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**ICT Investment and Internationalization of the Russian
Economy**

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Summary: In this paper the influence of ICT investments on the international activities of Russia is analyzed. Firstly, ICT investments are considered as a factor of the international competitiveness of the Russian economy (in comparison with some other countries). Dynamics of both export volumes and openness of national economies are used as the main criteria for comparison. Then, the role of ICT in the development of international activities on the regional level is analysed. Cluster analysis is performed for the set of data on the Russian regions. Finally, the accession of Russia to the WTO is considered in the context of the development of the ICT sector and the international activities of the Russian economy.

Zusammenfassung: Im Rahmen des vorliegenden Papiers wird der Einfluss der IKT – Investitionen auf die internationalen Aktivitäten Russlands analysiert. Zuerst werden IKT – Investitionen als ein Faktor für die internationale Konkurrenzfähigkeit der russischen Wirtschaft betrachtet (im Vergleich zu anderen Ländern). Entwicklungen von sowohl Exportvolumen als auch Offenheitsgrad der Volkswirtschaften werden als zentrale Vergleichskriterien herangezogen. Danach wird die Rolle der IKT in der Entwicklung der internationalen Aktivitäten auf regionale Ebene analysiert. Für einen Datensatz die Regionen der Russischen Föderation betreffend wird eine Clusteranalyse durchgeführt. Schließlich wird der Beitritt Russlands zur WTO im Kontext der Entwicklung des IKT-Sektors und der internationalen Aktivitäten der russischen Wirtschaft betrachtet.

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ICT Investment and Internationalization of the Russian Economy

Discussion Paper 196

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1. Introduction

The ICT sector is one of the most dynamic and important sectors in the modern economy.¹ According to many studies, ICT development could be considered as an important indicator of internationalization and globalization.² It contributes to the development of the internationalization process in many ways. Thus, some authors point out that ICTs:

- have an impact on economic growth and labor productivity;
- contribute to the modernization of economic structures which increases the level of international competitiveness of the national economy;
- reduce coordination costs;
- make the process of looking for international partners easier (Rangan and Sengul 2009).

The development of ICT seems to be an important premise for the internationalization of the national economy. The development of this sector, as generally with that of other branches, is based first of all on investment. The benefits of ICT investments are not fully reflected by the traditional financial investment evaluation methods like ROI or NPV. There is a need for a multidimensional evaluation method that includes both the long-term performance perspective and future business value of investments in ICT (Loefgreen 2006).

Obviously there are some interdependencies between the ICT investments and international activities of the country. The intangible qualitative innovation benefits of ICT are essential for improving the quality of production, enhancing business activities and creating new competitive opportunities. The increase in the level of countries' international competitiveness improves their position in international trade and makes them more attractive for FDI inflows.

In this paper, we analyze three aspects of this problem area focusing on the example of the Russian economy:

- the total level of investments in ICT and their influence on the international activities of the Russian economy;
- the interconnections between ICT investments and international activities at the regional level (cluster analysis of the Russian regions);
- the accession of Russia to the WTO (as one of the manifestations of an expansion in international activities) and its influence on the ICT industry.

¹ The term „new economy“ is first of all connected with an increasing role of the ICT sector (Welfens and Jungmittag 2001).

² The interdependence of ICT development and globalization is sophisticated. For example Welfens and Vogelsang point out that “the expansion of ICT is associated with the growth of a network society in which the flow of information and technology on the one hand is accelerating. At the same time, both ICT and digital networking facilitate international outsourcing and offshoring. Offshoring involves foreign direct investments while international outsourcing occurs through trade and arm's length market transactions” (Welfens and Vogelsang 2008).

Duwendag distinguishes between quantitative indicators (dynamics of the volumes of world exports, international direct investments, transnational capital movements) and qualitative steps of economic globalization (establishment of regional trade and economic unions, opening up of developing countries, expansion of multinational companies, transformation processes in post-socialistic countries, development of ICT). So, according to Duwendag, the ICT development is one of the qualitative steps of globalization (Duwendag 2006).

In the second section of the present paper, we will use volumes of international trade as a criterion of international activities.³ In the third section, a wider range of indicators will be used which will allow us to rank the regions and create clusters.

2. ICT investments and internationalization: Russian economy in international comparison

During the last 15–20 years, the ICT sector has made big progress. However the level of ICT development is different depending on the country and region. The most developed ICT sector is typical of both industrial countries (EU, the USA, Japan) and newly industrialized countries (Singapore, Malaysia, Thailand).⁴ The Russian ICT sector is 3–4 times smaller than that of the USA or of the EU but it has been growing since 2000 (Tables 1 and 2).

Table 1: ICT producing sector: dynamics of selected indicators in 1990-2000

Country	Share of GDP	Total employment	Labor productivity growth, 1990/1995	Labor productivity growth, 1996/2000
Russia	1,8 %	1,9 %	–7,8 %	6,4 %
Europe	5,9 %	3,9 %	6,7 %	8,7 %
USA	7,3 %	4,9 %	8,1 %	10,1 %

Source: Perminov and Egorova 2005

Table 2: Dynamics of internet users in Russia in 2000-2011

	2000	2001	2004	2005	2006	2007	2008	2009	2010	2011
Million people	2,9	4,3	18,6	21,9	25,8	35,3	38,4	41,5	61,4	70
%	2	3	13	15	18	25	27	29	43	49

Source: www.worldbank.org

At present the number of internet users in Russia is still lower than in industrial countries but higher in comparison with both CIS countries and world average data (Fig. 1).

As for the Network Readiness Index, the position of Russia lags behind industrial countries too. However some positive dynamics seem to be obvious. Russia achieved real progress in absolute ranking (from –0,56 in 2005 to 4,42 in 2012) and climbed from 78th place up to 58th (Fig. 2).

³ Another important indicator of a country's international activities is the volume of FDI attracted. This aspect is analyzed by the authors in the paper prepared for workshop 2 in Frankfurt-am-Main (1.06-2.06.2012). In this context some studies (Hamdani 2006 and Simon 2011) are to be mentioned.

⁴ According to some studies, „as a percentage of GDP, Europe's stock of ICT capital has fallen to about two-thirds of the level in the US, the word leader, having been close to parity in 1991“ (Thomas 2011).

According to the goals of this paper, there are two main questions to be answered:

- Is this growth a result of investment policy in the ICT sector?
- Does this growth contribute to the internationalization of the Russian economy?

First of all, some *methodological* problems should be mentioned. Investments in ICT are defined in accordance with the system of National Accounts of 1993. They cover the acquisition of equipment and computer software used in production for more than 1 year. Expenditure on software has only recently been treated as investment in the national accounts and methodologies still vary across countries (OECD 2007).⁵ That is why different indicators are used, which allow us to identify the most important trends characterizing both ICT investments in Russia, in comparison with other countries, and the contribution of ICT to the development of Russian international activities.

The dynamics of investments in telecommunications is shown on the Fig. 3. Russia has demonstrated sustainable growth in such investments since the beginning of the 2000's (with the exception of 2009). The volume of investment is comparable to that in such countries as Brazil, India or Germany. However they are clearly higher than in countries such as Ukraine, Kazakhstan, Malaysia, Hungary or Czech Republic.

Telecommunications are only one element of ICT. So, the analytical significance of this indicator is limited. Information technologies expenditures can also be considered as ICT investments. Information technologies expenditures in 2008 for selected countries are presented in Fig. 4. These expenditures in Russia are clearly less than in industrial countries. The interpretation of the level of these expenditures in comparison with some other countries could be different. The absolute expenditures (and not expenditures per capita) are shown. The volume of Russian expenditure exceeds for example some other countries such as Malaysia, Hungary, Czech Republic or Kazakhstan. However all of these countries have both different numbers of inhabitants and different economic structures. Thus, it remains unclear whether such volumes of expenditures could be enough to reach the real progress of ICT development and increase the international competitiveness of Russia.

