Building the Diverse Community

Beyond Regionalism in East Asia

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Science and Technology Cooperation between the Republic of Korea and the EU Countries

Introduction

Science and technology (S&T) development of the Republic of Korea (ROK) was particularly intensive during the last fifty years. After the Second World War, the Republic of Korea was one of the poorest countries in the world, technically backward. The war between North Korea and South Korea had also worse economic consequences. The purpose of the article is to assess the opportunities of science and technology (S&T) cooperation between the Republic of Korea and the EU, to study the current status of S&T cooperation and to reveal its main barriers.

More: please add research questions, research method applied in the article and structure of the paper.

Science and Technology in South Korea

After the Second World War, the main directions of Korean S&T development were research and development (R&D) in the field of defense, nuclear energy and space.

S&T policy formation of the Republic of Korea began in the early 1960s. as continuation and an integral part of industrial policy. The first five-year economic development plan was adopted in 1962, and only in 1967 the Ministry of Science and Technology of the Republic of Korea was established. The main task of the Ministry was to develop and implement

the state S&T policy. Also in 1967 the S&T Promotion Law was enacted to provide the legal basis for S&T development.

The development of the national innovation system of the Republic of Korea was based on foreign technology borrowing and sensible patent policy. The transfer of foreign technologies took forms of "turnkey contracts", licensing, consulting (UN IDO, 2012). An important role in the "economic miracle" of the Republic of Korea played large financial-industrial groups (chaebols) that were the basis of the national economy development for many years. They accumulated new knowledge and created scientific and technological potential of the country.

As a result of the innovative development the Republic of Korea is the twelfth largest economy in the world. By 2025, the Government aims to achieve seventh place in the world in terms of S&T development.

This objective is stated in long-term strategic initiative adopted in September 1999 and known as "Long-term vision for science and technology development toward 2025." The initiative involves three time frames, spanning a 25-year period:

First Step (by 2005): Place the Korean scientific and technological capabilities at competitive levels with those of the world's leading countries by mobilizing resources, expanding industrialized infrastructure, and improving relevant laws and regulations, to achieve leading role among Asian countries. Second Step (by 2015): Stand out as a major R&D promoting country in the Asia-Pacific region and get in the top 10 countries in the world, actively engaging in scientific studies and creating a new atmosphere conducive to the promotion of R&D. Third Step (by 2025): Secure a scientific and technological competitiveness in selected areas comparable to those of G-7 countries (Long-Term Vision for Science and Technology Development Toward 2025).

The realization of this initiative had positive effect: in 2012 the country moved in the first place in the ranking of information and communication technologies (ICT) development among 155 countries of the world. Innovative development of the Republic of Korea is also confirmed by the American agency Bloomberg which estimates South Korea as the second country in the list of the most innovative countries in the world. The Republic of Korea actively develops the following sectors: fundamental science, IT, nanotechnology, biotechnology, "green technologies", new forms of energy and materials (V. Samsonova, 2013).

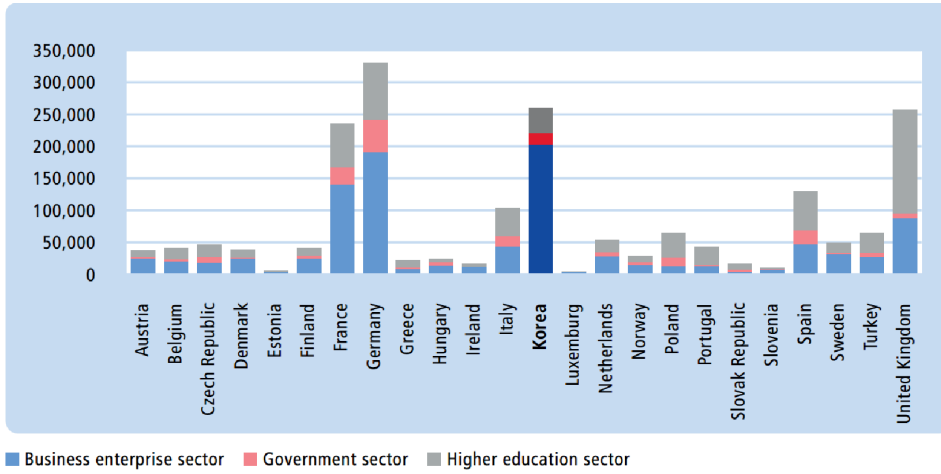


Figure 1. Number of full-time equivalent reseachers by institutional sector (2011 or latest year available)

Source: OECD Main Science and Technology Indicators 2012/2.

