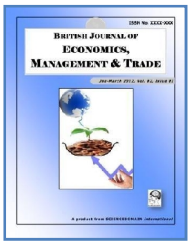

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Knowledge Capital Creation: The Case of Polish Economy

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Author's contribution

The sole author designed, analyzed and interprets and prepared the manuscript.

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ABSTRACT

Knowledge, and its application, is perceived as one of the key sources of competitiveness and growth in the global economy. In actuality, all kinds of intangible resources available to a country or region can offer a relative advantage and, in combination with others, yield future benefits. The importance of investment in knowledge, innovation, education and ICT was particularly exhibited in the Strategy Europe 2020 in the face of long-term global challenges such as climate change, scarcity of resources or adverse demographics. Without a doubt, these problems also affect the Polish economy which aspires not only to near averages of European competitiveness, but wanting to become one of the most competitive countries in the EU-27. The main purpose of the paper is to show the progress in the knowledge creation in Poland against the background of the EU-27 countries. Looking at the knowledge creation process through the prism of institutional approach, such an approach enables the identification of key barriers that have impeded this process thus far. The analysis confirms that one of the necessary prerequisites of effective knowledge creation is a friendly institutional environment which encourages the development of intellectual capital. The paper also explores the relationship between investment in knowledge capital and national competitiveness. Unfortunately, many empirical findings and statistical data suggest that Polish economy still suffers from permanent underinvestment in intellectual capital. It may thus hamper long-run economic performance and competitiveness. In a broader sense, the causal relationship between intellectual capital commitments and economic competitiveness is a function of governance standards. The aforementioned research is based not only on selected prior literature focused on intangible capital but it is also to be backed by broad empirical findings and statistical data derived from Polish and international think tanks.

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Keywords: knowledge; intangibles resources; intellectual capital, R&D intensity; competitiveness.

1. INTRODUCTION

The shift to a post-industrial, knowledge-based economy is progressively altering the role of the traditional factors of production. Symbolic resources are replacing physical ones, mental exertion is replacing physical exertion, and knowledge capital is beginning to challenge money and all forms of capital [1]. A structural change in economy, from traditional scale-based manufacturing, which mainly relies on tangible assets, to new innovation-oriented activities based on intellectual assets seem to be a global tendency. It allows to assert that knowledge and innovation became a key source of economic growth.

Many economies, including EU-27 countries, that aspire to be in the group of the most competitive in the world, realized that the ability to create new products and processes using the latest knowledge and technologies appears when a country possesses highly qualified human capital which is supported by structural capital. The existing subject literature points out that the necessary condition of knowledge-based economy development are particularly investments in education, R&D and ICTs. It cannot also be forgotten that a successful transfer of knowledge into competitive advantage depends critically on the effective economic policy which is able to create an institutional environment supporting the process of knowledge creation. However, the author does not focus on the mechanism of knowledge creation and its national specificity but rather concentrates on the differences in the level of knowledge capital accumulation which can be measured by the amount of investment in human and structural capital.

The paper presents the issue of knowledge capital creation in Poland in recent years against the background of the EU-27 countries. The aim of the undertaken analysis is not only to assess the progress in knowledge capital creation in Poland, but also to identify the basic strengths and weaknesses related to this process. Moreover, the conducted analysis should allow to answer the question whether knowledge creation always contributes to the increase in national competitiveness.

2. THE VALUE OF KNOWLEDGE IN A CONTEMPORARY ECONOMY

Knowledge has always been a very important factor determining the civilization progress. As David Hume wrote in XVIII century, the level of economic growth depends, first of all, on the psychological factors (motives of work, diligence). However, the process of economic growth is also determined by the level of intellectual and cultural development of a given society. Work, “knowledge” and humankind are inseparably related altogether, being a feature of more cultural and richer centuries. It is worth noticing that in ancient time wealth and power were mainly associated with the ownership of physical resources, to which the traditional factors of production, such as: labour, land and capital belong. The need for knowledge, as well as the access to it, has been limited then, and under the control of those who own the means of production. Undoubtedly, physical labour, tangible and money capital largely facilitated the Industrial Revolution two and a half centuries ago. Since that time, the process of transformation from a world largely dominated by physical resources to a world dominated by knowledge has also started [2,3]. According to Drucker and Weggeman, at least three phases which lead toward the intangible economy can be distinguished. The first one could be ascribed to the Industrial Revolution (1750-1880), during which companies used