Perminov and Egorova (2005) point out that the ICT investments in Russia are *relatively very low*. The main explanations of this phenomenon are as follows:

- inefficient government policy in this field;
- absence of high-tech stock markets;
- mostly small ICT ventures⁶;
- a very high level of monopolization and concentration of production in practically all sectors of the economy.

⁵ There are many studies about ICT investments (Löfgren 2006; Franklin et al. 2007; Inklaar et al. 2003; Shinjo and Zhang 2004), but in all these studies the ICT investments are not given as absolute quantities. So, in OECD reports the share of ICT investments at the non residential capital formations is considered.

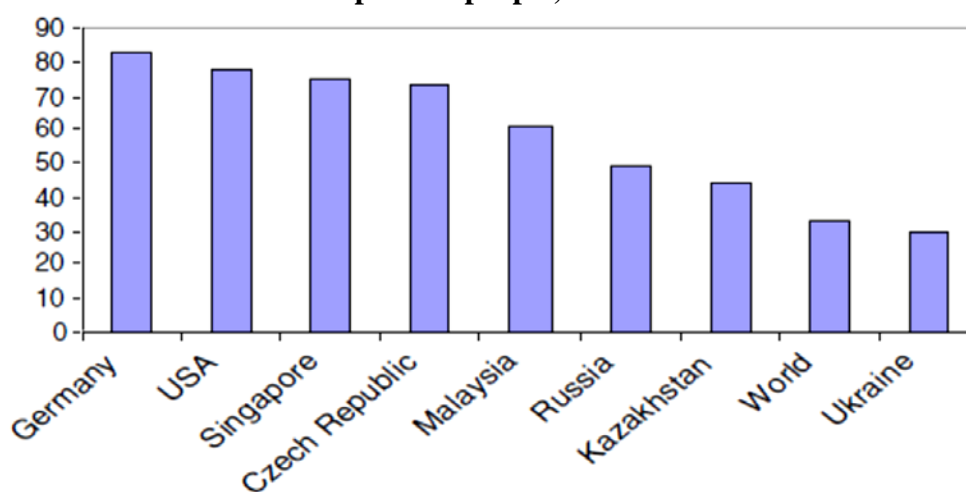
⁶ Small ventures are able to develop new types of ICT but their implementation on a large scale is impossible without the involvement of big market actors that control most of the market. The spread of ICT (for example the development of e-commerce) could lead to the liberalization of conditions for the competition. However Russian monopolists are not interested in such developments (Egorov and Perminova 2005).

Some other authors explain the low level of ICT investments in Russia by identifying such factors as the loss of the old education system (the education of engineers), the significant brain-drain of qualified staff and the lack of basis for high tech production.

The low level of ICT investment in Russia leads to some weaknesses characterizing Russian positions on international markets⁷ (Fig. 9, Appendix Figs. 13, 14, 15, 16, 17).

The aggregate exports and export of ICT goods and services are presented on Fig. 5a and b. The level of aggregate exports from Russia is higher than that of India (and many other countries) but clearly less in comparison with export leaders such as Germany, the USA or China.⁸ As for ICT exports, the weakness of Russia is much more significant. Thus, the ICT exports of Russia in 2010 equated to about 8 % of the level of the USA, 10 % of the level of Germany, 13 % of the level of India and 4 % of the level of China. This demonstrates the low level of international competitiveness of the Russian economy in ICT products. The data presented in the Figs. 6 and 7 confirms the weak position of the Russian economy in international competitiveness in general and in competitiveness in the market of ICT products in particular. The Russian economy lags far behind the export leaders in ICT market (Fig. 6). Brazil is the only one BRIC state which had the exports of ICT goods and services in 2010 less than Russia. In total exports, Russia had a relatively high volume (but incomparable with the USA, Germany, China or Japan). It is easy to explain this by the stable increase in oil prices.

Fig. 1: Number of internet users per 100 people, 2011



Source: www.eurostat.org

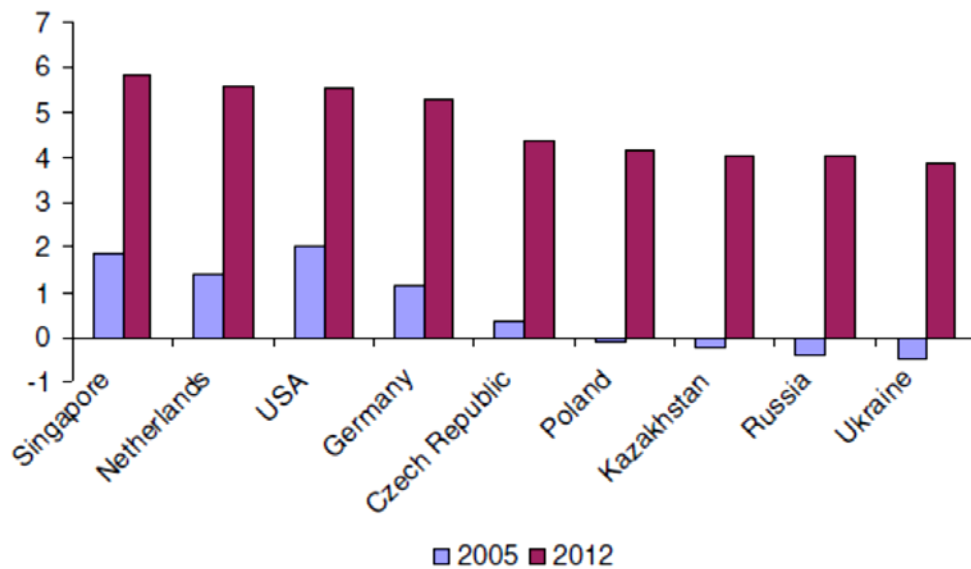
So, in spite of some progress in both the investments in ICT and their general development during the 2000's, it seems to not be enough in the context of global challenges. The contribution of ICT to the development of international activities does not lead to changes in the foreign trade structure of Russia which could be very important during the general liberalization of international trade.

⁷ Some authors analyze positions of different regions in the international trade of ICT products (Dunnewijk and Meijers, 2008)

⁸ More than a half of Russian exports constitute mineral products (oil and gas). Other countries primarily export manufacturing products (incl. ICT goods).

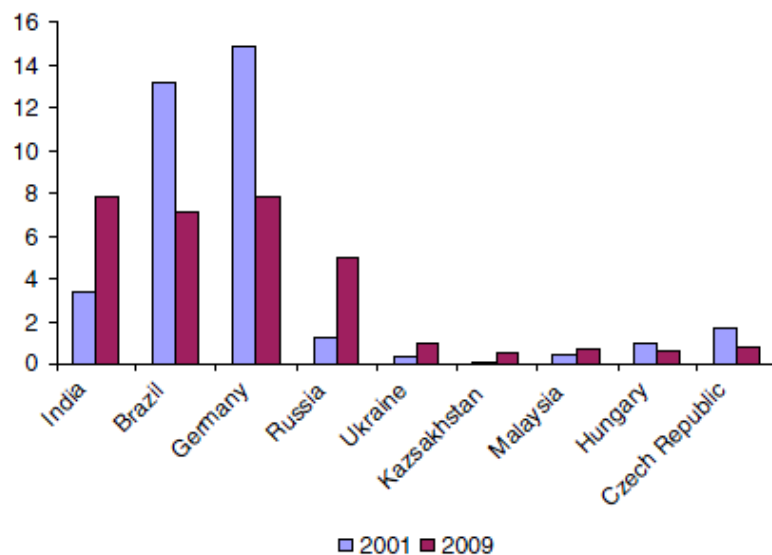
The possible contribution of ICT investments to the development of international activities are confirmed by the data presented in Figs. 8 and 9. The countries with a relatively high level of network readiness index have a high level of openness (Germany, Malaysia, Netherlands) or high absolute exports (the USA, China). Russia lags behind in both the absolute exports and the level of openness having a relatively low Network Readiness Index.

