that privatisation of the economy could not support the R&D sector enough. The share of R&D in the GDP fell hard in the 1990s and started lagging behind the Western figures. (Luukkanen 2010, 2.)

More recently the former President of the Russian Federation, the current Prime Minister, Dmitri Medvedev, has noted this anomaly and has urged Russian organisations, both governmental and private, to spend more on R&D and to focus on the development and creation of innovations in order to change the economic structure of the country and to reduce the dependence of raw material sales in the economy. (Medvedev 2009a.)

> **"We are absolutely certain that without modernization our economy has no future, even with all the tremendous natural riches it may rely on. These riches have ensured well-being for our ancestors and for ourselves, but we cannot live on our natural resources forever, no matter how vast they are." (Medvedev 2009b.)**

The Russian innovation environment and its possible problems caught my interest through my recent work placement in a Finnish-Russian consultancy. Russian customers of the consultancy were either Russian scientists or entrepreneurs who had developed and patented innovations in Russia but faced trouble in the large scale commercialization of their innovations. The trouble caused the patent holders to seek an alternative channel of commercialization and further development of their inventions, therefore the patent holders sought to develop and commercialise their innovations in Finland. I worked with the patent holders in the development and establishment of their businesses and companies in Finland

for a few years, and decided to conduct my thesis on the topic. Finnish-Russian cooperation in the commercialisation of patents and innovations is a promising model of business and has great potential in becoming a larger phenomenon in the future.

1.2 Aim of the study

The aim of this project is to gather knowledge of the differences in the aspects of business environments related to innovation development in Finland and Russia. There are naturally hundreds of aspects that affect the innovation environment, but due to the nature of a bachelor's thesis only some of the most general aspects are taken into consideration in the thesis.

The thesis aims to understand the main factors of either success or failure in the economies supporting innovation activities and thus aims to reason the upcoming trend of Russian patent holders' migration to Finland in order to commercialize their innovations.

The research approach is to gather knowledge from existing studies of the innovation environments in the countries in question and to reflect and compare the Russian patent holders' experiences of operating in both countries on the previously studied issues. Based on the interviews with the Russian patent holders, the objectives are also to highlight the shortcomings in the Russian environment and the successes in the Finnish counterpart and, consequently, to generate a set of factors that push innovators and patent holders away from Russia and a set of factors which pull them towards Finland.

The secondary study objectives are more personal. I am aiming to work in the field of Russian business in the future; hence the thesis is meant to showcase my interest in the Russian business environment and my current expertise and knowledge of it.

1.3 Outline of the study

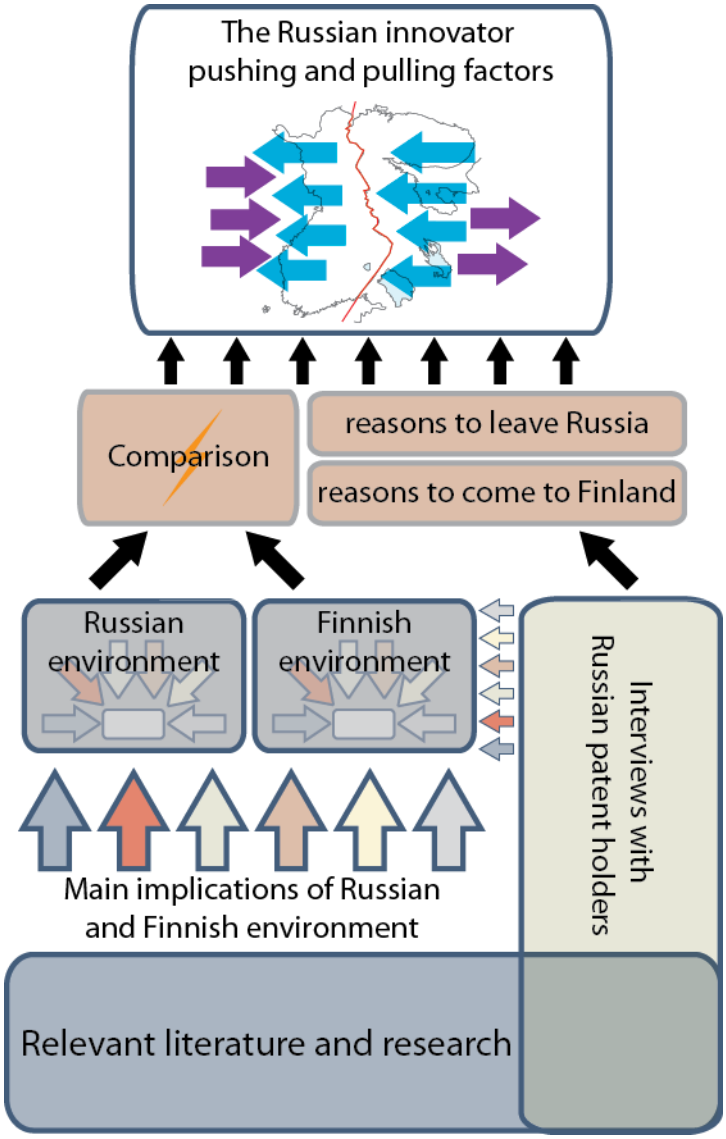

Figure 1. Outline of the study.

Figure 1 illustrates the outline of this study. The study revolves around an overview of relevant literature in the field of innovation development and research in either a Finnish or Russian environment. The main implications of either success or failure in the neighbouring countries' environments from previous research work are separated into categories according to a model of macro environment analysis to create a general view of the innovation environments.

The main implications for the macro environments from the literature are confirmed and completed with information retrieved by interviews with Russian patent holders who have entered Finland to develop their inventions further. The interviews conducted for this study also aimed to find out the main reasons for the patent holders' movement out of Russia, and the main reasons for their coming to Finland.

The so formed macro environments and their factors are then compared to each other. As the main differences in the macro environments are found, the information is combined with the reasons stated by the interviewees, and thus, the sets of factors that are either pushing Russian innovators out of Russia and pulling them towards Finland are created.

2 INNOVATION ENVIRONMENT

2.1 Macro environment for innovation companies

Defining an innovation environment is an ambiguous task as there are naturally various topics and issues that affect the environment and innovators in it. Innovation environment could be defined as an external macro environment influencing organisations' decision making process, which is defined by the political, economic, social, technologic and environmental factors affecting the functioning of operators inside the environment.

The five traditional factors in the macro environment affect all companies and actors in the environment regardless of their industry or level of development, and thus can be used also in the evaluation of an innovation environment. Some researchers at the VTT Technical Research Centre of Finland have used this model in their survey and analysis of the Finnish innovation environment by adding in a separate R&D factor (Alasaarela, Loikkanen, Oksanen, Rilla & Saarinen 2006), as is shown in Figure 2.

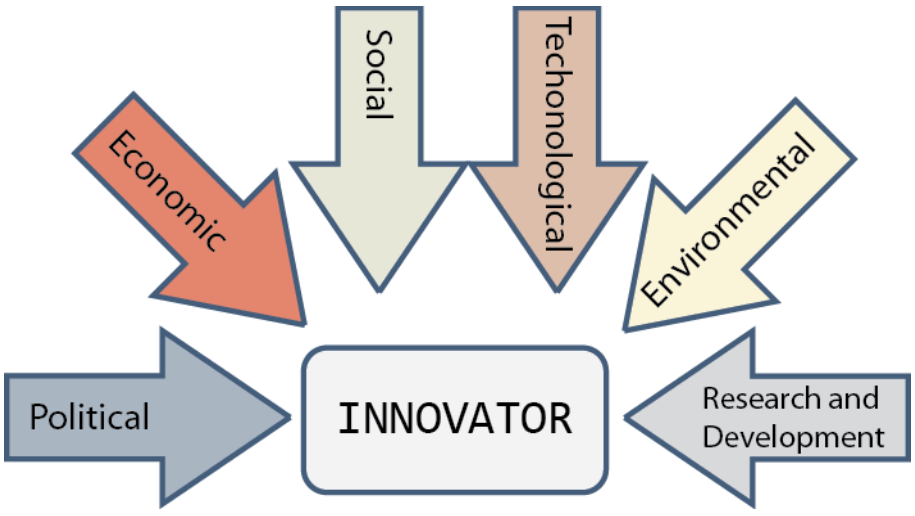

Figure 2. Six factors of the external macro environment affecting innovators.