knowledge to produce tools and products. The second phase was the Production Revolution (1880-1945) during which companies were using mainly knowledge to improve labour processes. The third and last phase, is finally called the Management Revolution (1945- the present), during which organizations use knowledge to improve knowledge [4]. Employee know-how, innovative capabilities, skills or, as Thomas Stewart puts it, the brain-power of the organization, seems to play a predominant role in defining the productive power of the contemporary corporation [5]. That is why, many researchers assert that this process has created a society in which knowledge is perceived as a primary resource. The world has entered the era in which the new wealth of nation is tied directly to the creation, transformation, and capitalization of knowledge. It means that in such a society, value is created not by the accumulation of capital or labour but rather by knowledge and innovation [6].

From the perspective of economic theory, knowledge has been recognized and incorporated thanks to the models of endogenous growth [7,8], where the central attention has been drawn to human capital and innovation capacity. Endogenous growth theories proposed the introduction of new accumulation factors such as knowledge and innovation which are responsible for self-maintained economic growth. The concept of "knowledge-based economy" – is related to economies which are directly based on the production, distribution and use of knowledge and information. The growing importance of intangible resources can be perceived as a result of service sector expansion, globalization, deregulation, and the emergence of new information technologies. Today, firms often spend much more on intellectual assets as on tangible ones. It is estimated that now intangible assets account for nearly 90% of their market value. In 1982 year 60% from every 100 dollars invested in companies which belong to the industrial sector was spent on tangibles, whereas at the beginning of the 20th century only 16%. Other examinations also show that in 1999 tangible assets constituted only a 16% of the market value of American companies on average. The observed tendency takes place at present and it confirms the growing importance of intangible assets [9].

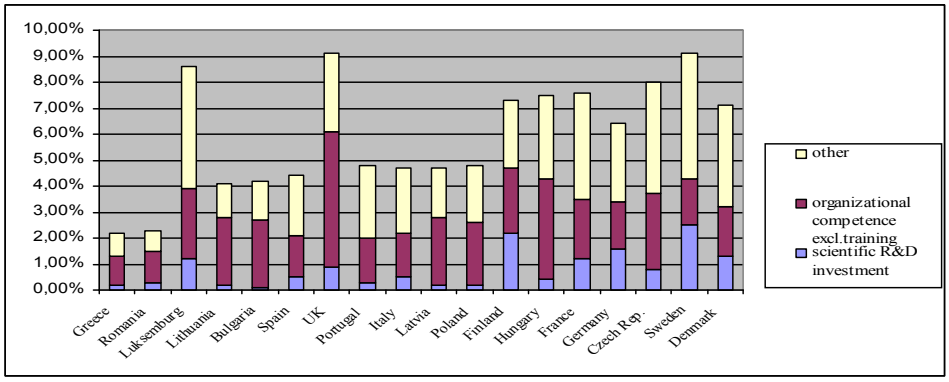


Fig. 1. Intangibles as share of GDP (%) in the selected EU-27 countries
Date concerning intangibles investment comes from year 2005.
Source: [10]

As shown in Fig. 1 the growth of intangible investment is also observed at the macro level in most modern post-industrial economies. The amount of spending on intangibles can be additionally seen as an indicator of the degree of transition towards the knowledge based economy.