Fig. 2: Network Readiness Index in selected countries



Source: www.itu.org

Fig. 3: Investments in telecommunications in selected countries, bln USD

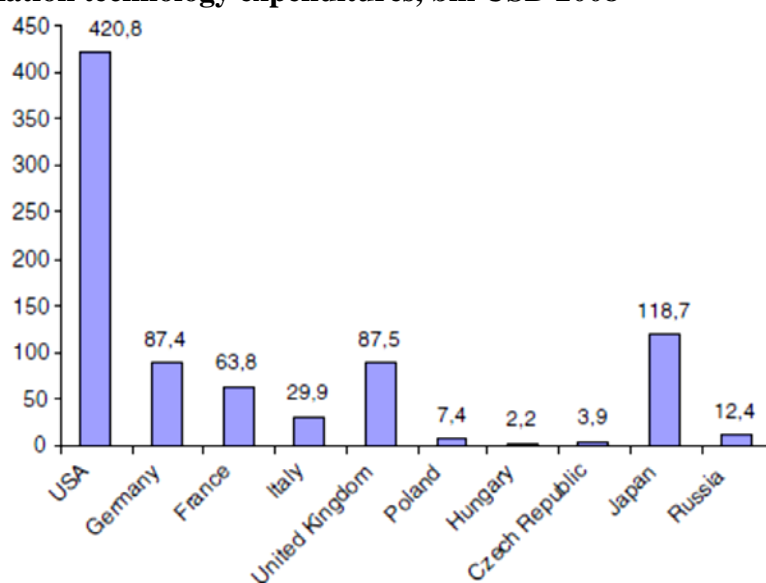


Source: www.eurostat.com

3. ICT investments and internationalization: comparative analysis of the Russian regions

The discussion in the previous section has shown that the growth of the ICT sector reinforces the development of international economic activities and thus the level of internationalization of countries' economies. This holds true for both the developed and emerging economies (Liu and Nath 2012). The Russian market for ICT has grown considerably during the last 10 years, (Petukhova and Strepetova 2012; Ershova and Shaposhnik 2013), which is reflected in particular by the growth of the Network Readiness Index. Investment in the Russian ICT sector has grown as well, especially investments in telecommunications, but also expenditures on information technologies.

Fig. 4: Information technology expenditures, bln USD 2008



Source: www.eurostat.org

To answer the questions of whether the growth of the Russian ICT market is connected with ICT investments and if the development of ICT contributes to the internationalization of the Russian economy, we will compare the performance of different Russian regions in relation to these issues. This analysis will help us to reveal the main factors supporting or hindering ICT development on the regional level as well as to understand the influence of ICT development on international activities and/or vice versa. The issues of the geographical inequality of ICT distribution, even in countries with high levels of information society development, nowadays arouses much interest among researchers (Acconcia and Del Monte 2003; Lasagni and Sforzi 2007; Barrios et al. 2008).

Due to the availability of information provided by the Federal State Statistics Service of the Russian Federation Goskomstat 2013), we will use investments in ICT equipment as one of the key parameters in our analysis. Investments of small enterprises are not reflected in the statistical data.

Investments of large and medium-sized Russian enterprises in ICT equipment reached 248,6 bln RBL in 2011 (approximately 6 bln Euro) which constitutes a growth of 46 % in current prices compared to 2010.

These investments are not distributed evenly among the Russian regions with Moscow attracting the dominant share of ICT investments (Table 3). The top 10 of 80 Russian regions attract over half (53,9 %) of the total investments in ICT equipment.

Most of the Russian regions mentioned in Table 3 are also leading in attracting all types of investments in fixed capital: for instance, Tyumen, Moscow, Krasnodar, St. Petersburg, Moscow region and Yekaterinburg. However, not all Russian regions attracting high volumes of investments in ICT equipment are characterized by the stable growth of this parameter. Table 4 confirms that investments in ICT equipment are volatile and have opposite trends in different Russian regions.

Table 3: Top-10 Russian regions attracting the highest volume of investments in ICT equipment, 2011

Regions	Share of total investments in ICT equipment, %
Moscow	22,2
Krasnodar	5,5
Irkutsk	5,1
St.Petersburg	3,7
Tyumen	3,6
Yekaterinburg	3,2
Moscow region	2,8
Samara	2,7
Tatar Republic	2,6
Novosibirsk	2,5

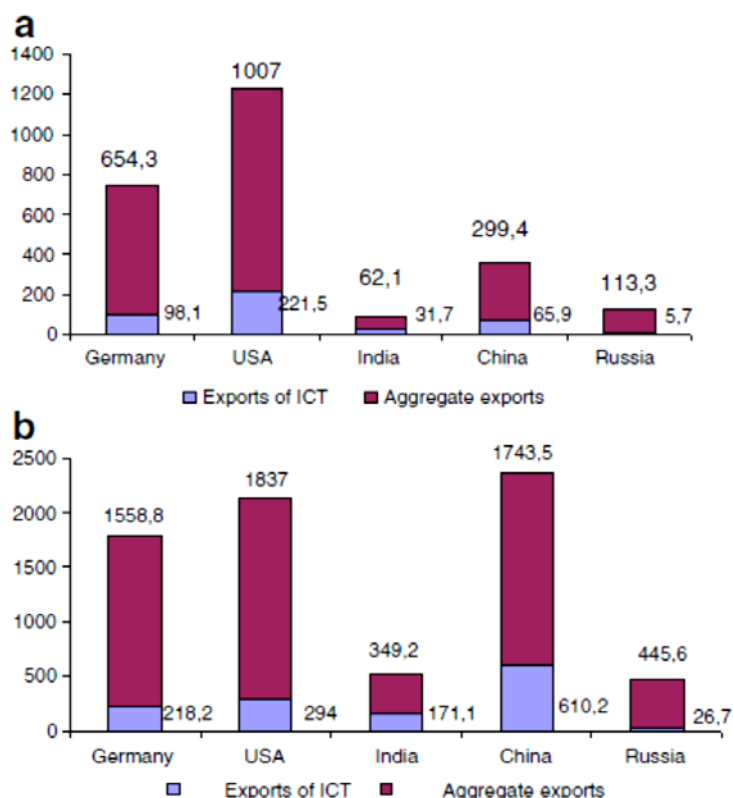
Source: www.gks.ru

Table 4: Russian regions with the highest positive and negative dynamics of investments in ICT equipment, 2010-2011

Regions	Dynamics of investments in ICT equipment, %, 2010–2011
Dagestan	896,8
Irkutsk	636,6
Trans-Baikal Territory	300,1
Kabardino-Balkaria	239,2
Northern Ossetia	180,4
Kurgan	–22,6 %
Mordovia	–24,6 %
Kaluga	–26,6 %
Chukotka	–33,2 %
Pskov	–41,9 %

