

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2015; 1(166): 69-72

JEL 339.012 (048)

УДК 339.012

DOI: dx.doi.org/ 10.17721/1728-2667.2015/166-1/10

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THE ANALYSIS OF FOREIGN DIRECT INVESTMENTS IN SPHERE OF NANOTECHNOLOGY INNOVATIONS IN EUROPEAN UNION

The paper studies present state of direct investment in technological innovations in the European Union. The EU member states are found to demonstrate different economically motivated preferences as to investment in nanotechnology. The EU investment strategies are assessed from the viewpoint of challenges facing developing and transition economies.

Keywords: nanotechnology, nanomaterials, investment, innovation, ecology.

Introduction. With fast growing rivalry for leadership in promising areas of the global market it is important to determine each country which can provide her successful participation in this competition and will receive an opportunity to qualify for a future technological rent. Fulfilled requirements and activity in the field of research and development are not of the most important case but also the action appropriate to the efforts of competitors, aimed at preparing for the coming technological revolution. It is largely attributed to the widespread use of nanotechnology.

The stakes in the struggle for the leadership of nanotechnology are very high. From the results of this competition depends not only on the country's place in the international division of labor, but also its role in the global financial system. With all the possible adjustments of the system it will continue to serve the appropriation of technological rent-leading innovation competition countries. The higher the demand for advanced technology, the more attractive is the currency of the country that can offer such technology. Position of the countries in the new global division of labor is planned to be determined by the year 2020, when the characteristic of this wave of technology will become dominant in the leading world economies. By this time the restructuring of the global financial system can be completed.

Not surprisingly, the nanotechnology race participants are closely observing the actions of each other. Comparative analysis of the efforts and achievements of the countries and regions in the field of nanotechnology presents many foreign Foresight studies and research reports. One of very important goal of this research is to work out recommendations for future development of direct investment into nanotechnologies sphere as an innovative sphere.

Reserch. Europe has not managed to become a leader in the development of information and communication technologies and are now concerned that a similar could happen with the new wave of technology. In "The Sixth Framework Program for Research and Technological Development" (FP6) nanotechnology are among the priorities of European research [4]. This priority is preserved in "The Seventh EU Framework Program for Research and Technological Development" (FP7 2007-2013) [5]. The European Commission – the largest sponsor of nanotechnology research in Europe.

Until now, the EU hopes to rivalry lay nanotechnology on the formation of a kind of "common market" of relevant studies and their active financing process. However, so far only a united Europe has achieved leadership in nanotechnology number of scientific publications which is

significantly inferior to U.S. in particular, the number of nanotech patents.

When analyzing the reasons for the lag of the EU on the U.S. marked as a weak support of European nanotechnology research from business and less clear compared to the U.S. and Japan.

Among the states – members of the European Union, which collectively spend on nanotechnology much more money than the Commission, the leader is Germany, followed by France and the United Kingdom.

With foreign direct investment, the picture looks different. In Europe, only a third of the funding comes from the business. In U.S. private attachment cover 54% of the cost, and in Japan – two thirds. In absolute terms, EU spending's on research in the field of nanotechnology are less than 2.5 billion EUR. It reflects the difference between Europe and its competitors on nanotechnology research: the level of public funding is comparable, but the European industry is lagging behind the other participants in the race.

The main purpose of this study is to analyze the processes of direct investment of innovative technologies, such as nanotechnology, on the example of European Union, France and Ireland.

Nanotechnologies are applied in production of over 80 groups of consumer commodities and of over 600 types of raw materials, component parts and industrial equipment.

World nanotechnologies market shows the annual growth by 15 – 17%. Currently the products manufactured with the use of NT-technologies account for about 0.01% of global GDP. In the structure of NT production of 2012 the leading role was assigned to chemical industry, academic pursuits (intermediary products, as a rule – custom-made ones) and electronics. In the global NT-structure the production of NT materials dominate.

The largest consumers of goods of nanotechnologies market in 2011 were the following:

- environmental companies (56% of overall market volume);
- electronics industry (20.8%);
- energy industry (14.1%) [6].