It is worth noticing that the share of new intangibles in GDP varies considerably ranging from 2% to 9% GDP. Countries such as Sweden, Finland and Germany with traditionally high rates of R&D rank above average in terms of their investment in intangibles. However, the UK, Belgium, the Czech Republic, the Netherlands and Hungary also rank highly, in spite of relatively low R&D intensity. This phenomenon can be easily explained by different types of innovation model adopted in these countries. It turns out that many of them are simply intensive in other types of intangibles which capture training, architectural design, new financial product, date bases and software. Generally speaking, Scandinavian, Anglosax and Continental regions demonstrated particularly high level of intangible capital investment, but the Eastern European economies are also trying to catch up with the skill-intensive countries. In Poland the amount of investment in intangibles as a share of GDP was at the level of 4, 8%, while in the top leading countries such as the UK and Sweden exceeded 9%. It is worth adding that the most dynamic economies are Slovakia, the Czech Republic, Austria, Belgium and Finland, whereas Greece and Romania are the laggards [11].

It is commonly known that intangibles are an important source of future growth. That is why, the USA, Japan, Sweden and Finland invest heavily in knowledge creation and utilization, measured by the sum of R&D expenditures, software purchases, and public and private spending on higher education. In the context of the growing importance of intangibles in contemporary economy, there is also an urgent necessity to increase the knowledge capital potential in Poland in order to maintain fast economic growth in the future.

Taking into consideration the differences between EU-27 in the amount of education and R&D expenditure expressed as a % of GDP which can be treated as knowledge capital expenditure, it is worth analyzing them with reference to the Global Competitiveness Index. It embraces 12 pillars, such as: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, financial market development, technological readiness, market size, business sophistication and innovation. In order to explore the relationship between the incurred inputs on the knowledge capital creation and the effectiveness of using them which found its expression in national competitiveness, the statistical data were taken from sources such as Eurostat and Global Economic Forum [12,13].

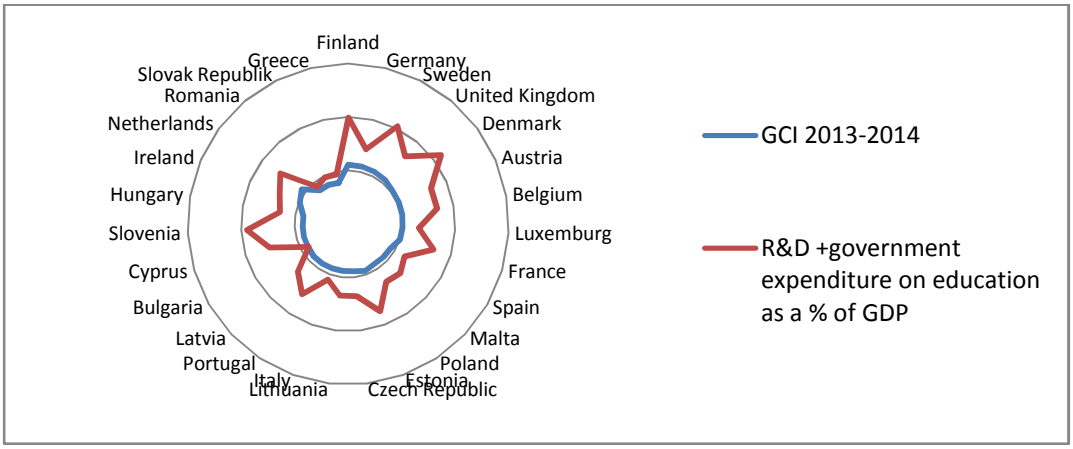


Fig. 2. The relationship between investment in knowledge capital and national competitiveness

Source: Own calculations

The conducted analysis showed the strong, positive correlation between investment in knowledge capital and competitiveness of the EU-27 countries (above Fig. 2). It can be confirmed by the value of the correlation coefficient 0.67 at a significance level of 5%. What is interesting, if we take into account only 17 Member States of the EU in 2004, then the correlation coefficient 0, 76 takes much higher value than previously. It turns out that the EU-15 countries not only spend more on education and R&D, but also more effectively what is possible to achieve in the conditions of the stable institutional environment which supports the knowledge creation. As a result countries belonging to this group such as Finland, Sweden or Germany are usually leaders of global competitiveness rankings.