The study and the comparison of the macro environments in the countries create the basis for the outcome of the study. The basic study of the macro environment's factors however encompasses various factors, some of which have a large effect on innovational capabilities and some that do not affect the actors in the innovation environment at all. In this study, only the most obvious factors, having a rather straightforward effect on innovational capabilities of the country, are taken into account.

2.1 National system of innovation

Other ways to look at and examine the innovation environment are the national systems of innovation (NIS), which were introduced by Christopher Freeman in the book *Technology and Economic Performance: Lessons from Japan*. NIS is defined as "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies" (Freeman 1987, 1). An OECD (1997, 7) study of NISs describes that "the national innovation systems approach stresses that the flows of technology and information among people, enterprises and institutions are key to the innovative process."

One of the simplest ways to describe a national innovation system is a triple helix model. "The institutionally defined Triple Helix is premised upon separate academic, industrial, and governmental spheres and the "knowledge flows" among them" (Etzkowitz & Leyersdorff 1998, 198). The model also describes the integration of these three actors.

> **"In addition to linkages among institutional spheres, each sphere is increasingly able to assume the role of another. Thus, universities take on entrepreneurial tasks such as marketing knowledge and creating companies, while firms develop an academic dimension, sharing knowledge among each other and training employees at ever higher skill levels" (Etzkowitz & Leversdorff 1998, 198).**

Figure 3 displays the flow of resources between the three main actors in the national innovation system, i.e. the government, academia, and industries.

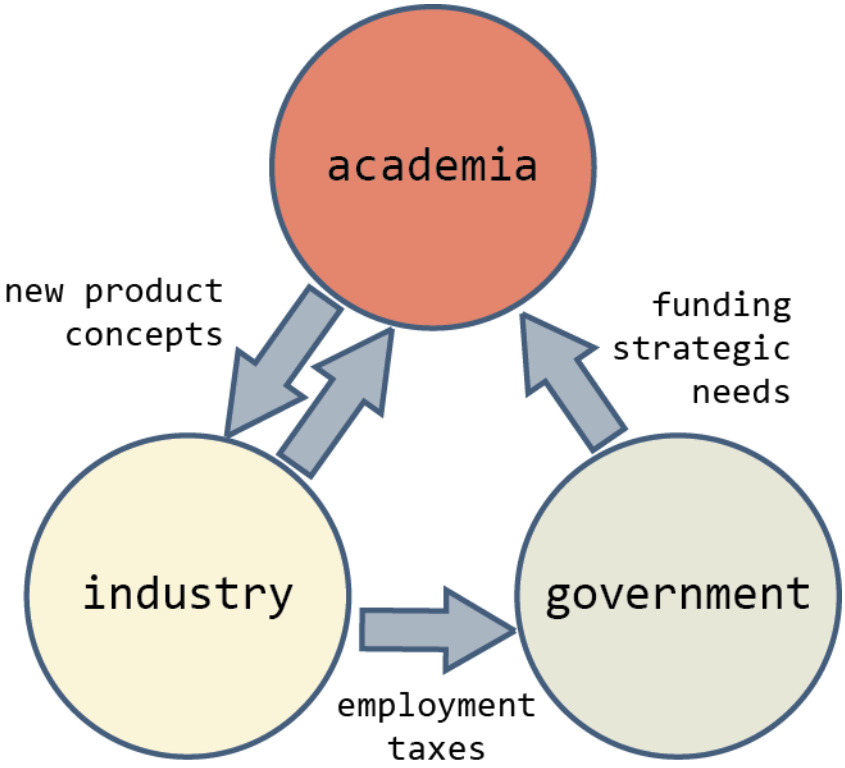

Figure 3. A triple-helical model of a national innovation system with resource flows (Source: (Dezhina & Zashev 2007).

As the triple helix model is rather simple, it is often insufficient to describe the whole national innovation system. Thus, Etzkowitz and Leyersdorff (1998) have developed the basic model further to the Triple Helix II and Triple Helix III models, which describe the linkages and the processes of an innovation system more precisely.

The model could also be extended with several other factors and actors in order to describe the environment and system for specific companies better. Gehani (2007) has extended and modified the triple-helical model in his study of innovations in synthetic rubber and tire technology. With the industry in question, the original triple-helix model's actors, the government, academia and industries, could be divided into several different actors each. For example, the industry could be divided into the company in question, rival innovative enterprises and collaborative innovative suppliers. Government is divided into national innovation policy and regional/state innovation institutions, and the academia is described more accurately by research universities.

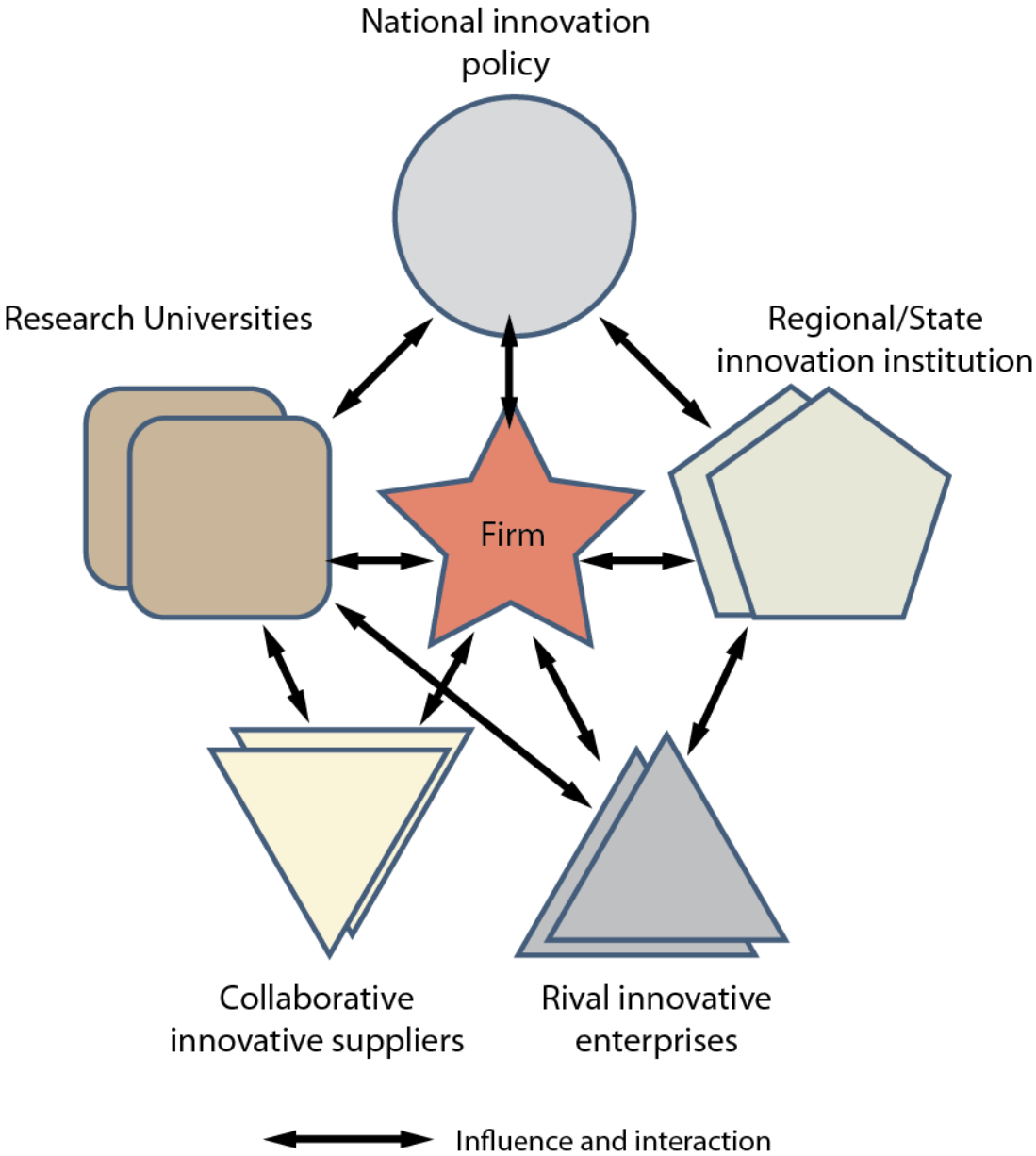

Figure 4. Extended national innovation system in synthetic rubber and tire technology (Source: Gehani 2007).