Such an allocation ,in the experts' opinion, is to change. The demand for NT products, according to the estimations of Lux Research, is to be allocated by 2015 among the market directions as described below:

Potential Demand for Nanotechnology Products in 2015 (%)

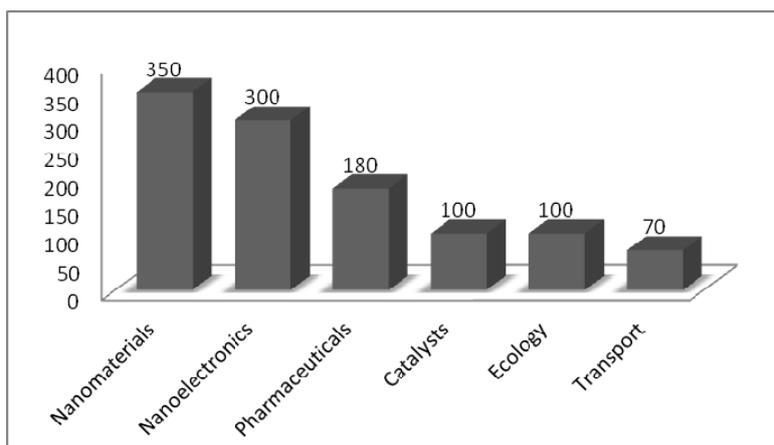


Fig.1. Potential demand for nanotechnology products in 2015

Source: designed by authors

According to the forecast, the highest demand will be observed for NT materials: carbon NT tubes, NT wires, NT porous materials, nanoparticles, NT-structured materials, dendrimers, quantum dots, fullerenes and products of NT electronics.

Essential number of companies working in the sphere of nanotechnologies is concentrated in the EU countries contains data on annual financing of nanotechnologies in the leading EU companies and agencies.

Allocation of foreign investment projects in economy sectors of France was similar to general allocation of the

EU investments. In 2011, France was among the leaders in attraction of foreign investments into industry, particularly – in chemical industry, metal processing and agricultural and food sector.

The average amount of investments in the field of nanotechnologies in France made 206.7 million EUR per year in the period of 2007-2011. The surge of nanoscience and nanotechnologies in the country is connected to the number of government projects, particularly with the Nanotec 300 that gave rise to influx of foreign investments at the first stage.

Table 1. Foreign investment in the nanotechnology sector in France in 2007-2011 (in millions of EUR)

	2007	2008	2009	2010	2011	Total for the period
Investments in mill.EUR:	153,8	174,5	202,7	235,6	270,6	1037,3

Source: European Nanotechnology Landscape Report 2011

At the same time, the investments got an uneven allocation in the period concerned. Some relevant stagnation was observed in the field of micro technologies and microelectronics due to decrease of capital expenses in the field of microelectronics (1.7 million EUR in 2007-2011). In the meantime, rather strong growth in amount of over-

all operational costs in the period of 2010-2011 was observed (61.4%) that was a logical outcome of investments made in the previous years.

As for geographic allocation of investments, relevant data are provided in the Table.

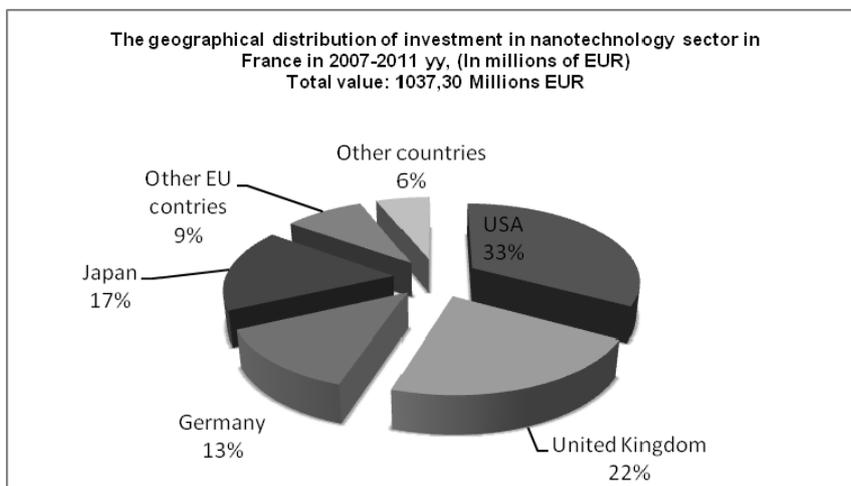


Fig. 2. Geographical distribution of investment in nanotechnology sector in France in 2007-2011 yy.

Source: designed by authors

Over the last few years the intense growth and development of nanotechnologies market and productions that include nano-components can be observed in the world. Optimistic predictive estimates of the market in 2015 reach 2.4 trillion USD. During the last years over 16,000 nanotechnology companies were created, and their number doubles every 1.5-2 years. The USA, Japan, Germany and South Korea are the leaders of global nanotechnologies market. France belongs to the "B league", and Ireland is a common player in the world market.