3. THE CREATION OF HUMAN CAPITAL IN POLISH ECONOMY AGAINST THE BACKGROUND OF THE EU-27 COUNTRIES

There is a common consensus among economists that human capital is an important determinant of productivity, both at the individual and aggregate level, and that its role is particularly crucial in today's knowledge-driven economy. It is assumed that workers with greater problem-solving and communication abilities should perform better than their less skilled counterparts at any task that requires more than the routine application of physical labour and will also learn faster. The growing demand for knowledge workers is also a consequence of the rapid improvement and spread of information and communication technologies (ICT) in recent years. Due to the fast technological progress and competition pressure which take part in contemporary economy, it seems to be obvious that in order to stay ahead in the technological race and have the access to the potential benefits of new technologies, national economies should pay greater attention to the quality of human resources.

Taking into consideration the potential of human capital which Polish economy possesses, it has to be clearly stressed that we have experienced the real quantitative academic boom in recent years the effect of which is an increasing amount of students (from 394 thousands in years 1990/1991 to more than 2 million). It is a relatively good result, especially if the statistics show that only four Member States reported more than 2 million tertiary students in 2010. Among them are such countries as Germany, the United Kingdom, France, Poland [14]. Highly skilled people are crucial for the generation, diffusion and use of knowledge. In the EU-27 countries 34, 6% of the population aged 30-34 obtained a university degree in 2011. Unfortunately, it is still much lower compared to other advanced economies, especially South Korea and Japan. What is more, these results considerably vary across European countries. The top leaders in this field (with indicator above 40%) are Ireland, Denmark, Luxemburg, Cyprus, Finland, Sweden, France, Belgium, the UK. In contrast, less than 30 % of the population in this age range had a tertiary education in Slovakia, the Czech Republic, Italy, Portugal, Malta and Romania. In case of Poland it was 36, 9% [15].

Higher education plays a central role in the development of human beings and modern societies, enhancing social, cultural and economic development, as well as active citizenship and ethical values. The educational boom in Poland which has been observed since 90s is undoubtedly a positive tendency. However, the quality of Polish education system leaves much to be desired. Especially worries the fact that in Poland we have got insufficient number of graduates in science and technology compared to the other EU countries. The statistics additionally prove that the educational structure of Polish society remains inappropriate because of the lower number of graduates per one thousand inhabitants in such kind of fields as science, mathematics and computing, engineering, manufacturing and construction. On the other hand, there is too many graduates in social sciences and

humanities & arts. In 2010 year it was still above 50% graduates, whereas the EU average was at the level of 47, 2% [16].

It is commonly accepted that one of the measure of a country's potential research capability can be the number of PhD students. Data shows that there were 525 810 PhD students in the EU-27 in 2010, compared with 479 420 in the United States and 73 730 in Japan. In relative terms, the broad subject group of science, mathematics, computing, engineering, manufacturing and construction-related studies accounted for more than one third (36.4 %) of the PhD students in the EU-27, a proportion that was somewhat higher than in Japan but a little bit lower than in the United States [17]. It affirms that in human resources of the EU-27 countries a great creative potential is found which can be decisive for their future development. Unfortunately, in spite of the rapid increase in new doctoral graduates observed in the European Union, the share of graduates in such disciplines as natural sciences and engineering remains in Poland at relatively low level of 20% [18].

The number of scientists and engineers in population can be seen as another basic indicators which characterizes the quality of human capital. One objective for European universities is to attract and maintain highly-qualified staff and students in order to support their research capabilities. The statistics show that within the EU-27 there were 12,5 graduates from science and technology per thousand persons aged 20 to 29 years in 2010, with particularly high ratios in Finland, France and Ireland (all above 20). It has to be simultaneously pointed out that Poland obtained in this field a relatively good result (15, 8%) - above the European average [19].