The national innovation system provides a model for assessing the level of success of an innovation environment. The country's innovative capabilities and functioning can be assessed by looking at how the sectors provided in the model operate on their own, how they collaborate, and how the flow of resources and integration within the sectors is handled.

2.3 Push and pull factors in migration based on innovation development

Human migration describes the movement of humans from one area to another. People move from a country to another for various reasons. These reasons could be related to countries' political, economic, environmental and social situations, often driving people to migrate from an area lacking certain possibilities to an area which provides better opportunities for living.

One of the most common theoretical concepts in international migration research is the "push-pull" theory, which in its limited form provides a set of negative push factors in the country of origin and a set of positive pull factors in the country which attracts migrants from the original country. These sets of pushing factors could consist of elements such as economic, social and political hardships in the country of origin, and the pull factors in the target country of immigration, which often offers comparative advantage in these sectors. The combination of these pushing and pulling factors will determine the size and the direction of migration. (Böröcz & Portes 1989.)

Traditionally these factors are used in studies of movement of labour between countries of large gaps in wealth, but the push-pull factors also provide a suitable way to examine and reason the migration of patent holders and innovators from one country to another. In addition to the traditional push and pull factors, which are often related to employment possibilities, the overall economic and political situation, and some other factors are also considered in this study. The main issues for innovation development are the availability of risk capital and supportive funds and the technological level and standards of infrastructure in the countries, all of which are taken into account in generating the final factors for this study.

3 RESEARCH METHODS

A qualitative research method was used in this thesis. Qualitative research is based on reflecting true life and is often interested in such issues that cannot be measured quantitatively (Hirsijärvi, Remes & Sajavaara 2000, 151-155). In qualitative research, a large number of research subjects and statistical argumentation method is not necessary or possible (Alasuutari 1993, 22). The qualitative research methods are used primarily to define a problem and generate hypotheses. They are often used in research as the prelude to quantitative research in order to identify determinants, and develop quantitative research compositions (Kälviäinen 2009).

The low number of quality respondents with expertise on the topic at hand led to the need for a qualitative study. The nature of the study, comparing two ambiguous environments, also supports a qualitative research approach rather than a quantitative one since macro environment is a rather wide concept with many factors entailed that cannot be measured in numerically.

3.1 Research questions

There are four primary research questions in this study:

1. What are the differences between Russian and Finnish innovation environments?
2. What are the reasons behind Russian patent holders' aim to move outside of Russia to develop their innovations?
3. What does the Finnish innovation environment have to offer for Russian patent holders?
4. How does the innovation process differ in the case of a Russian innovator operating in Finland?

The first question of the differences in the innovation environments of two neighbouring countries creates the basis for this study. The answer to the question is mainly derived from

previous studies and information related to the environments. The information retrieved for this question is also reinforced with interview data of Russian patent holders.

The second research question discusses the reasons behind the trends of Russian patent holders' movement outside of Russia to develop their innovations, and the third aims to find out the features in the Finnish innovation environment which is drawing innovators to Finland from elsewhere.

The answers to the first three questions together generate an overview of the differences of the innovation environments and the factors affecting it, and reasons for movement of patent holders from Russia to Finland. These three questions form the basis for the creation of the model of push and pull factors.

The fourth question tries to identify the differences in the actual process of innovation development and reaching the support of the Finnish government for an innovator of Russian origin. If there are any hindrances to the process of innovation development in Finland for a Russian innovator, these factors are added to the model of push and pull factors, more specifically to the Finnish side as negative factors.

3.2 Information retrieval

The information retrieved for the study is divided to two categories, primary research data and secondary research data. The secondary data is comprised of previous studies and statistical information related to the innovation environments of Finland and Russia. Meanwhile, the primary research data consists of narrative interviews of Russian patent holders who have started the process of manufacturing and commercialization of their inventions in Finland under a Finnish limited company. The interview form designed for the thesis contains several topics for discussion rather than straightforward questions. Some direct questions were composed in order to help the interviewee to discuss the topics if necessary. The interviews were conducted fully in Russian. The narrative data was then translated roughly to English for further analysis.

One shortcoming of the primary data collection method is that there are not too many Russian people who have established businesses around their patents in Finland. The few patent owners that have done so are also not easily reached. If reached, some of them have been reluctant to participate in the interview, as the nature of their business revolves around patented technologies. Personal trust between the interviewee and the interviewer and good Russian language skills are required to conduct such extensive interviews with the Russian patent owners.

The two interviewees in this study both have researched their own innovations, own several patents in Russia, have established limited companies in Finland and are in the process of commercialization of their inventions in Finland. The first interviewee had developed and patented a renewable energy system for the Northern climate conditions in Russia, but faced difficulties in further development and commercialization of the invention as the Russian government decided to downshift support given to renewable energy research (Interviewee 1 2011). The second interviewee had invented and patented personal respiratory protection equipment which was based on nano-sized channels providing unique physical reactions. The manufacturing of the equipment from natural fibres and components requires extremely high precision, which could not be fully achieved with the available equipment in Russia (Interviewee 2 2011).

Taking into account that the interviewees have operated both in Russia and Finland, have used the support mechanisms and funds of both governments and have experience in patenting and innovation development, they are competent in evaluating the innovation environments in Finland and Russia, at least by reflecting on their own experience of operating in them.

3.3 Realisation of the study

The realization of this study started in autumn 2010 at North Karelia University of Applied Sciences with choosing the thesis topic. I chose the topic of comparing Russian and Finnish innovation environments, as I had personal interest and some background information on them through recent work placements.

I conducted an initial literature review during the autumn period of 2010 and searched and studied previous researches related to the topic. During the spring period of 2011, I stayed in St. Petersburg, formed the interview and gathered some secondary data on the Russian environment. The primary data collection took place during the summer and autumn of 2011, when the interviews with the patent holders were conducted in Joensuu, Finland. After the interviews, I started the reporting process, which took several months due to working simultaneously in a Finnish-Russian consulting agency in Finland. The thesis was completed and presented during the spring semester of 2012.

3.4 Validity and reliability

The results of this research are reliable. Much of the information related to the macro innovation environment in both Finland and Russia were collected from reliable and independent sources, such as the European Commission, OECD, WIPO and the World Bank. These sources have been heavily cited also in other research done in the field, by the researchers at the Pan-European Institute, for instance. Another factor that affects the reliability of this is study is that the differences in the innovation environments found in the macro environment in the secondary data were similar to the differences found in the primary data, i.e. the interviews with the Russian patent holders, who have actual experience of working in the environments.