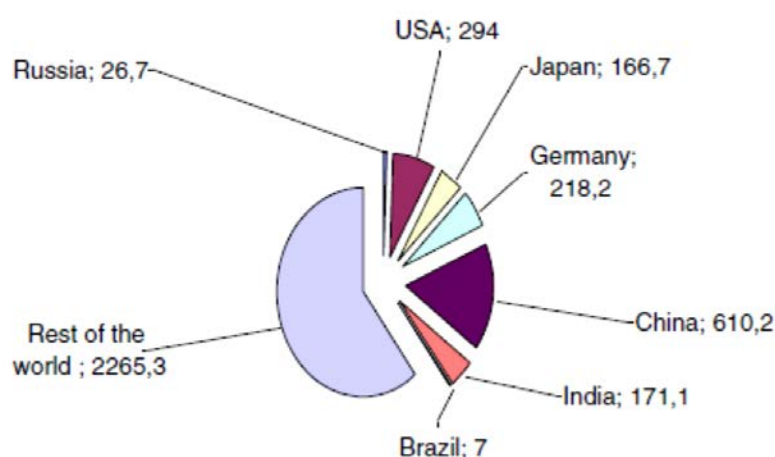
Source: www.gsk.ru; own calculations

Fig. 5: a Dynamics of aggregate exports and exports of ICT goods and services, bln USD, 2001, b Dynamics of aggregate exports and exports of ICT goods and services, bln USD, 2010



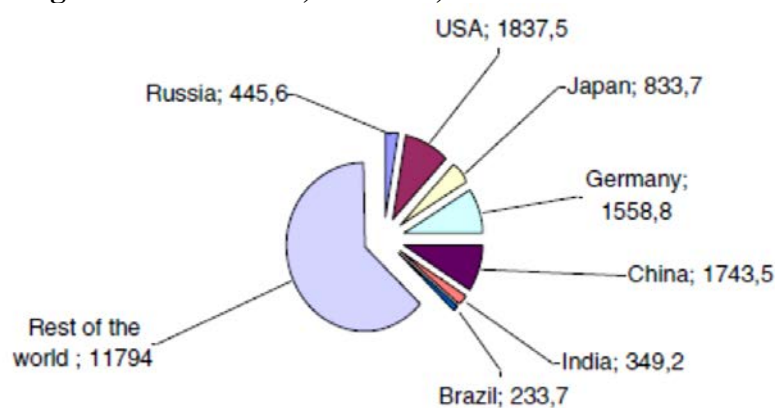
Source: www.worldbank.org, own calculations

Fig. 6: Exports of ICT goods and services, bln USD, 2010



Source: www.worldbank.org; own calculation

Fig. 7: Exports of goods and services, bln USD, 2010

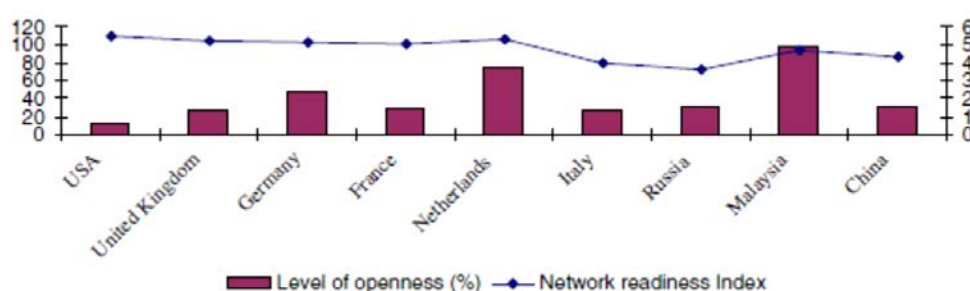


Source: www.worldbank.org; own calculation

The major increase in investments in ICT equipment in 2010–2011 is observed in the Northern Caucasus (especially in Dagestan, Ingushetia, Kabardino-Balkaria, Northern Ossetia and Chechnya). Investments in the North-Caucasian Federal District are financed to a large extent by the state budget (53.9 %–89.4 % in the above mentioned regions compared to 18.8 % on average in Russia). Thus, the fast growth of investments in ICT equipment in this Federal District may be explained by state priorities in the development of its economy.

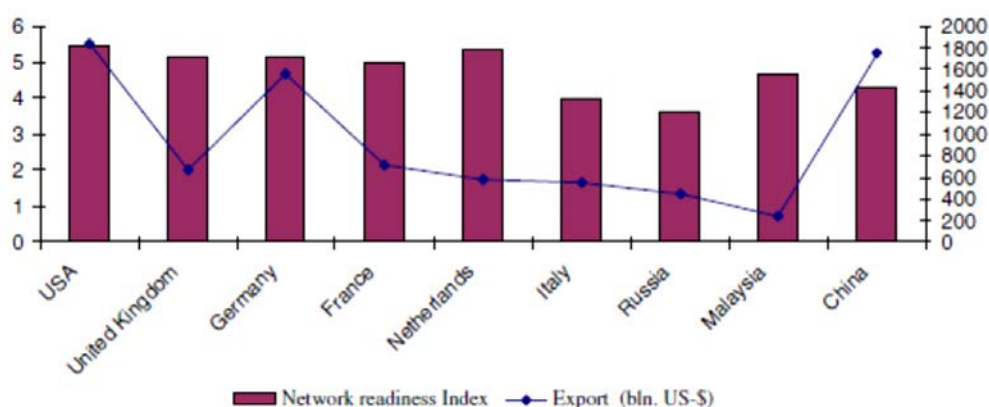
Due to the relatively high volatility of this parameter, a total and an average value of investments in ICT equipment in 2010 and 2011 will be used in further analysis.

Fig. 8: Network Readiness Index and level of openness, 2010



Source: www.itu.org

Fig. 9: Network Readiness Index and exports, 2010



Source: www.itu.org; www.worldbank.org

The size of the Russian regions varies from 11.5 million people in Moscow city to 50,500 people in Chukotka, with a median equal to 1.227 million people. That is why it is appropriate to analyze average per capita investments in ICT equipment. The leading Russian regions in this respect are (data of 2010–2011, thousand rubles):

- some of the regions rich in mineral resources (Tyumen – 7,52, Buryatia – 3,80, Murmansk – 3,59, Irkutsk – 2,88, Sakha Yakutia – 2,04, Novosibirsk – 1,98);
- regions attracting investments of all types (Moscow city – 3,68, Krasnodar, the host of the Olympic games in 2014 – 2,31);
- Far Eastern regions (Khabarovsk – 3,95, Magadan – 2,94, Chukotka – 2,15, Primorye – 1,83, Sakhalin – 1,80);
- the largest cities – industrial centers (Nizhny Novgorod – 1,78; St.Petersburg – 1,76).

The regions with the lowest figures of average per capita investments in ICT equipment (data of 2010–2011, thousand rubles):

- regions of the Northern Caucasus (Dagestan – 0,10; Ingushetia – 0,15; Kabardino-Balkaria – 0,35; Northern Ossetia – 0,48; Chechnya – 0,54);
- regions with a low gross regional product (GRP) per capita (Altay – 0,17; Penza – 0,50; Chuvashia – 0,53; Kalmykia – 0,54; Adygea – 0,55; Mari El – 0,56; Kurgan – 0,56);
- other regions (Leningrad region – 0,4; Udmurtia – 0,49; Vologda – 0,66).