The next, equally important indicator, is the number of human resources employed in science and technology-related occupations. HRST accounted for more than 40 % of the workforce in such countries as Luxembourg (51, 6%), Sweden (41, 8%) or Denmark (41, 4%) in 2011. In the analyzed period the relatively high shares were also recorded in the Netherlands, Germany, and Finland, whereas the lowest in Portugal, Romania, Bulgaria and Greece. In case of Polish economy it was exactly 28, 4% [20]. When in turn the proportion of persons working in high- and medium-high technology manufacturing and knowledge-intensive services sectors in Poland is taken into account, the results do not look as well as previously, due to the relatively low share of these sectors in Polish economy. Generally speaking, employment in these sectors in Poland amounted to 5, 5%, while the average EU was 6, 7% [16]. It allows to state at the same time that Polish economy is not as advanced as other EU countries in the process of knowledge based economy building.

One of the key weaknesses of Polish human resources seems to be the relatively low share of the population aged 25 to 64 participating in education and training. It was only 4, 5 % in 2012 and significantly less compared to the average of EU-27 at the level of 9 % [21]. Regarding this tendency, the large differences in participation rates are also observed among EU-27 countries. According to the EU benchmark, the Scandinavian countries and Denmark belong to the best performers, reaching rates of 20-30%. The data put United Kingdom, Luxemburg, Netherlands or Slovenia in the next group, with participation rates around 13-16%, while the Lithuania or Poland are at 5% participation rate. On the other hand, it is worth noticing that the poorest results obtained such countries as Bulgaria, Greece and Romania which have recorded little or no progress since 2000.

4. THE CREATION OF STRUCTURAL CAPITAL IN POLISH ECONOMY AGAINST THE BACKGROUND OF THE EU-27 COUNTRIES

Structural capital usually refers to the non-human storehouses of knowledge, which are embedded in its technological, information and communications systems as represented by its hardware, software, databases, laboratories and organizational structures. At the macro level, it can also be identified with organizational, technological and structural infrastructure supporting human capital efficiency. The creation of structural capital is determined by the amount of private and public spending on R&D and ICT. It is worth stressing that research and development activity lies at the heart of the EU's strategy. Unfortunately, research intensity in the EU has increased only marginally, in contrast with remarkable growth in the major research-intensive Asian countries. It turns out that R&D intensity in the EU-27 countries (understood as R&D expenditures which are expressed in a percentage of GDP) has stagnated at around 2% of GDP since 2010 [22]. Among the Member States, the highest R&D intensity above the Lisbon target was only recorded in Sweden, Denmark and Finland. In contrast, there were at least ten economies that reported R&D expenditure accounting for less than 1% of their GDP in 2010. Unfortunately, Poland with gross domestic expenditure on R&D at the level of 0, 74%, was among them.

Information and communication technologies (ICT) are equally important in the process of knowledge creation in a contemporary economy. They are considered to be critical for improving the competitiveness of European industry and, more generally, to meet the demands of its society and economy. Compared with Japan or the United States, the EU has a relatively low share of ICT expenditure, expressed as a share of GDP. Expenditure on information technology in the EU-27 represented 2.8 % of GDP in 2010, compared with 3.5 % in Japan and 3.3 % in the United States [23]. In case of Poland the amount of spending on ICT in 2010 exactly obtained the EU average level. What is more, broadband access to Internet, taking into account the number of lines per 100 inhabitants in Poland (at the level of 18, 8%), is still below the average EU-27 which in 2013 reached 28, 8%. At the EU level there were at least two countries such as the Netherlands (40, 2%) and Denmark (39, 8%) that can be called as the top performers, with the United Kingdom, Germany, France, Finland or Sweden exceeding the 30%. Poland, unfortunately, together with Bulgaria and Romania belongs to the group of countries lagging behind [24].