4 RESULTS

4.1 The innovation environment in Russia

4.1.1 Political factors in Russia

The legislative environment of the Russian Federation started to form only during the 1990's after the collapse of Soviet Union. The principles of the Constitution of the Russian Federation were adopted only in 1993 (De Muniz 2004, 83), and the Civil Law was constructed in four parts. The latest additions to the Civil Law came into force only in December 2007, when Section 7, "Rights to the Results of Intellectual Activity and Means of Individualization", providing legislation related to immaterial property rights, was passed (Federal Service for Intellectual Property, Patents and Trademarks 2011). The legislative environment and the laws in it are new in comparison to other Western countries. The system is partially unstable because of this, as there have been various reforms to the legislation during the last two decades. (Lehtinen 2011.)

Interviewee 1 stressed that the legislation and legality of the country and its citizens is the main factor in creation of a suitable base for innovation development. As the Russian legislative environment is still under development and some laws related to immaterial properties have passed into action only in recent years, the legislative environment and law abidingness of the nation is not on a good level if compared to Northern European countries. Corruption in the judicial and state organs, combined with the lack of legislation and law abidingness creates serious problems for the innovative environment. These together create a rather high level of uncertainty for Russian businesses in general, and especially for those related to innovations. (Interviewee 1 2011.)

Many studies discuss that the Russian political system acts as a hindrance to innovation activities as it creates legal barriers for innovation collaboration. This negatively affects the establishment of small innovative enterprises (SIE) negatively. (Dezhina & Peltola 2008,

7.) The political environment in Russia should be reformed immediately by establishing appropriate institutional, legal, and taxation frameworks to support small and medium sized enterprises (SMEs) and SIEs. Creating an economic and political environment that encourages rather than discourages the activities of such companies would be of grand importance. (Ivanova & Roseboom 2006.)

The corruption of the political and business environment is a known fact in Russia. According to the Transparency International's Corruption Index for 2010, Russia ranked 154th out of 183 countries in the index, meaning that the country belongs to the group of highly corrupted countries. The corruption in political organs of a country undermines the innovation environment by partially killing true competition over the support money and resources distributed by the government (Interviewee 2 2011). In a World Economic Forum survey (2011) the corruption and inefficient government bureaucracy were noted as major hindrances in the business environment by Russian entrepreneurs.

Russia has been also lacking a functional innovation policy. Policies related to science, technology and innovation have been formed rather recently in the 2000s. The late awakening to innovation development could be explained by the fact that the Russian Federation has been under the turmoil of political and economic reforms for the last 20 years; this unrest has not provided a stable environment for innovation development.

4.1.2 Economic factors in Russia

Russia seems to be gaining back the pace of economic growth after the fall of the worldwide economic crisis in 2008-2009, resulting in GDP growth of about 4% in 2010 and 2011 (Rosstat 2012). The general economic growth provides favourable conditions for government actions towards innovation activity stimulating (European Commission 2007b), as there should be a surplus of funds to distribute for the support of business development.

Russia's economic structure is very different from most European countries, as there is a predominance of large companies, a concentration on mining and heavy industry, and an almost complete lack of high-tech, consumer goods industries (European Commission 2007b). The general orientation of the economy and its businesses naturally affects the available equipment and expertise. Without an effective high-tech industry, the development process of other high technologies in the country will be slower, if not impossible without external resources and equipment.

The portion of Russia's GDP generated by SMEs is estimated at the relatively low range of 13-17%. This has an effect on the economy overall as the SME sector is often credited with granting national economies' flexibility, diversity, and the strength to weather economic downturns. (Bolotinsky & Jiang 2008.) By having such a low amount of SME contribution to the economy, the Russian economic sector is missing the flexibility and diversity of the companies which often is required in innovation activities.

Under more precise examination of the economic structure, the statistics from 1998 to 2004 show the number of SIEs to be declining in number and in share of total enterprises. The amount of SIEs has reduced from 38,800 in 1998 to 20,700 in 2004; the share of SIEs of all companies has reduced at the same time from 4.5% to 2.5% of all operating companies. It is discussed that the decrease in the number of SIEs can be explained by the restraints set up elsewhere on the Russian innovation infrastructure, including those political and financial. (Dezhina & Zashev 2010, 9.)

4.1.3 Social factors in Russia

The population in Russia is well educated, as 55.5% of 25 to 34 year olds and 44.5% of 55 to 64 year olds have a tertiary degree (Statistics from 2002, OECD 2011). In addition to a highly educated society, Russia has a substantial science base and a well-developed education system in science and technology, which both should benefit the country's innovation activities (Peltola 2008, 2).

The entrepreneurial culture and its integral parts such as work ethic, enthusiasm, incentive and motivation are very important factors in producing new and competitive companies (Alasaarela et al. 2006, 17). In Russia scholars and researchers at universities are rarely entrepreneurially talented, and rarely do they have an opportunity to use their innovations as a basis for spinoff companies. Some problems related to the spinoffs occur in the financial stage, as the scholars are not paid well for research work, and much of support funds and grants have to be used for living costs rather than research and development. (Interviewee 1 2011.) It is discussed that the problems in the political environment and legal obstacles negatively affect the entrepreneurial culture in Russia by discouraging company spin-offs from the universities, while many small innovation companies are formed through such spin-offs in many other countries (Dezhina & Zashev 2010, 7-8).

The demographic factors and capabilities of the population to conduct scientific research and development in Russia seem to be in proper condition, but indicators of actual innovation activities are disappointing. The amount of public resources used for the creation of knowledge is not in balance with the measured outputs of these activities, which is one of the main challenges for Russian innovation policy. (Peltola 2008, 2.)

4.1.4 Technological factors in Russia

The technological standards and the level of infrastructure and machines in companies and regions need to be on a high level in order to realize innovation anywhere. In Russia, especially in the regions outside of Moscow and St. Petersburg, modern laboratories are lacking and behind the production capabilities and possibilities for product development of European standards. These issues negatively affect the development of innovative products and especially the development of production equipment for innovations in Russia. (Interviewee 2 2011.)

Russian companies which are operating in traditional Russian high-tech industries, such as aerospace, defence and machine building industries inherited the technologies which were at one time on top of the world. They have been capable of maintaining their superiority

with strong political support from the government, but at the same time, they have become less competitive and sometimes even obsolete in the changing economic and political system. Still, Federal support for R&D in these industries has grown during the past two years. (European commission 2007b.) As the technology in companies and overall in the country gets older, the need for R&D grows as new machinery and technology is required in order to keep up with the modern standards of production. (Dezhina & Peltola 2008, 6.)

4.1.5 Environmental factors in Russia

The potential of the clean-tech sector is underestimated in Russia. The field does not get any special incentives for development, as opposed to many other European countries' policies, where green technology and clean-tech innovations get even greater support than other innovational fields. The clean-tech industry was somewhat supported at the beginning of the 2000's, but this was cut when Russia became the largest oil producing country in the world, and even larger support was given to the development exploration and drilling for oil. (Interviewee 1 2011.)

4.1.6 Research and development in Russia

The Russian R&D sector is mostly government-owned and -financed, which means that the Russian business enterprise sector in science and technology is mostly represented by enterprises and organizations that are under direct or indirect government influence through controlling shareholders (Dezhina & Peltola 2008, 3-4). Thus, the R&D investments by the business sector in the Russian Federation are very low in respect to comparable industries in advanced economies, which results in a lack of commitment by the business sector. This can be listed as one of the major weaknesses of the Russian innovation system. (European Commission 2007b.)

The European commission also discusses that one of the critical bottlenecks for Russian start-up companies is getting access to R&D capital. In addition to expanding venture

capital funds of the state, the government should also look at how private venture capital funds and business angels can be stimulated. The government could offer certain incentives for private investors, provide simplifications to rules and regulations, and solve other specific bottlenecks. (European Commission 2007b.) Monetary support for innovations is not enough for small businesses and it is not spread across the regions of Russia evenly, but rather generally used for large scale projects such as Skolkovo (Interviewee 2 2011). Skolkovo is a large scale innovation centre in Moscow which concentrates on gathering intellectual capital and stimulating the development of its member companies (Skolkovo 2012). Skolkovo is often considered to become the future Silicon Valley of Russia and to raise the level of Russian innovations to an international standard.