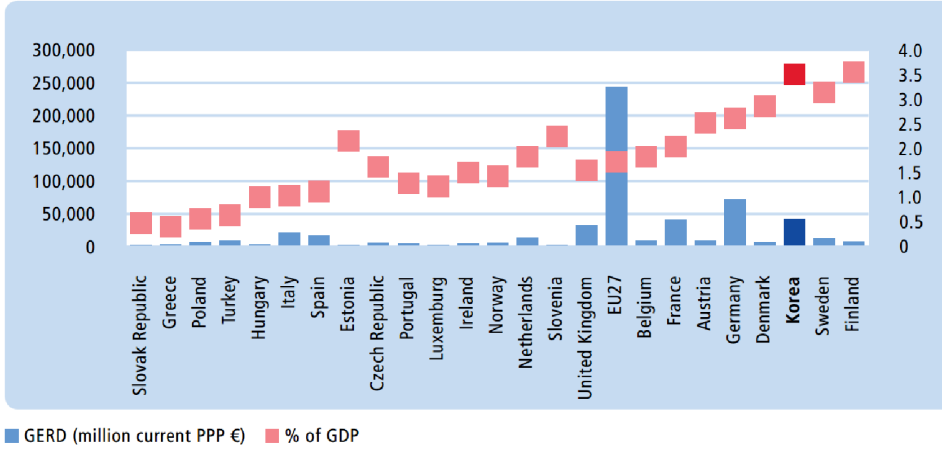


Figure 2. GERD at current PPPs and GERD as a percentage of GDP (2011 or latest year available)

Source: OECD Main Science and Technology Indicators 2012/2.

Korean methods of cooperation

The Republic of Korea is an important EU partner in the field of S&T. It is the first Asian country that concluded a free trade agreement with the EU. The EU is the second trading partner and the largest source of foreign direct investment of the country.

The Republic of Korea is one of the leading global suppliers of a wide range of consumer electronic products which are manufactured by Samsung and LG. Hyundai and Daewoo are important manufacturers of cars and other vehicles. Less well known the fact that the Republic of Korea is the world's largest exporter of construction services. The country has a well-developed shipbuilding industry. The largest vessels carrying liquefied natural gas are produced in the Republic of Korea. Korean companies have contacts with many partners around the world. Their units in the EU create workplaces and pay taxes to the local budgets. They collaborate with research laboratories in the EU and cooperate with European centers of excellence. Therefore, S&T cooperation between the Republic of Korea and the EU has high importance for both sides.

Nominally cooperation of the Republic of Korea and the EU in science and technology can be divided into two components: cooperation at the international level and at the level of the private sector. Cooperation on the highest level covers more fundamental areas: knowledge sharing, joint research, the creation of research centers, etc. Cooperation between the companies in the field of science and technology touches upon more practical aspects, it focuses primarily on the development and creation of goods and services which contain "know-how" and have competitive advantages to capture share of the market.

Before studying the S&T cooperation between Korean and European institutions it is important to understand the ways of Korean S&T interaction with other countries. The Korean S&T strategy contains the following methods of technology transfer (Graham Mitchel, 1997):

- *International Forums and Foundations*

The Korean government is supporting the establishment of S&T forums to act as a corridor between Korean commercial S&T establishment and world high-technology companies to facilitate the transfer of international technology. The role of both the forums and the foundations is to remedy Korea's weakness in key industrial sectors by creating opportunities to interface with scientists working with specific technologies. These

forums and foundations facilitate Korea's globalization plan by exposing foreign companies and individuals to Korean business practices.