The growth of structural capital investment is one of the necessary conditions to improve the efficiency of innovation processes. Many statistics indicate that the innovativeness of Poland is relatively low, as compared internationally. According to the European Innovation Scoreboard 2013 Report, Polish economy ranked 24 among the EU countries [25]. One of the main causes is the low propensity to innovate in Polish enterprises. The data from 2008-2010 years shows that almost 53 % of EU-27 enterprises were considered as innovative. During the analyzed period the highest propensity to innovate was recorded in Germany (79%), Luxemburg (68%) and Belgium (61%). At the other end of the range, the lowest propensity to innovate was registered by enterprises in Bulgaria (27%) and Poland (28%) [26]. It worries, especially if the innovativeness of Polish enterprises has not significantly improved since 2010. However, it is worth stressing additionally that innovation development requires not only more investment in structural capital but also the ability to cooperate. That is why the observed reluctance and the lack of mutual trust between science and economy in Poland are perceived as one of the main barriers which hamper the process of building a knowledge economy.

It should be emphasized clearly that underinvestment in the field of structural capital determines the results obtained in innovation activity negatively. Taking into account the inventiveness of Polish economy, which is reflected by the number of patents, licenses and trademarks, it is worth underlying that Poland has obtained one of the lowest results among the EU-27 countries so far. Regarding only the number of patent applications to EPO per million inhabitants in 2010, it was 8, whereas the EU average exceeded 108, 6. Among the Member States, the highest number of patent applications to the EPO was recorded in Sweden, Germany, Denmark and Finland [27].

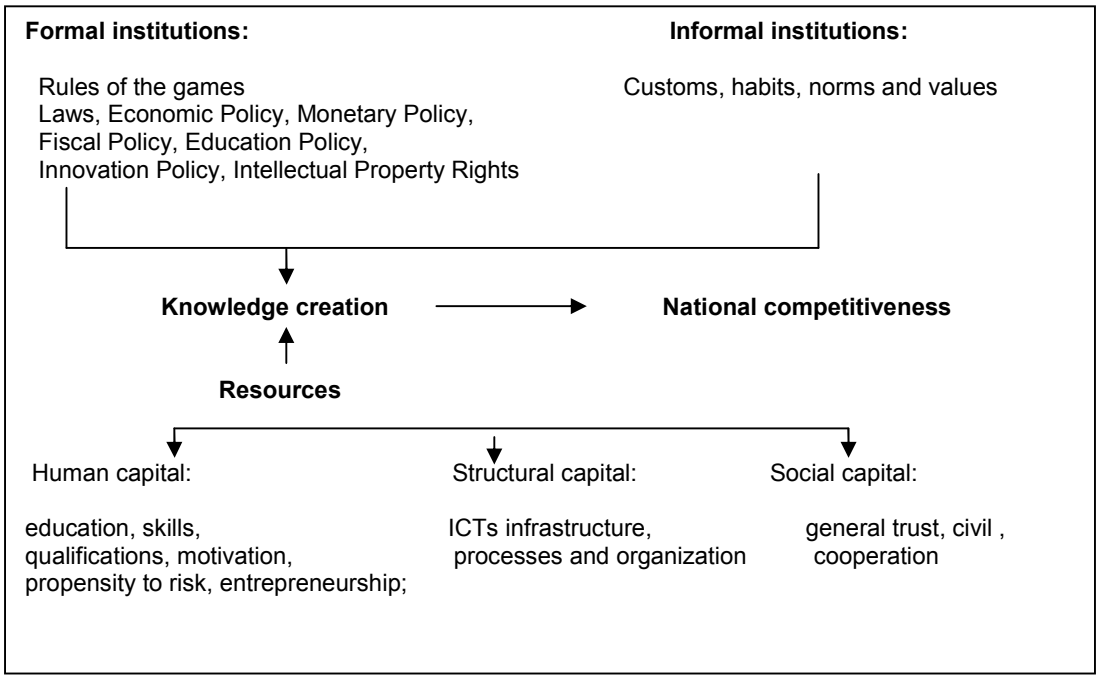
The number of patents, licenses and trademarks measures a country's inventive activity and also shows its capacity to exploit and translate knowledge into potential economic goals. Because innovation activity usually requires a lot of investments which are naturally more risky and highly uncertain, Polish enterprises are rather willing to get innovative solutions ready-made abroad instead of engaging in such kind of activities. It means that Polish economy is based mainly on knowledge which is produced abroad, while the share of domestic intellectual capital plays a marginal role in this process.