In Europe, the process of establishment and development of nanotechnologies is coordinated by the European Nano Business Association – a non-commercial organization founded in 2002. Its main objective is the facilitation of the development of strong and competitive European industry based on the use of nanotechnologies. The ENA's mission lies in ensuring professional development of the NT-business emerging in the EU. The EU states followed the path of scientific and technological potential development through integration of efforts of all the EU member states. The number of companies engaged in nanotechnologies is approximately the same in the USA and Europe, while about one half of the European companies are located in Germany.

Overall amount of investments into NT in 2012 made 13.9 billion USD. Influx in the sector of private investments became the main trend of the last year, while corporate expenses for NT research became the main source of financing, and relocated the public investments to the sidelines. The role of venture capital in the development of nanotechnologies is rather small – only 0.8 billion USD of investments fall to its share. The USA accounts for 90% of total venture financing amount [8].

The developments of NT projects do not earn much profit, but many people consider this direction to be a rather attractive financial perspective. France allocated 7.9 billion EUR for stimulation of scientific and research activity, including 1 billion EUR for research centers and 1 billion EUR for laboratories. Partially the funds were assigned in the sectors of bio- and nanotechnologies. For the purpose of foreign investors' stimulation, France offers the best conditions for tax return upon condition of performing scientific research, including those in the sphere of nanotechnologies.

France is one of the most dynamically developing states in the sphere of scientific research. High concentration of qualified staff, excellent research institutes in the state sector, huge national investments as well as modernized university programs are crucially beneficial for France in this respect.

Over the last 10 years 330,000 jobs were created in France within the framework of over 6,000 new foreign investment projects. Special attention is paid to the investments into new technologies. For instance, over the last 10 years France took over 320 projects in the field of new technologies for research and development with foreign investments.

The average amount of investments into the field of nanotechnologies in France made 206.7 million EUR per year for the period of 2009-2013 [9]. The analysis of economic indicators highlights the attractiveness of France as an object for foreign investments, given its position in the European Union, size of domestic market, infrastructure quality, labor force skills and quality of life in the country.

Economic attractiveness of the country is connected with a broad range of macroeconomic criteria. The main indicators include: market size, human resources, scientific research and innovations, infrastructure, administration and financial conditions, investments and labor expenses (including taxation) as well as quality of life [11].

Currently also Ireland is an advanced center of direct foreign investments. For several decades Ireland has been a beneficial place for the companies set up in Europe. Over 1,000 companies operating in various spheres located their offices in Ireland: IT, cloud data processing, social networks, software development, financial services, medicine and biology, international services. Ireland ensures its investors high profits due to combination of the lowest in the world corporate tax rate that is 12.5%, structured tax benefits for research and development, skilled and universal labor resources and economy with competitive costs [10].

In 2012, many new transnational corporations and new companies located their research centers and development centers here. For several decades Ireland has proved itself to be the beneficial place for the companies set up in Europe. The key advantages are the following:

- business supporting culture;
 - common law system similar to the English common law and known to transnational corporations of the USA;
 - low corporate tax rate – 12.5%;
 - relief from corporate tax for dividends paid to other legal entities;
 - tax benefits and extended system of tax credits in research and development;
 - skilled English-speaking staff;
 - membership in the EU and Eurozone that provides easy access to the internal EU market;
 - the only one English-speaking member of the Eurozone;
- Easy access from the continental Europe and North America.

One of the ways to overcome crisis for the Irish government now is the attraction of foreign investors to development of nanotechnologies. During the period between 2001 and 2009 Ireland attracted about 282 million EUR of investments into nanotechnologies [11].

One of the main aims of the government of Ireland regarding development of nanotechnologies is their application as a catalyst for formation of economic values and business innovation culture. This strategy implies an increase of financial flow of annual budget for technologies, science and innovations in the field of nanotechnologies which requires at least 114 million EUR of financing during the next 5 years.

Conclusions. The analysis held in the research demonstrated that among European Union member countries France and Ireland apply different approaches to attraction of foreign investments into the field of nanotechnologies. France, being a major scientific center with good infrastructure, aims at the development of nanotechnologies for its own purposes but with the attraction of additional foreign scientific resources; while Ireland considers investments into nanotechnologies as the means of recovery and uprising of its own economy.