The second main difference to other European countries is that the higher education sector in Russia has been conducting less than 10% of the total research and development in the country when considering expenditure (GERD), whereas on the European Union average has been over 20% in the 2000s (OECD 2011). Russian universities also do not play an important role in R&D. Only about 40% of the higher education institutes in Russia are actually involved in R&D (Dezhina & Peltola 2008, 4), which shows low the integration of industry-academia-government in R&D and innovation development really is.

4.1.7 Key features of the Russian innovation environment

Figure 5 comprises the key features of the macro environment for innovation development in Russia from the political, economic, social, technological and R&D points of view.

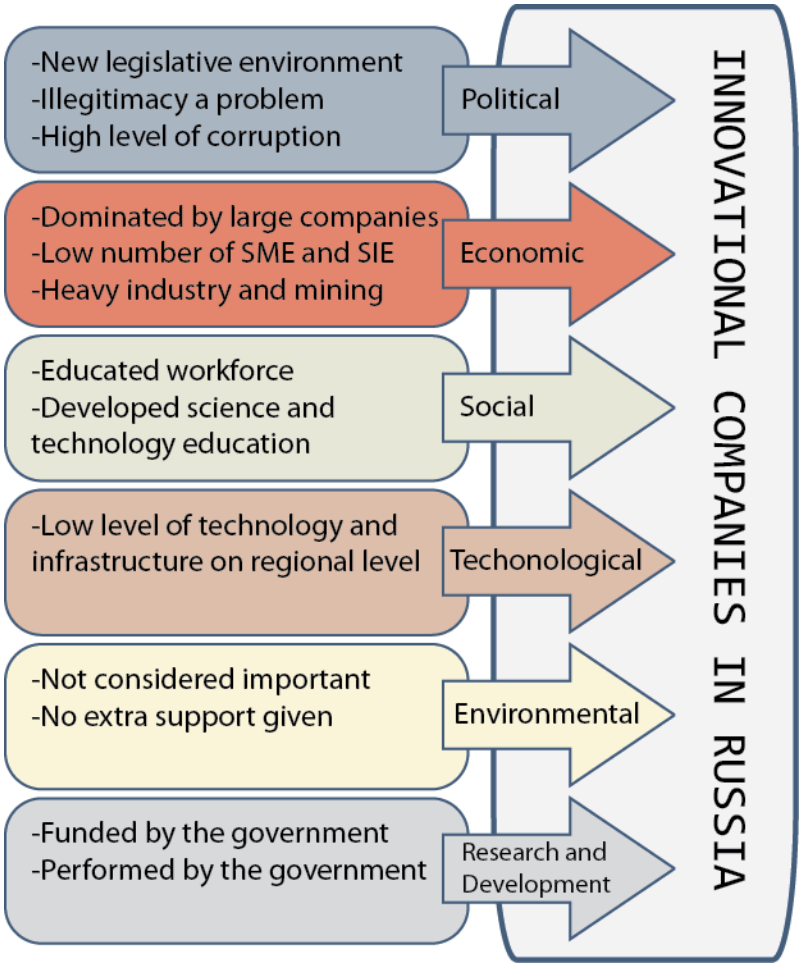

Figure 5. Factors affecting the Russian macro environment for innovational companies.

4.2 National system of innovation in Russia

In connecting the three main sectors of R&D, government, industry and education, the problem in Russia is that the government plays too large of a role in the innovation sphere, resulting in other sectors being less active in the innovation process (Dezhina & Zashev 2007, 15-16). The Russian government is the main financer of R&D, financing around 70% of all activities in 2010. The Russian government also conducts much of the R&D activities, comprising around 30% of total performance. (OECD 2011.) The strong grip of the government leads to Russian companies assuming the role of manufacturer and seller instead of cooperating closer with the other sectors, i.e. the government and academia. The same applies to the education sector, which does not have the initiative to establish closer

relations with the business sector, but rather remains as a mere receiver for government funds. (Dezhina & Zashev 2007, 15-16.)

As Russia has started to conduct a national innovation policy only recently, the economy and actors in the national innovation system have not yet developed enough to collaborate efficiently. Dezhina and Peltola (2008, 7) condensed the external problems which obstruct the science-industry collaboration down to three points: underdeveloped mechanisms of R&D financing from the government, financial barriers for public organizations and Federal Research Centres to commercialization, and legal barriers for collaboration in establishing small innovative enterprises.

No models or theories of innovative development will work in Russia until the questions related to illegitimacy and the dysfunctional legislation are addressed and solved. The functional legislative framework is the only issue that can create a stable basis for true innovation development and supporting systems related to it. (Interviewee 1 2011.)

4.3 The innovation environment in Finland

4.3.1 Political factors in Finland

According to Transparency International's Corruption Index for 2010 Finland is considered to be a country of very low corruption, ranking 4th out of 183. This means that Finland is one of the least corrupted countries in the world. The low amount of corruption in the decision making and supporting organs creates a healthy basis for competition between innovations and ensures that the support given is objective. As Interviewee 1 stressed that the legislation and legality of the country and its citizens is the main factor in the creation of a suitable base for innovation development, he continued that one of the main reasons for his entry to Finland for innovation development was that Finland is known for its legality as well as its law-abiding citizens and low amount of corruption (Interviewee 1 2011).

Increasing regulation in the European Union (EU) has had a powerful influence on the competitiveness of the corporate operating environment. While the integration of the member countries brings down obstacles for international cooperation, the competition between the countries tightens. (Alasaarela et.al. 2006, 24.) In addition, when the regulative and legislative powers shift to a central organ commanding several countries, the single member countries of such a union might lose the ability to attract foreign actors by specific incentives as the power to issue such incentives would be in central organs. Incentives, as tax exemptions, have been introduced in some of the EU countries, but so far not in Finland (Alasaarela et. al. 2006, 27).

In Finland an innovation policy was engineered to increase the number of technological innovations in the beginning of 1990s during its recession to raise Finland's competitiveness in the globalizing economy. Finland succeeded well in the project and pulled itself out of the recession with the policy. Since then, the science, technology and innovation policies have been exercised determinedly in Finland by applying the concepts of the innovation systems. (Science and Technology Policy Council of Finland, 2003.)

4.3.2 Economic factors in Finland

In Finland the SME sector provides around half of the GDP input, and employs 56% of the population. The rest is accounted for by the large companies (European Commission 2008). As mentioned before, the larger SME sector grants the economy more flexibility and diversity and thus leads to more optimal corporate environment for innovation implementation. The Finnish government is actively promoting SME businesses, as most of the public private equity investments are directed at seed and start-up phase financing in Finland. (Science and Technology Policy Council of Finland 2002).

Interviewee 2 (2011) discussed that the start-up phase financing is the most crucial point of financing in a company's life cycle. Without adequate initial support and funding, technological projects based on innovations cannot start operating. In Finland it is possible

to raise adequate money from different forms of supportive funds and cheap government loans without much bureaucracy. (Interviewee 2 2011.)

Finland has invested heavily in information and communication technology starting from the 1990s. This has resulted in rapid economic growth and a significant number of patents in the field. An OECD report of the information economy shows that Finland has been one of the top countries in the world by many ratios which measure ICT development and activities in different countries. The effect of ICT R&D conducted in Finland has been of paramount importance in improving employment and generating growth. (OECD 2002.) The ICT sector also accounts for most of the patents applied in Finland and is thus an important sector for innovation.

4.3.3 Social factors in Finland

The Finnish population is educated slightly over the OECD averages, where 39.4% of 25 to 34 year olds and 29.0% of 55 to 64 year olds have a tertiary degree (Statistics from 2009, OECD 2011). Finnish students are doing well also when it comes to middle education. Finland has been ranking in the top nations in PISA studies, which measure young students' capabilities in mathematics and science (PISA 2009). The skills of the Finnish work force are evaluated to be higher than in the EU as a whole, due to vocational training and the work force's participation in various training (European Commission 2008).