• *Centers of Excellence*

Centers of Excellence operated by leading foreign institutes provide Korean researchers with opportunities to work with internationally accomplished scientists and excellent equipment. The Ministry of Science and Technology is encouraging the international research centers and world leading institutes to create centers in Korea to help the Koreans catch up with the more advanced countries in S&T. The Korean S&T strategy called for establishing Centers of Excellence as a means of attracting first-rate scientists from more advanced nations to Korea.

• *Academic Exchanges*

Academic exchanges are common in every field of study and almost every country. Korea is no exception, and Korean students and researchers are often sent abroad to acquire advanced degrees or study specific fields of knowledge. For Korea, however, there is a greater sense of national purpose to these exchanges than for many other countries.

• *Technical Links with Foreign Universities*

The chaebols form international industrial-academic cooperative associations with foreign universities to do joint research in advanced technology. Expanding links with foreign universities allows the chaebols to improve their industrial capabilities faster, incorporating highly trained personnel who have professional connections to research institutions. There are a number of benefits to be gained from cooperation with foreign academic research institutions.

• *Strategic Cooperation between Korean and Foreign Companies*

Cooperative agreements between Korean and foreign firms have long been a source of infrastructure and commercial technology for Korea. The chaebols generally bring cash, production process experience, and access to new markets with them to the negotiating table; foreign firms generally bring the necessary technology. Strategic technical alliances with other world market leaders allow the chaebols to penetrate new markets faster and give them access to a broader range of cutting-edge technology.

Strategic cooperation is the process of identifying gaps in indigenous technologies, seeking out the technology, and then engaging the owner of

the technology in a cooperative relationship that results in the transfer of the technology. Korea may provide any number of incentives for technology transfer, including funding commercialization, providing plants and equipment, contributing other technology, or facilitating local market access.

The Korean government is often involved at different levels of the strategic cooperation process, specifically in identifying weaknesses in the indigenous S&T structure, finding foreign companies willing to transfer their technology for commercial purposes, and subsidizing the actual transfer.

- *Joint International R&D*

Strategic cooperation can also include participation in joint international research. Because the initial focus of this research is precompetitive, companies are reportedly more willing to share their technology. Korea's expansion of these types of international projects indicates their success.

The interaction between Korean and European researchers and the authorities responsible for S&T cooperation began in the 1990s. The importance of such cooperation is recognized by both parties: S&T cooperation was added to the Framework Agreement for Trade and Cooperation between the European Community and the Republic of Korea, which came into force in April 2001.

Cooperation with the European Union

In 2006 the Republic of Korea and the EU signed an agreement on S&T cooperation. The principle of mutual access to S&T programs is a crucial commitment of the fair and mutually beneficial cooperation.

Moreover the Republic of Korea has agreements with the International Thermonuclear Experimental Reactor (ITER) and Euratom, and the European Council for Nuclear Research (Conseil Européen pour la Recherche Nucléaire – CERN) and the European Research Coordination Agency (EUREKA). The Republic of Korea and the EU have launched the following projects to strengthen S&T cooperation: KORANET (the Korean scientific cooperation network with the European Research Area), KESTCAP (the Korea-EU Science and Technology Cooperation Advancement Programme) and KORRIDOR (Stimulating and facilitating the participation of European researchers in Korean R&D programs) (Bobe, Crehane 2013).

The main directions of S&T cooperation between the Republic of Korea and the EU at the international level are:

• *nanotechnologies and new materials development*

The parties have agreed to exchange information regularly and work together to solve problems of mutual interest. However, the actual results of cooperation have not been achieved because of long-term period of research in this area.

At the same time, the Republic of Korea has a great potential in this area, because the country is the fourth in the world in terms of the nanotechnologies development. In December 2000, the government has included the development of nanotechnologies in the number of budgeted projects, and since then has funded research centers and programs in this area. Nanotechnologies have been declared as strategic technologies. As a result, the Republic of Korea was able to reconcile the distance between the levels of nanotechnologies development of the Republic of Korea and the leading countries. In 2004, the level of nanotechnologies development of the Republic of Korea accounted for 62% of the United States' (in 2001 – 25%). Now South Korea aims to enter the three leading countries in the field of nanotechnologies by 2015.