It is a well-accepted statement that a high level of ICT development paves the way for more possibilities of spreading knowledge and revealing entrepreneurial creativity. ICT might be helpful in gaining knowledge of foreign markets, in finding partners abroad and in coordinating activities in foreign markets. Thus, a high level of ICT development contributes to the internationalization of economy. The data on the Russian market also shows a very high correlation between investments in ICT equipment and the level of internationalization of the Russian regions reflected in the volumes of export, import and foreign investments:

- correlation between the investments in ICT equipment (2010–11) and the volume of exports (2011) in Russian regions is 0,933;
- correlation between the investments in ICT equipment (2010–11) and the volume of imports (2011) in Russian regions is 0,904;
- correlation between the investments in ICT equipment (2010–11) and the foreign investments (2011) in Russian regions is 0,911.

This dependency might be two-way: not only that better ICT development contributes to easier foreign trade operations and makes the region more attractive for foreign investments but also higher investments in ICT equipment might be a result of the active participation of foreign companies in the region's economy. Foreign companies might not only make large investments in ICT equipment themselves but also bring modern standards of business communication and control mechanisms to the Russian partners and competitors. Implementation of these communication and control procedures requires acquisition and modernization of ICT equipment. A high positive trade balance might build a financial foundation for high investments in ICT equipment in some regions.

The Russian regions having the highest levels of per capita investments in ICT equipment show also the best results in parameters measuring the level of internationalization. Thus, the top 20 (out of total 80) regions according to per capita investments in ICT equipment account for 72,6 % of the total Russian exports and 83,3 % of the total foreign investments in the Russian economy (data of 2011). Development of ICT requires not only investments to acquire computer equipment and build telecommunication networks. These are knowledge intensive technologies that demand a well educated and highly qualified work force, even in the process of their application, not to speak about the efforts to create new hardware and software.

Knowledge cannot be created and distributed to a wide selection of employees in a fast and simple manner. Development of knowledge in ICT requires a wellfunctioning educational infrastructure as well as long-term work by big groups of specialists on the fulfillment of large-scale ICT projects.

That is why we considered it expedient to include the share of those employed in the ICT sector in the total employment in our analysis of investment attractiveness of ICT sectors of different Russian regions. ICT employment in different European regions is analyzed in several studies, for instance, by Koski et al. (2002). The share of those employed in the ICT sector out of the total workforce in Russia was 2,0 % in 2011. This variable seems to be more stable in different regions than the investments in ICT equipment.

The maximum values of the share of those employed in the ICT sector are observed (Table 5) in:

- Moscow and St.Petersburg;
- the regions close to Moscow city with lower salary levels and high development of industry and education (Vladimir, Kaluga, Ryazan, Moscow region, Orel);
- research and industrial cities (Tomsk, Penza).

Table 5: Russian regions with the highest share of those employed in the ICT sector as a percentage of the total workforce, 2011

	Region	Share of those employed in the ICT sector, %
1.	Vladimir	4,3
2–3.	Kaluga, Ryazan	3,8
4.	St.Petersburg	3,7
5–6.	Moscow city and region	3,4
7.	Penza	3,1
8–9.	Tomsk, Mari El	3,0
10–11.	Orel, Kaliningrad	2,9

Source: www.gks.ru

The mutual interdependency of both human and capital investments in ICT sector and parameters showing the level of internationalization of the specific regions suggests using hierarchical cluster analysis to discover intrinsic relations between these characteristics. Hierarchical cluster analysis is used to classify sets of data when the number of groups is not known beforehand. A clustering technique was used earlier to analyze ICT developments on a national level by Kun-Huang (2011).

The variables chosen to describe the Russian regions in the hierarchical cluster analysis are the following:

- average investments in ICT equipment per capita, 2010–2011;
- share of the workforce employed in the ICT sector, 2011;
- GRP (gross regional product) per capita, 2010;
- export per capita, 2011;
- foreign investments per capita, 2011.

Export and foreign investments characterize the level of internationalization of each region; while investments in ICT equipment and the share of those employed in the ICT sector characterize capital and human input into the development of ICT. Large volume of GRP seems to be an important prerequisite for the ICT sector development, which might be even more important than the volume of foreign investments. GRP shows the scope of economic activities in the region influencing the corporate demand for ICT products and partly private and municipal demand.

Squared Euclidean distance was used to measure the similarity of data. As an algorithm of cluster analysis, Ward's method was chosen. The initial data were standardized. SPSS software was used to run the hierarchical cluster analysis.

Seven clusters were identified, four of which contain many cases and three contain just one or two regions. Four main clusters with the examples of regions representing each cluster are described in Table 6 and Figure 10. These are:

- “*ICT producing regions*”. These regions have the highest level of employment in the ICT sector (1,9 times above the Russian average). So, the input of human resources is large but the involvement of other factors for the successful development of ICT production is not proportionate. We can particularly mention the lack of investments in ICT equipment (1,2 times below average) and foreign investments in general (1,6 times below average).
- “*Traditional industrial and research centers*”. These are the regions which reached the peak of their development in the industrial era. They can still boast of a very strong technical education and a good research infrastructure. The share of those employed in the ICT sector is above average in these regions (1,2 times higher) but GRP and investments in ICT equipment per capita are below average (GRP – 1,5 times lower than Russian average). The level of internationalization of these regions is quite low; the volume of export per capita is 3 times below the Russian average. Especially striking is the volume of foreign investments per capita, which is 4,1 times less in this cluster than the average in Russia..
- “*Regions modernizing their economy*”. These regions are enjoying a well developing economy with a rather good level of internationalization. Their per capita investments in ICT equipment is slightly above average in Russia. The same can be said about their per capita GRP. However the input of human capital into ICT development might not be sufficient because the share of those employed in the ICT sector is below average for Russia (1,5 times below average). The economic development in this cluster is based mostly on domestic investments because the level of per capita foreign investments is 3,5 times below average.
- “*Regions with weaker economy*”. These territories have a striking lag in all analyzed parameters from the Russian average, in particular very low per capita investments in ICT equipment (2,2 times below average). Their economy cannot be considered as really included in global economic relations because their products have as yet not found their way to export markets (per capita export 8 times below average) and their economy is hardly attracting any foreign investment (8,3 times below average).

Table 6: Results of the hierarchical cluster analysis: characteristics of the main clusters

Cluster	Population, people	Per capita investments in ICT equipment, rubles	Employment in ICT sector, %	Per capita GRP, rubles	Per capita export, USD	Per capita foreign investments, USD
ICT producing regions	15551 300	1230,0	3,8	216069	1711,4	844,8
Traditional industrial and research centers	37976 100	1255,8	2,4	172468	1136,9	328,1
Regions modernizing their economy	44248 798	1564,2	1,3	247995	2977,4	386,7
Regions with weaker economy	29701 700	671,9	1,2	111616	423,4	162,8

Source: Own calculations

Fig. 10: Results of the hierarchical cluster analysis: examples of regions in the four main clusters

<p><i>Cluster 1</i> <i>ICT producing regions</i> 5 regions: St.Petersburg, Kaluga, Ryazan, Vladimir, Moscow region</p> <ul style="list-style-type: none"> • highest level of employment in ICT sector; • lack of investments and markets for rapid development 	<p><i>Cluster 2</i> <i>Traditional industrial and research centers</i> 25 regions: Yekaterinburg, Nizhny Novgorod, Novosibirsk, Omsk, Tomsk</p> <ul style="list-style-type: none"> • employment in ICT sector above average; • GRP and level of internationalization below average
<p><i>Cluster 3</i> <i>Regions modernizing their economy</i> 25 regions: Krasnodar, Primorye, Sakha Yakutia, Khabarovsk, Tatar Republic</p> <ul style="list-style-type: none"> • investments in ICT equipment above average; • employment in ICT sector below average 	<p><i>Cluster 4</i> <i>Regions with weaker economy</i> 21 regions: regions of the Northern Caucasus, Adygey, Atlay Republic, Tyva, Kalmykia</p> <ul style="list-style-type: none"> • very low investments in ICT equipment; • very low level of internationalization