Thus, France firstly stimulates scientific purposes, and Ireland stimulates commercial purposes. The strategies of attraction of foreign investments into nanotechnologies of the states analyzed are based on these purposes. We suppose that the French path is the most suitable for economically, scientifically and technically developed countries, while the Irish strategy is suitable for the states with problematic, developing or transition economy.

The development of nanotechnologies and nano-product markets in the leading states is mainly caused by high level of communication systems development and high communication activity of the market participants. Hence, other countries that are planning to cultivate this market shall pay special attention to the development of information and communication technologies. Besides, an important factor is training of scientists. For that purpose the experience of Ireland can

be used. This country managed to ensure the increase of level and quality of education for its population at the expense of foreign investments.

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Надійшла до редколегії 11.05.14

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АНАЛІЗ ІНОЗЕМНИХ ПРЯМИХ ІНВЕСТИЦІЙ У СФЕРУ НАНОТЕХНОЛОГІЧНИХ ІННОВАЦІЙ У КРАЇНАХ ЄВРОПЕЙСЬКОГО СОЮЗУ

Стаття присвячена дослідженню прямих іноземних інвестицій в інноваційні нанотехнології на прикладі країн Європейського Союзу. Проведений аналіз обсягів та напрямків інвестицій показав, що країни Союзу розглядають інвестиції в нанотехнології як інструмент прискорення економічного розвитку.

Ключові слова: нанотехнології, наноматеріали, інвестиції, екологія.

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АНАЛИЗ ИНОСТРАННЫХ ПРЯМЫХ ИНВЕСТИЦИЙ В СФЕРУ НАНОТЕХНОЛОГИЧЕСКИХ ИННОВАЦИЙ В СТРАНАХ ЕВРОПЕЙСКОГО СОЮЗА

Статья посвящена исследованию прямых иностранных инвестиций в инновационные нанотехнологии на примере стран Европейского Союза. Проведенный анализ объемов и направлений инвестиций показал, что страны Союза рассматривают инвестиции в нанотехнологии как инструмент ускорения экономического развития.

Ключевые слова: нанотехнологии, наноматериалы, инвестиции, инновации, экология.

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2015; 1(166): 72-79

JEL C5, Q5

УДК 338.1

DOI: [dx.doi.org/ 10.17721/1728-2667.2015/166-1/11](http://dx.doi.org/10.17721/1728-2667.2015/166-1/11)

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THE ENERGY COMPONENT OF THE ENVIRONMENTAL SECURITY: UKRAINE IN THE MIRROR

Energy security is important for any state. It is important for the state's environment and economy. Ukraine is an energy dependent state, as well as an import-energy dependent one. The paper is devoted to the statistical analyses of Ukrainian energy sector from the position of its world representation. The purpose of this research is on the base of statistical analysis of current internal and external trends in the energy sector of Ukraine to consider possible mechanisms to stimulate and accelerate environmental-friendly energy security of Ukraine. Main objectives: to trace the dynamics of world and Ukrainian main energy indicators in the synergy with the state energy security index; to cluster launched efficiency-targeted energy projects in Ukraine in geo-industry aspect. Analyses of dynamics of energetic vs environmental performance of Ukraine in 2000–2014 world ranks shows that being in low segment of world rankings on aspects of energy and environmental security, Ukraine shows positive tendencies to the improvement, however with slow steps. In order to identify the most promising and most attractive sector of the economy in Ukraine to investors we held grouping of current launching energy-efficient projects in the aspect of industries and sectors where energy-efficient technologies operate. The rank analyses depicted that the most popular among economic sectors for energy efficiency investments are enterprises of agriculture and consumer goods industry, and the most attractive regions of Ukraine for implementation of investments in energy efficient technologies are Ivano-Frankivsk, Luhansk and Kherson oblasts.

Keywords. Environmental security, energy sector, energy security, ranking.

Introduction. Nowadays there is no state that can be sure in its security. States and its inhabitants constantly are facing the novel challenges and straggling different threats. Currently energy, governance and security became hot topics of all international meetings, mass media news and political debates. XXI century had begun with war conflicts on the planet, which have as an initial cause – energy re-

sources. Energy security is on the top of concerns and a funding platform for all leading states and unions. For example, the EU interests in its strategic programme Eastern Neighborhood Partnership (including Ukraine) are reflected in the Platform #3 – Energy security – that supposes:

- approximation of the regulatory framework;
- development of electricity, gas and oil interconnections;