The Republic of Korea began to develop nanotechnologies actively in 2002. By 2008, Korean scientists developed about 15 new devices that would be used in different industries. The Republic of Korea is the fifth largest country in the world in the number of inventions and patents related to nanotechnologies.

Now Korean scientists are developing those kinds of nanotechnologies, which are used to create new materials, to solve environmental issues and energy problems. Nanodevices that will be applied in robotics, automotive industry, "pervasive" computer networks and medicine are planned to be created be using the experience in the field of semiconductors.

• *information and communication technologies: new technologies, Internet-technologies, robotics.*

Korean authorities are actively involved in the Framework Programme №7, embracing ICT. Cooperation in field of grafemnyh technologies represents mutual interests of the both sides.

During the last thirty years, the Republic of Korea has had high rate of ICT development and by 2010 had become one of the world leaders in prevalence and availability of services in this sector. ICT are regarded by the government as one of the main "engines" of the South Korean economy.

In 2011, about 21% of the GDP of the Republic of Korea and 32% of its export were determined by ICT sector. At the moment, the country is in first

place in the world in the use of broadband connection: 78% (16 million) of residential homes have a broadband connection to the Internet. The Republic of Korea has leading positions in the field of mobile technology and one of the first countries in the world to commercialize the technology of 3G and 3G +.

• *non-nuclear energy:* diversification of energy sources, decrease of the fossil fuels usage, reduction of carbon dioxide emissions, and increase of energy efficiency.

Cooperation between the Republic of Korea and the EU in the field of energy technologies is covered by the agreement on energy cooperation between Euratom and ITER. Participation of the Republic of Korea in the EU Framework Programmes on research and technology development has been focused only on the energy sector: Korean Institute of Science and Technology (KIST) in the project NANOHy – a project to develop hydrogen storage systems in the solid state.

In June 2011 Brussels hosted a South Korea – EU forum devoted to "green energy". It joined officials, academics and representatives of the companies involved in photovoltaics, wind energy, intelligent networks, fuel cells, etc. – the areas where the Republic of Korea and the EU are recognized as the leaders.

The most promising areas of cooperation: the intelligent networks, hydrogen fuel cells, solar and wind power.

The Republic of Korea in terms of energy consumption is in the tenth place in the world. Meanwhile, the South Korean economy is 83% dependent on the import of energy, of which 44% is oil. Due to the almost complete absence of commercial deposits of hydrocarbons on the territory of the Republic of Korea, and as well as aiming to reduce the country's dependence on traditional energy sources, in December 2008, the President of the Republic of Korea Lee Myung-bak declared the strategy of "green growth" development and transition to a "low-carbon" economy as the national priority (Han Taek-Whan, Kang Sang In , 2011).

In accordance with the objectives by 2030, the share of "clean" energy in the energy balance of the country is expected to increase from the current 17% to 39%. In this case, nuclear power is seen by South Koreans as the most suitable alternative to traditional energy resources: its share is expected to grow from 15% to 28%. This is connected with the presence of own technological base in field of peaceful use of nuclear energy, and with the initiative taken by the Government of South Korea that targets to reduce greenhouse gas emissions commitments by 30% toward 2020.

The Committee on the "green growth" was established under the President of the Republic of Korea and headed by the Prime Minister of the Republic for the practical implementation of the strategy.

At a meeting of the committee on "green growth", held on 13 October, 2011, the President of the Republic said that in the near future, one of the pillars of the Korean economy will be solar and wind power, and by 2015 in the renewable energy will be invested 40 trillion JK won (about $ 36 million) (KPMG, 2012). In addition, it was decided to allocate 9 trillion JK won for the construction of a wind farm on the coast of the Yellow Sea with the capacity of 2.5 GW / h and 7 trillion JK won for the construction of small wind and solar power stations.

The nation's leadership develops own technologies, and capacities of the production of wind power stations, which until 2009 were imported from the abroad. Since October 2009 the plant that was built by the shipbuilding company Hyundai Heavy Indastries operates in Kunsan (prov. North Jeolla). This plant can produce wind turbines with the total capacity of 600 MW per year. In addition, the South Korean corporations acquired the American wind energy company De Vinci and the Dutch STX Group.