Apart from the Russian regions which could be united into relatively well populated clusters, there are some Russian territories whose characteristics are too distant from all others. So, in the hierarchical cluster analysis they form clusters consisting of one or two territories. These are:

- *Moscow city (cluster 5)*. In a very centralized Russian economy, the capital is the territory with a large per capita GRP (2,8 times above average), high investments in ICT equipment (2,5 above average) and a high share of employment in the ICT sector (1,7 times above average). This is also the city attracting the most foreign investment (7,9 times more than average) and carrying out much of the export activities (4,8 times more than average).
- *Chukotka (cluster 6)*. This is the region with some per capita parameters quite close to Moscow city but the relative sizes of these two regions as well as economic foundations behind these parameters do not allow uniting them in one cluster. Chukotka is characterized by a high GRP per capita (3,2 times above average) and high foreign investments per capita (4,8 times above average) but low exports per capita (3,8 times below average).
- *Tyumen (cluster 7)*. Here the per capita GRP is very large (3,7 times above average), per capita exports and foreign investments are large as well (13,2 times and 6,9 times more than average relatively). The region is prosperous and able to spend a lot on ICT: it is characterized by very high investments in ICT equipment (5,1 times above average). However it might be assumed that ICTs are only applied and not developed there because the region has a relatively low share of workers employed in the ICT sector (1,2 times below average).
- *Sakhalin (cluster 7)*. The situation on the island of Sakhalin is close to that in Tyumen: GRP per capita 3,8 times above average, exports 9,5 times above average, foreign investments 10,5 times above average. However much less attention is paid to ICT development: the share of the workforce employed in the ICT sector is 1,8 times below average for Russia while investments in ICT equipment are close to the Russian average.

Thus, the hierarchical cluster analysis allows us making the following conclusions. High investments in ICT equipment in some regions are not followed by the corresponding high employment in the ICT sector. This means that most investments in ICT equipment in Russia are done by industries not belonging to the ICT sector. Thus, ICT equipment is used mostly to improve the performance of different industries, especially to develop export oriented branches of the Russian economy (natural resources).

The regions with high employment in the ICT sector, and high research potential, mostly lack investments in ICT equipment. This situation inevitably hinders the development of ICT production. The experience of restructuring European industrial centers has to be studied (Tripl and Otto 2009; Rabellotti et al. 2009). Thus, one may conclude that investments in ICT equipment to the present day have had no decisive influence on modernizing the structure of the Russian economy.

4. Russian ICT sector after the accession of Russia to the WTO

New trends in the internationalization of the Russian economy could be connected with the accession of Russia to the WTO (which happened in August 2012). Now the WTO rules control more than 97 % of world trade volumes. The transformation of international trade principles according to WTO standards will go step by step until 2020. The accession to the WTO can surely be positive in the context of the internationalization of Russia. As a WTO member, Russia will be more attractive for foreign investment. Russian authorities will get the opportunity to protect their exporters based on international standards. Russia will play a part in the modernization of international trade rules.⁹

What effect could the WTO entrance have on the Russian ICT sector? Nowadays it is difficult to identify all possible trends exactly. Experts have different points of view. First of all, the reduction of custom tariffs is to be expected. Russia's average tariffs on ICT products are currently 6,7 %. After full implementation of its WTO accession commitments, Russia's average tariff on ICT products will be reduced and bound at 4 %. Russia has committed to join the Information Technology Agreement (ITA), providing duty-free treatment on all ITA products within 3 years. As a result, information technology products from computers to telecommunications will enter the Russian market duty-free. Besides that, other reforms are to be expected in the following spheres:

- transparency;
- import licensing;
- intellectual property rights;
- government procurement;
- E-commerce and cross-border-service.

Some experts point out that WTO accession could be positive for Russia due to the following factors:

- development of international competition will motivate Russian companies to search for new opportunities with the aim of increasing production efficiency. This is directly connected with additional investments in ICT infrastructure;
- reducing custom tariffs will lead to price reductions and bring benefits for consumers of ICT products and services;
- liberalization of the financial sector will improve the credit conditions for the Russian ICT companies.

Not all experts¹⁰ are so optimistic in their estimations of the prospects of the Russian ICT sector. Many of them identify both positive and negative effects. For instance, WTO accession might bring benefits for Russian exporting companies while internally oriented companies get some additional disadvantages. It is also possible to speak about considerable problems for retail trade originating from competition with e-commerce. Some benefits for companies not engaged in the shadow market might be expected. It is

⁹ According to the former Russian Minister of Finance A. Kudrin, the WTO accession could lead to additional economic growth of 3-4 % in 10 years (0,4 % per year).

¹⁰ The discussion of experts is summarized in the paper of Gerachenko 2012.

possible to underline two opposite trends in the demand for ICT products such as the decline due to cost cutting by the Russian processing industry and growth due to the need of the processing industry to increase competitiveness by means of ICT application.

Thus, generally speaking, Russia's accession to the WTO should speed up the progress of internationalization of the economy and bring new impulses for the development of the ICT sector. However the consequences for the next several years remain unclear.

5. Conclusions and recommendations for further research

At present, one can observe two important trends in the economies of many countries: the development of an information economy and the increase in the level of globalization. These two trends are interconnected: on one hand, information and communication technologies help in solving the problems resulting from geographical distance between countries; on the other hand, ICTs can themselves be traded on the global level.

The development of ICT, as with that of any other sector, requires investments. These investments are relatively low in Russia compared with the global leaders. It leads to some deficits in the international activities of Russia. This is true, for example, both for exports of ICT goods and services and the share of those exports compared to total exports. Also the weaknesses of Russia become clear through comparison of network readiness indexes and levels of openness.

It is important to consider the presence of another prerequisite for the successful development and application of ICT equipment: well-educated human resources working in the ICT sector. Only the combination of modern equipment and the sufficient input of human resources can bring significant progress to ICT development.

In this paper a comparative analysis and a hierarchical cluster analysis of Russian regions were used to find out if larger investments in ICT equipment are followed by the corresponding increase in the share of the workforce employed in the ICT sector and if there is a connection between the level of investments in ICT equipment and the level of globalization of specific Russian regions. The analysis revealed that the regions attracting the most of investments in ICT equipment are also leading in the volumes of export, import and foreign investments.

However, this correlation may be interpreted as follows: the companies and authorities of "richer" regions which are more involved in global economic activities are able to acquire more ICT equipment to ease coordination and control in different industries. As larger investments in ICT equipment are not followed by the corresponding high share of employees employed in the ICT sector, these investments do not lead to an increase in development and production of ICT products and, consequently, to the export of these products.