Interviewee 1 discussed that the workforce in Finland is well educated and competent to support the development of innovations, but this person also criticized the narrow field of specialization of Finnish companies and workers. When subcontractors are narrowly specialized, there is a need to build a larger network of machine suppliers. On the other hand, highly specialized experts can solve problems related to their special field more accurately. (Interviewee 1 2011.)

Interviewee 1 also praised the effectiveness of the workforce in Finland. The Finnish workforce in general is well taught to work efficiently, and on a general level the workers

take responsibility for their actions and need less leading and commanding as opposed to Russian workers. These factors notably contribute to the success of the start-up companies. (Interviewee 1 2011.)

4.3.4 Technological factors in Finland

Technological factors play a key role in a functional innovation environment, and in modern day Finland, there is great confidence that the country is fully competitive with other Western countries on the technological level. The level of technology in Finland developed from an almost non-existent state to one of the highest in the world during the several decades after World War II. (Alasaarela et. al. 2006, 20.)

Both of the interviewees stated that one of the main reasons for them to move to Finland was the technological capabilities and possibilities provided in the country. The development of their innovations was in the phase that serial manufacturing by automated machinery would be necessary, something which turned out difficult in Russia. Finland provides innovators the necessary technology for building and necessary facilities for testing, such as European wide accredited laboratories. (Interviewee 1 2011; Interviewee 2 2011.)

4.3.5 Environmental factors in Finland

Development related to environmental technology and improving the environmental conditions is given much support in Finland. Finland has been ranking at the top in the World Economic Forum's Environmental Sustainability Index since 2000. In addition Finland has ranked well in other international indexes which describe environmental sustainability, competitiveness, clean water and innovative solutions. (Ministry of the Environment 2011.)

Finland was one of the first countries in the world to compose a major national programme addressing sustainable consumption and production. This programme aims to make Finland one of the most eco-efficient and competitive societies by 2025, through long-term policy-making and supportive measures. (Ministry of the Environment 2011.)

4.3.6 Research and development in Finland

Finnish research and development is mainly financed by industry, which accounts for 66.1% of the total R&D financing, and performed by the business enterprise sector, accounting for 69.6% of all R&D performance. This is considered an important factor for efficiency in the innovation development. The main source of funds is the industry itself, which has a positive effect on developmental work, as there is more motivation to get results when the industry's own money is at stake.

4.3.7 Key features of the Finnish innovation environment

Figure 6 comprises the key features of the macro environment for innovation development in Finland from the political, economic, social, technological and R&D points of view.

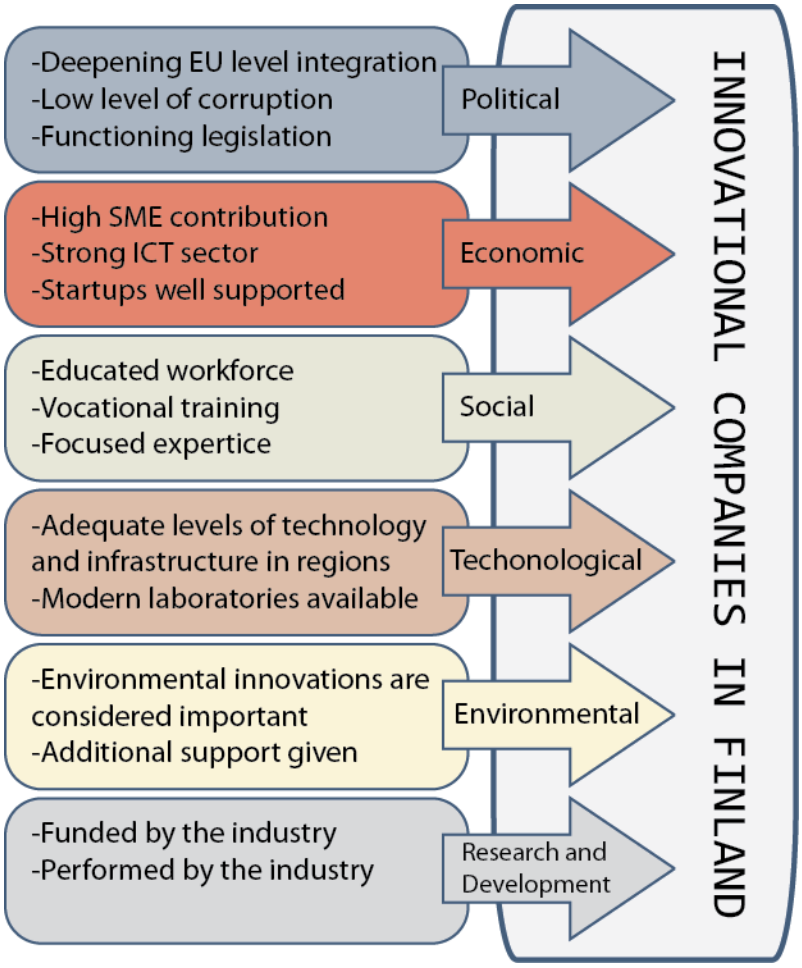

Figure 6. Factors affecting the Finnish macro environment for innovative companies.

4.4 National system of innovation in Finland

Finland was among the first countries to adopt the concept of a national innovation system as a planning model for the development of a science, technology and innovation policy. Since 1990 the concept has been used as a political instrument to stimulate and encourage interaction, competitiveness and internationalization among the core players: private enterprises, producers of knowledge and skills, and innovation financing and service organizations, as well as governmental and regional bodies responsible for supporting and directing Research and Technical Development Infrastructure. (European Commission 2007a.)

The Finnish national innovation system is complimented in the literature and research of innovation economies. Sectoral collaboration between the actors operating in the system is on a good level, and the flow of resources and knowledge in the economy are promoting further knowledge creation, SIE establishment and entrepreneurship through university spin-offs.

4.5 Comparison of the main indicators of innovation activities and indices

Table 1. The main scientific and technology indicators and patenting statistics of Russia and Finland for 2010 (Sources: OECD 2011, WIPO 2011),

	Russia	Finland	Source
Monetary R&D inputs 2010			
Gross Domestic Expenditure on R&D (GERD) (million current PPP $)	32838.0	7588.7	OECD 2011
GERD as a percentage of GDP	1.16	3.87	OECD 2011
Monetary R&D inputs by financer 2010			
Percentage of GERD financed by industry	25.5	66.1	OECD 2011
Percentage of GERD financed by government	70.3	25.7	OECD 2011
Percentage of GERD financed by abroad	3.5	7.3	OECD 2011
Social R&D inputs 2010			
Total researchers (FTE) Full time equivalent	442071	41425	OECD 2011
Total researchers (FTE) per thousand total employment	6.3	17.0	OECD 2011
Total R&D personnel (FTE)	839992	55897	OECD 2011
Total R&D personnel (FTE) per thousand total employment	12.0	22.9	OECD 2011
R&D outputs 2010			
Patent applications by origin	32763	12405	WIPO 2011
R&D ratios 2010			
Patent applications by origin 2010 / GERD (million current PPP $) 2010	1.0	1.6	WIPO 2011, OECD 2011
Patent applications by origin 2010 / Total researchers 2010	0.1	0.3	WIPO 2011, OECD 2011
Patent applications by origin 2010 / Total R&D personnel 2010	0.04	0.2	WIPO 2011, OECD 2011

Finland is using more resources on R&D when compared to Russia, and the resources are also used more effectively. Firstly, the gross domestic expenditure on R&D (GERD) in 2010 was in total only four times larger in Russia than it was in Finland. As percentages of the countries' GDP, Russia's GERD is only 1.16% of the total GDP in the country, whereas Finland's GERD comprises 3.87% of the GDP. Russia employs over 10 times more researchers and R&D personnel than Finland does in total, but when considering researchers as a percentage of total workers, Finland has relatively more personnel working on R&D and research.