Programs of researchers and scientists mobility are the basis of S&T cooperation. EU countries such as France, Germany, GB and Italy, together with the Republic of Korea successfully implement mobility programs:

1. Italy and the Republic of Korea organized the programs which supported scientists in the short-term missions. However, with the reduction in the international travel costs and increasing number of international conferences, forums and workshops that enable the exchange of experience and knowledge, such programs have been canceled. Currently, the support is provided to scientists in the mid-term missions (up to 3 months), which enable them to develop ideas for the further fruitful cooperation.

2. The Danish Government is also implementing a mobility program aimed to support researchers at the mid-term missions which prepare projects and proposals to implement independently or jointly by the EU, Member States and the Republic of Korea.

3. Germany implements mobility programs in cooperation with the Republic of Korea. The result of such exchange is the creation of a community of scholars and researchers, consisting of more than 30 thousand of experts who have lived or worked in Germany and the Germans who lived or worked in the Republic of Korea. At the moment Germany is moving towards the institutionalization and systematization of knowledge-sharing processes (Bobe, Kreohane, 2013).

Many of the mobility programs are implemented at the institutional level. For example, within the cooperation between the Danish Technical University (DTU) and the Republic of Korea, which began in 2008, 5 educational programs ware organized for the award of joint academic degrees, mainly from Korea Advance Institute of Science and Technology (KAIST). DTU made R&D contacts with major Korean companies such as Samsung, LG and Hyundai.

International projects were launched to promote S&T cooperation between the Republic of Korea and the EU:

1) KORANET – Initiative to strengthen the regional S&T cooperation between the Republic of Korea and the EU.

The project brings together European and Korean scientific and technical community through collaborative research and joint initiatives. The first joint initiative was published on February 8, 2008 The purpose of the project is to analyze the current situation of scientific and technical cooperation between the Republic of Korea and the EU, as well as the creation of sustainable relationships between researchers, investment institutions, research organizations and political institutions (Elke Dall, Hanna Scheck, Marion Steinberger, Hans Westphal 2013).

2) KORRIDOR – the project to encourage and support the participation of European researchers in R&D programs of the Republic of Korea.

The project aims to provide European researchers information on the Korean national research programs.

3) KESTCAP – The program of scientific and technological cooperation development between the Republic of Korea and the EU.

KESTCAP project promotes cooperation in science and technology between scientists from the Republic of Korea and the EU, mainly on the basis of the Framework Programme of the EU № 7. The objectives of the project are the development of the strategy of sustainable cooperation; facilitating the exchange of information; organization and support of activities between the two countries.

In addition to the main areas of cooperation contained in the 2006 agreement between the Republic of Korea and the EU cooperation in the field of health are actively developing, where the main subject of research are infectious diseases, mainly tuberculosis. Projects with the participation of the both sides focus on the development of vaccines. The Republic of Korea is represented by the Institute Pasteur of Korea (involved in 4 projects), the International Vaccine Institute (2 projects), the Yonsei University and the Korea Research Institute of Chemical Technology.

Conclusion

The European centers network has been established in Korean universities aimed to promote better understanding of EU policy through the development of a variety of programs, including training programs for researchers, as well as outreach activities related to the EU and its policies. In the Republic of Korea four centers provide financial support to researchers whose work involves the study of the EU. Domestic and international conferences and seminars are organized.

However, despite the agreements in force and the created institutional framework of S&T cooperation, the collaboration between scientists, researchers, engineers from the Republic of Korea and the EU has not yielded significant results yet. Cooperation potential remains untapped.

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Building the Diverse Community

Beyond Regionalism in East Asia

The processes in East and South Asian became a peculiar subject for global community of international relations in the field. The presented volume is a collection of papers dealing with the processes of regionalization in East and South Asia. We collected papers from different academic unit both from Europe and Asia. Taking regionalization as a core subject of the volume the readers will discover the complexity of ongoing processes in East and South Asia. We present collection of papers from a very different perspectives starting from the theoretical debates, through economic dimensions of integration to policical and military scope of regionalization in East and South Asia. The whole volume presents the diversity of understanding among international relations scholars community. By shaping the diverse view we can possess the better and in depth understanding of East Asia.

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