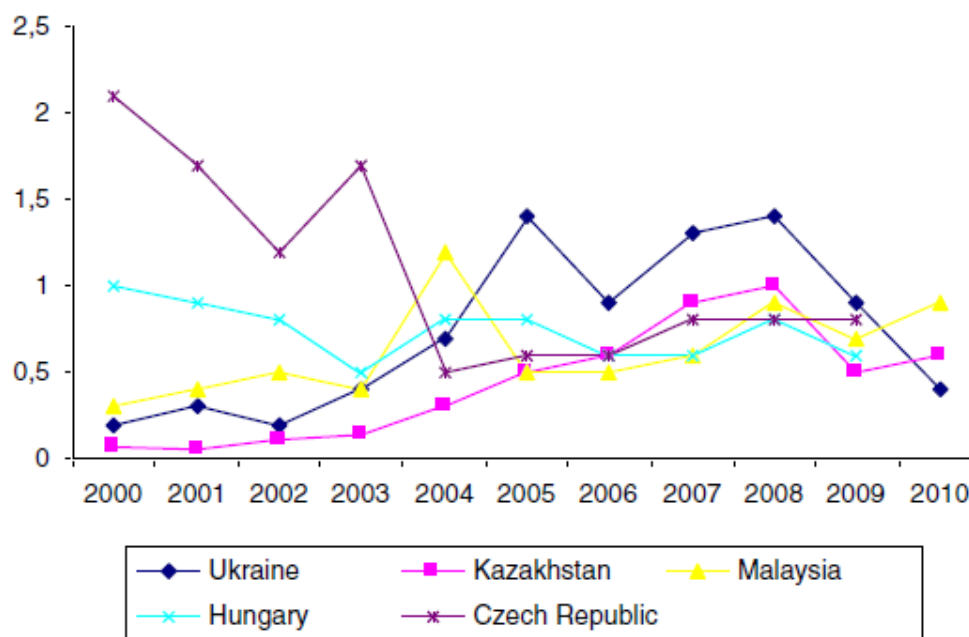
The disproportions in the regional development of the Russian economy are also seen in the issues concerning ICT development. There is a considerable number of regions that are more or less excluded from the processes of globalization and building the information

economy. Several regions exporting natural resources or getting support for the modernization of their economy have the possibility to invest a lot in ICT equipment. Regions with the highest research potential are not leading in expenditure on ICT equipment. Only Moscow city shows a more or less balanced approach to the development of the ICT sector.

This research has some limitations which can be overcome by further research. First of all, more variables can be included in the analysis, for instance, characterizing education as an important prerequisite for ICT development. Secondly, the structure of export, foreign investments and GRP should be analyzed in more detail to find out what industries make the highest investments in ICT equipment. Thirdly, the population density should be considered in combination with investments in ICT equipment.

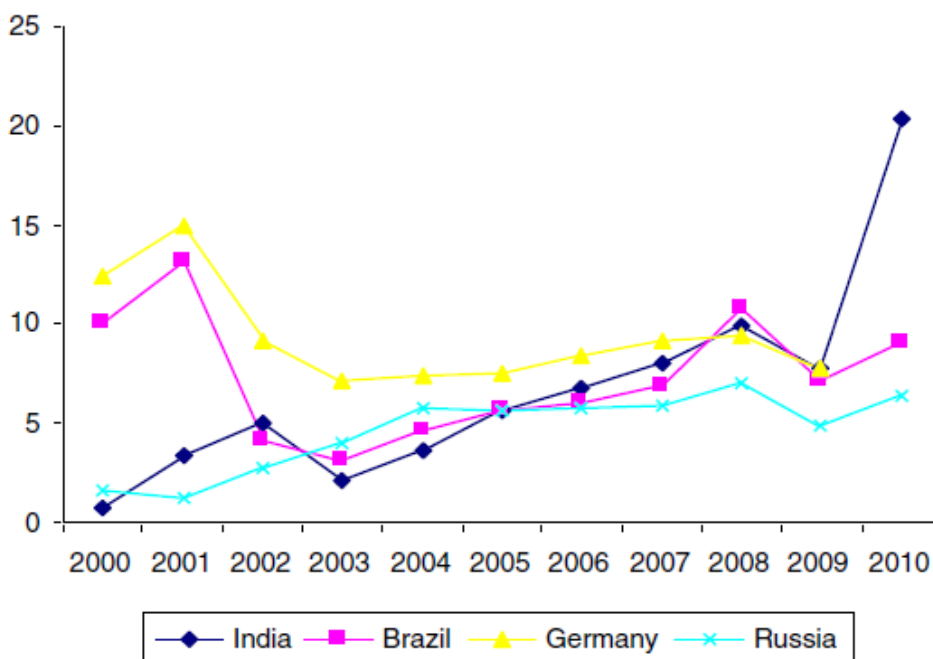
Appendix

Fig. 11: Investments in telecommunications in selected countries, bln USD



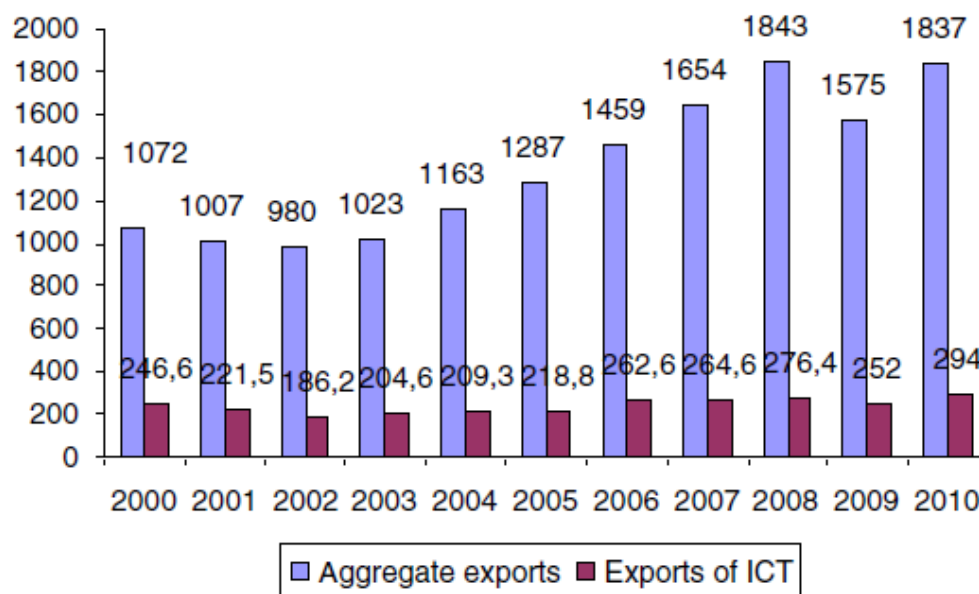
Source: www.eurostat.com

Fig. 12: Investments in telecommunications in selected countries, bln USD



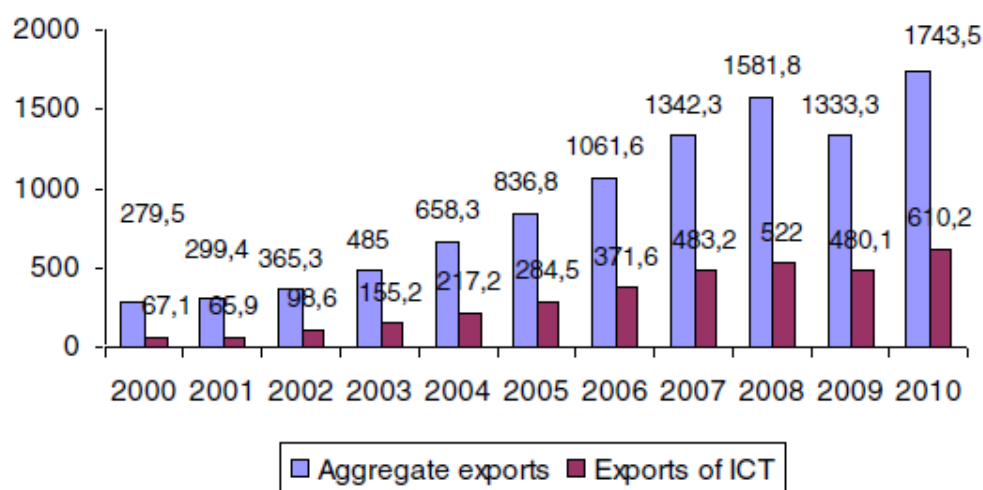
Source: www.eurostat.com

Fig. 13: Dynamics of aggregate exports and exports of ICT goods and services, the USA, bln USD