In 2010, 32,763 patent applications originated from Russia and 12,405 from Finland (WIPO 2011). The difference in the numbers of applications is vast if we take into account the difference in the sizes of the economies.

If we measure the effectiveness of the R&D expenditure in each country, in Finland 1.6 patent applications are generated for every million US dollars used for R&D purposes, whereas in Russia only 1 patent application is generated per million. Notable differences are also found in the number of patent applications per research and R&D personnel, where Finland seems to be several times more effective. Not only is Finland using comparatively more resources on R&D, but it is also using the R&D resources and personnel more effectively, generating more patent applications per GERD and R&D personnel than Russia (OECD 2011 & WIPO 2011).

There are also organizations that study and rank different economies' favourability for innovation activities, such as INSEAD and the Boston Consulting Group, which both keep their own global innovation indexes. Finland ranks 5th in INSEAD's index and in Boston Consulting Groups index 7th place. Russia is ranked only to be the 49th most favourable economy for innovation in Boston Consulting Group's index and 56th in INSEAD's ranking. (INSEAD 2011 & Andrew, DeRocco & Taylor 2009.)

Another way to measure a country's suitability for innovation development is the Knowledge Economy Index created by the World Bank Institute. "The Knowledge Economy Index takes into account whether the environment is conductive for knowledge to

be used effectively for economic development" (World Bank 2012a). The index consists of four pillars, which measure the economic incentive regime, the innovation system, education of the human resources and the level of use of information and communication technology. In 2012, Finland was ranked in 2nd KEI, whereas Russia landed in 55th place out of 145 economies (World Bank 2012a).

The World Bank also measures business regulations all over the world through the Doing Business project. "The Doing Business Project provides objective measures of business regulations and their enforcement across 183 economies and selected cities at the sub-national and regional level." In 2012, the Ease of Doing Business- ranking for Finland was 11th. Even if Russia ranks in the better half of the economies in innovation indexes and suitability for innovation activities, it also ranks a less impressive 120th out of 183 economies (World Bank 2012b.) on the regular business regulation level, which definitely acts as a further hindrance to innovation activities.

4.6 The differences between Russian and Finnish innovation environments

Most of the factors in the macro environment for innovation companies differ vastly between Russia and Finland. The countries in question and their innovation environments could be described as being opposites of each other.

Firstly, the political environments for innovation development in Russia and Finland differ enormously. The support framework for innovation activities in Finland is proven to be quite effective, allowing Finland to rank high in the innovation indexes, whereas Russia has a lack of working support mechanisms and frameworks for innovative activities. Other radical differences can be found in the fields of corruption and bureaucracy in the political organs and decision makers, where these issues hinder the development of innovations in Russia.

In the economic sector the structure of operating companies is heavily biased towards the large companies in Russia, which predominate in contributing to Russian GDP, while

SMEs play the dominant role in Finland. The scale of a company affects its flexibility, giving SMEs possibilities to become more innovative and use innovations more easily to generate growth. The concentrations of the economic sectors also differ in Russia and Finland, where Russia, rich in natural resources, concentrates more on mining and heavy industries. So far in Finland, growth is sought mainly from the ICT sector, where most of the modern patents and innovation lie.

Both countries have a well educated population, with a high percentage of people that go through tertiary education. Russia has traditionally had a well-developed education sector in science and technology, but somehow it does not show in innovation indicators and in the number of innovative companies, as other aspects of the innovation environment hamper development. It is said that the Finnish work force would be narrowly focused, having specialists with extensive, but narrow knowledge of technology and science, whereas Russian developers would seem to be well versed in several spheres.

The technological differences and infrastructural differences are said to be vast, especially in the less populated regions between Finland and Russia. The Russian innovation environment suffers from a low level of regional infrastructure, a lack of modern facilities and the fact that much of technology in companies is becoming obsolete. In Finland, the technological and infrastructural level of regions and companies is generally on a good level, which ensures the availability of modern machinery, equipment, laboratories and testing facilities for innovation development.

The environmental factor is considered in Finland to be of importance in driving innovations further and generating growth to the economy; hence the innovations related to clean technology and improving environmental conditions are supported by the government. The issue is not the same in Russia, where environmental innovations are not given special attention.

Regarding the research and development factor, the portions of R&D financing and R&D performing differ between Russia and Finland. The portion of R&D that is funded by the government in Russia is huge compared to the European counterparts and Finland. This is

said to be as a burden to the innovation environment as the government provides so much that it also has plenty to say where the funds can be used. Furthermore, in Russia the education sector is performing a low amount of the entire R&D conducted in the whole country, and the government has a larger overall role in this. In Finland the R&D is mainly financed and carried out by industries, followed by the larger input of the education sector, leaving the governmental portion of performing R&D to the smallest sector. When the R&D is financed by the industry they have more at stake in the activity and thus they are driven to get results from it, rather than just raising support money.

4.7 The patent holders' reasons to move out of Russia and to Finland

According to the interviews with the Russian patent holders conducted in 2011, there are three main categories of reasons for the patent owners' intentions for leaving Russia. To address and solve the problems in the innovation development in Russia, both of the interviewees decided to seek their way to Finland in order to develop, realize and commercialize their innovation further. After several years of operating in Russia and a few years in the Finnish environment, the interviewees list the following aspects to be the main competences in the Finnish innovation environment and the main hindrances in Russia: financial reasons, legislative reasons, and technological reasons.

4.7.1 Funding of innovation development

Although there is a lot of capital available in Russia which could be distributed for the development of innovations, the government and risk investors are not taking small innovations into account when financing them. The innovation support and funding is generally used for large scale projects, which merely helps a few dozen companies. Monetary support for innovations is not enough for small businesses and it is not spread across the regions of Russia evenly (Interviewee 2 2011.)

Both interviewees agree that innovation funding does not happen in Russia objectively, as corruption has a role in the functioning of the country and its decision makers. Supportive funds from the government or regional municipalities are often distributed between a number of people and companies every year, killing a part of real competition and evaluation of potential innovations (Interviewee 1 2011; Interviewee 2 2011.) The basis for government funded projects is kept a secret, and the public cannot review developing innovations, as it would reveal the true nature of innovation fund raising and the low level of objectivity in it (Interviewee 1 2011).

The amount of bureaucracy also hinders the fund raising process for Russian innovation developers. The grant applications require copious amount of documentation and papers at the initial stage of fund application, in addition to similarly bureaucratic reporting of the process few times during the financial period. This requirement of excessive records and documents for getting the grants shifts the focus of the development work to documentation (Interviewee 1 2011; Interviewee 2 2011.) Interviewee 2 commented that he stopped leaving applications for grants due to the objectivity and bureaucracy issues.

The government support for innovation development is on a different scale in Finland than it is in Russia. Potential projects can raise governmental funds (grants and loans combined) by vast amounts for the expenses that the development requires. The bureaucracy related to the application and process following is also on lower level, even when the supported amounts are much larger than in Russia. The Finnish government also considers smaller projects and development works to be important and does not rule them out of the support mechanisms. (Interviewee 1 2011; Interviewee 2 2011.) The active participation in the innovation project funding by the Finnish government also helps raising funds from the private sector, as investors can already see that the innovation is already somewhat verified by the governmental actors (Interviewee 1 2011).

4.7.2 Legislative environment

Both interviewees stress the importance of a functioning and non-corrupted legislative environment in the development of innovations. The functioning legislative environment and the law abidingness of citizens create an honest basis for the development of products based on immaterial properties, such as patents. Both of the interviewees have not encountered any violations or attempts of such in Finland, and both knew that Finland ranks well in the political stability and corruption indexes along with its Scandinavian neighbours. (Interviewee 1 2011; Interviewee 2 2011.)

As the Russian legislative environment is still under development (for instance the laws related to immaterial properties have passed to action only in recent years), the legislative environment and law abidingness of the nation is not on a good level if compared to Northern European countries, for instance. The corruption of judicial and state organs combined with the lack of legislation and lack of law abidingness creates serious problems for the innovative environment. These together create a rather high level of uncertainty for business in general and especially for businesses related to innovations. (Interviewee 1 2011.)

In case of patent violations or thefts of immaterial property, the patent owner might not stand a chance in court if the violation had been done for instance by a company which has power or contacts in the regional or governmental command chains (Interviewee 1 2011).

4.7.3 Technological level

Another key issue in innovation development is the availability of high level technology, machinery and laboratories which can and are willing to support the innovation development. These standards and resources are available and more than adequate in Finland for Finnish companies. The development of the interviewees' innovations stopped mainly because of the lack of skill to create automated production facilities for the patented products. (Interviewee 1 2011; Interviewee 2 2011.)

A large positive addition to the technological standards is that there are laboratories and organizations in Finland in which the testing of products is accredited also in other EU countries, making further patenting, certification and sales expanding through Finland much easier than from Russia (Interviewee 2 2011).

In addition to these issues, there are various smaller points that are functioning better than in Russia, providing more efficiency to the development work. These points include overall availability of the Internet and communication networks, generally good living conditions, lack of traffic jams, and general attitudes towards work in Finland. (Interviewee 1 2011.)

In Russia, especially in the regions out of Moscow and St. Petersburg, a lack of modern laboratories, production capabilities and possibilities for product development of European standards hampers innovative development. It also particularly cripples the development of production equipment for the innovations in Russia. (Interviewee 2 2011.)

5 DISCUSSION

5.1 Innovators push and pull factors in Finland and Russia

The main aim of this study was to determine the factors that were either pushing innovators or patent holders out of Russia and factors that were pulling innovators and patents towards Finland. Figure 7 lists sets of these factors that affect Russian innovators and can lead to their moving to develop and commercialize patents in Finland instead of Russia.

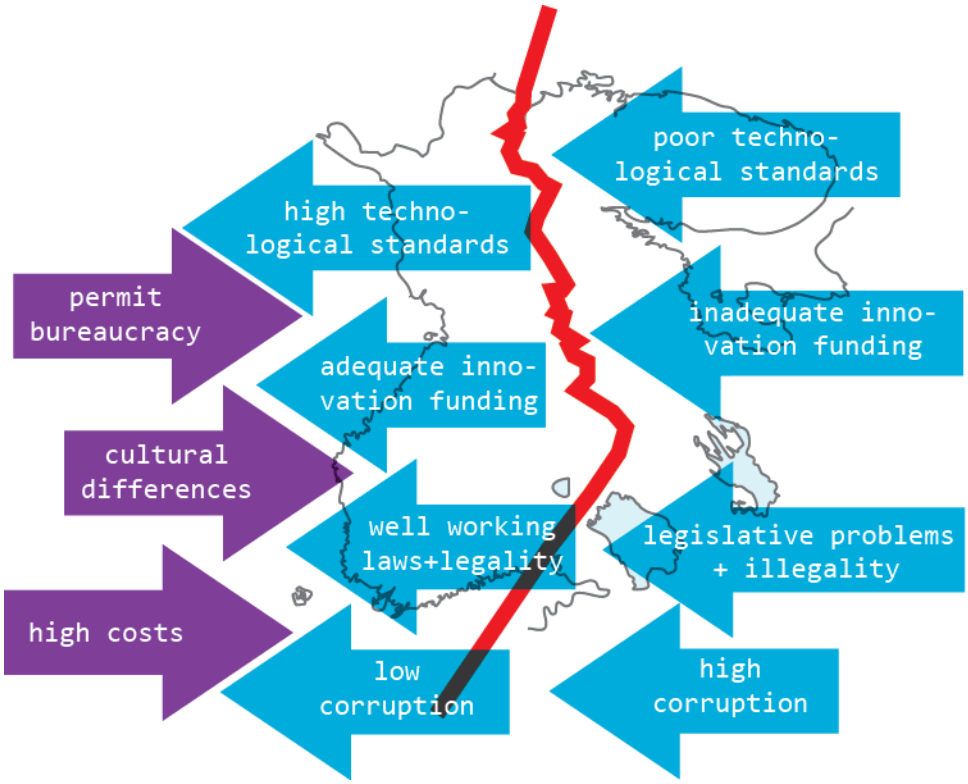

Figure 7. Factors that push and pull innovators and patent holders between Russia and Finland.

The blue arrows on the Russian side represent the push factors in Russia and the blue arrows on the Finnish side consequently represent the pull factors in Finland.

As Figure 7 implies, the pushing and pulling factors in Finland and Russia are practically each other's opposites. This is natural as these aspects play the main role in innovation

development. The differences in these basic factors of innovation development could also explain the large difference in innovation index rankings between the nations.

As the interviewees mentioned, the main reasons for their emigration out of Russia were the poor technological standards, inadequate innovation funding available, problems in the legislation and legitimacy and corruption. These factors were the main remarks in other studies (Peltola 2008; Dezhina & Zashev 2010) which have considered the Russian innovation environment. Overcoming these obstacles could involve coming to Finland for innovation development.

Even when the differences in innovation environments between two neighbouring countries are so vastly in favour of the smaller Finland, not too many Russian innovators or patent holders have successfully entered Finland for further development of their patents or have actually realized the patent to the stage of production or commercialization. This can be explained by the regulations of the Finnish government related to conducting business and by the somewhat difficult processes of visas and residence / working permits. Other factors that negatively affect Russian patent holders' working in Finland are the differences in working culture and the very high costs for operations and labour. These three factors work against the Russian patent holders in Finland and thus can be called as push factors on the Finnish side, marked with purple arrows in Figure 7.

The main hindrance in Finland for Russian patent holders is the bureaucracy related to operating and fund raising in Finland. In order to raise innovation support and funds from the Finnish government, the company must be registered in Finland and pay Finnish taxes. The company must have at least one person on its board who permanently resides in the European Trade Area. Without trustful contacts that are willing to join the board of the company, to take responsibility of the company's actions and to cope with the Finnish bureaucracy and business requirements, it is difficult to organize any business activity in Finland.

Not much can be done to improve the Finnish push factors of cultural differences and high cost level in the country. To improve and broaden the immigration of Russian innovators to

Finland, the permit bureaucracy is the only aspect which can be eased. Movement in Finland towards easing these restraints set by the government has already begun, as there has been discussion of removing visa requirements for travellers, which already would make networking and cross-border collaboration much easier. Facilitation of the Finnish operation environment and tackling the hindrances for Russian patent holders' innovation development in Finland could result in more development based migration, more commercialised innovations, technological advancement and wealth generation through Finnish-Russian collaboration.

5.4 Recommendations for future research

As with any macro environment, the innovation environment is highly complex, and its profound study requires extensive knowledge and insight on the subject. This study found out the main problems in the Russian innovation environment and the main positive factors in the Finnish environment by looking into the most obvious issues and topics related to the innovation environments. The study did not dwell into the reasons which have caused either the success or failure in the innovation environments.

The study had a rather small sample, as there are not too many Russian patent holders who have actually commercialized their innovations in Finland. For future research, some specialists and experts who have studied the field of innovation development could also be relevant sources for narrative information related to the topic.

This study also did not provide advice for the development of the Finnish environment to attract more Russian patent holders. Future research in the subject could be done to find out more of the hindrances and the requirements for the Russian patent holders' operations in Finland. By studying the requirements and hindrances, a model of Finnish support structure or network for Russian patent holders could be generated. The aim of this model would be to attract more Russian patent holders and innovators to develop their innovations in Finland.

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