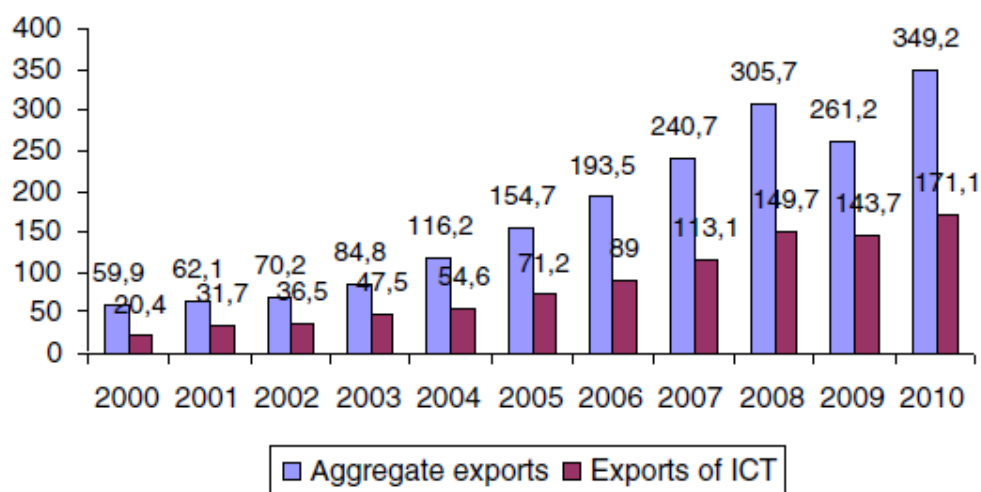
Source: www.worldbank.org, own calculation

Fig.14: Dynamics of aggregate exports and exports of ICT goods and services, China, bln USD



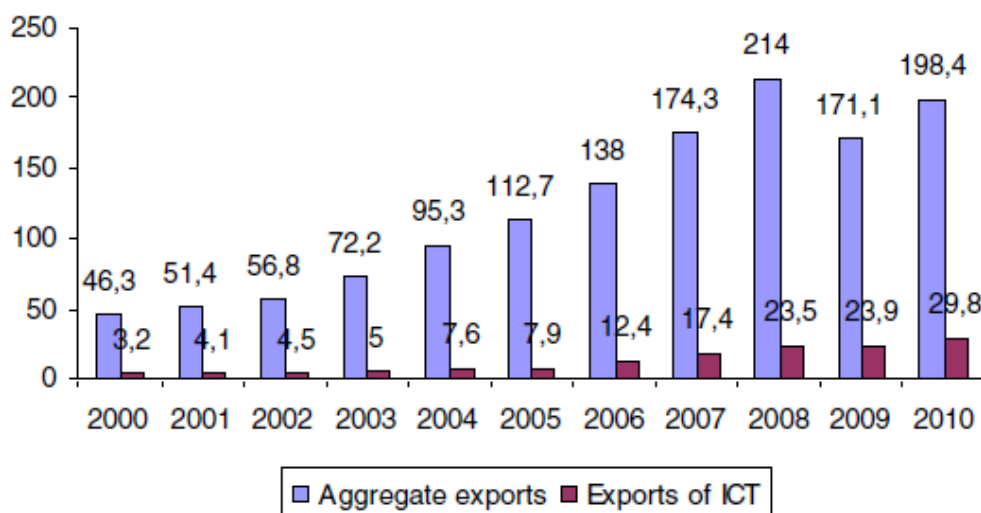
Source: www.worldbank.org, own calculation

Fig.15: Dynamics of aggregate exports and exports of ICT goods and services, India, bln USD



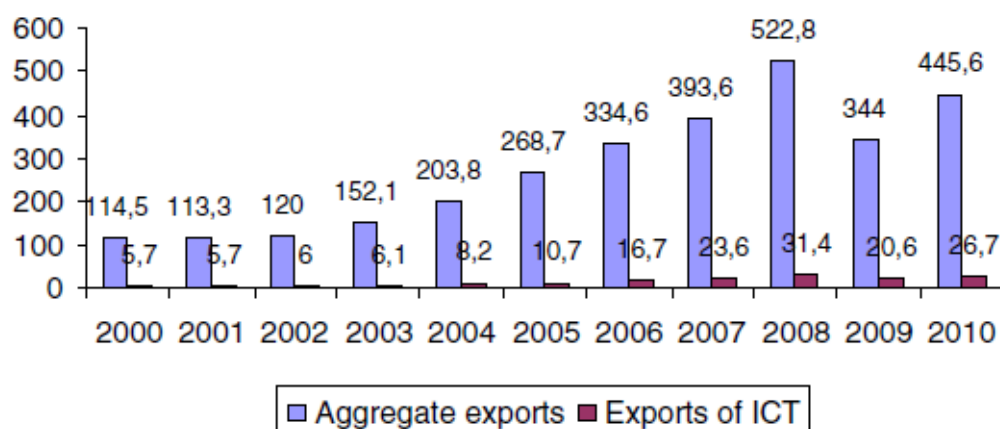
Source: www.worldbank.org, own calculation

Fig. 16: Dynamics of aggregate exports and exports of ICT goods and services, Poland, bln USD



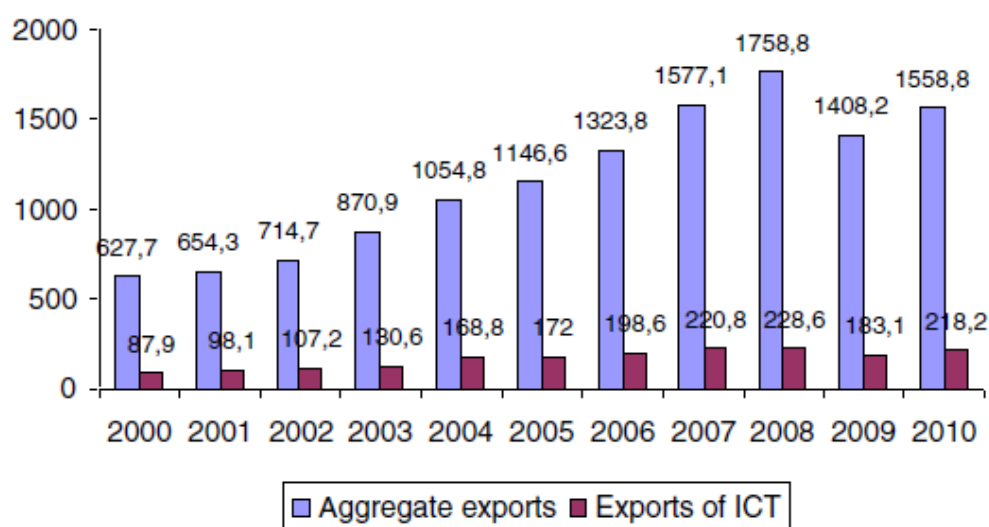
Source: www.worldbank.org, own calculation

Fig. 17: Dynamics of aggregate exports and exports of ICT goods and services, Russia, bln USD



Source: www.worldbank.org, own calculation

Fig. 18: Dynamics of aggregate exports and exports of ICT goods and services, Germany, bln USD



Source: www.worldbank.org, own calculation

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