5. THE MAIN BARRIERS OF KNOWLEDGE CREATION IN POLAND

On the basis of undertaken analysis it can be said that intellectual capital development in Poland against the background of the EU-27 countries is still relatively low. The permanent underinvestment in the field of education and innovation seems to be a serious hindrance in the process of building the knowledge-based economy. What is more, the knowledge creation and diffusion require not only additional support by structural capital but also the increase in interpersonal trust. In the context of a growing interest in how various socio-cultural factors affect growth [28,29,30], it is worth underlying that trusting economies are expected to have stronger incentives to innovate, to accumulate physical capital and to exhibit richer human resources. That is why, many researchers often indicate the shortages in social capital in Poland as one of the key reasons for poor results obtained in intellectual capital development. However, it should be not be forgotten that creating a society of skilled, flexible and creative people requires the existence of institutions which encourage the widespread and efficient use of local and global knowledge, including building a dynamic information infrastructure and an efficient innovation system comprising firms, science and research centers or universities, which provides environment that nurtures R&D. Institutions, undoubtedly, are a significant determinant of economic growth. In countries where institutions related to property rights are in place, there is not only greater efficiency in the use of resources but also greater technological progress and innovation leading to economic growth and poverty reduction. It allows to presume that a successful transfer of knowledge into competitive advantage depends on the quality of institutional environment.

In picture 1 the role of formal and informal institutions in the knowledge creation is emphasized. The institutional framework that defines the deliberate incentive structure of a firm plays a critical role in creation and protection of knowledge [31,32]. According to North allocative efficiency is a static concept with a given set of institutions; while the key to continuing good economic performance is a flexible institutional matrix that will adjust in the context of evolving technological and demographic changes. The author distinguished informal constraints (sanctions, customs, traditions, codes of conduct) and formal rules (constitutions, laws, property rights). Institutions have been devised to create order and reduce uncertainty but the process of knowledge creation is particularly associated with innovation. It means that both institutional quality and flexibility seem to be of great importance in the process of building knowledge economy. In order to understand what

determinants are responsible for the effective knowledge creation which is a key to improve national competitiveness it is worth not only indicating the amount of investment made for the intellectual capital development, but above all institutional surroundings.



Picture 1. Institutional determinants of knowledge creation

Applying the institutional approach to the case of Polish economy allows to identify institutional barriers which hamper the process of knowledge creation. In the context of the necessity of building the knowledge economy in Poland, it seems to be obvious that government should particularly support the institutions functioning in the areas of education, training and research through set of policies (mainly monetary and fiscal). Because of many weaknesses of innovation system, there is also an urgent need to create an environment of competitive firms willing to invest in human and structural capital, with links to outside knowledge sources. It seems to be possible only thanks to the effective institutional solutions which government provides in order to encourage economic entities to undertake innovation activity. Among many instruments the most desired are public financial support for firms and institutions engaged in innovation and development or tax incentives which are aimed at domestic and foreign investors. What is more, the government's role is to build educational and workforce-development systems that are constantly reviewed and able to adopt and meet market requirements. Unfortunately, the low efficiency of tertiary education and research institutions in Poland is caused by the permanent underinvestment, the inappropriate structure of education and the poor intersectoral cooperation between science and economy. Due to the outdated system of education unadjusted to the knowledge-driven economy requirements, the human capital resources are not used as effectively as they should and lots of creative potential which the Polish societies possess is simply wasted.

The knowledge creation is not only an issue of formal but also informal institutions efficiency. The concept of informal institutions includes elements such as learning, trust, habits and

customs, norms and values. Softer institutions are usually built up on the basis of face-to-face interactions and are difficult to change. In connection with that, it has to be underlined that a serious barrier of knowledge creation in Poland is cultural heritage originating from the previous central-planned economy which definitely does not support entrepreneurship and innovativeness. Moreover, it has to be taken into consideration that every country has its own distinctively historical, religious and cultural background, so that a blueprint of institutional development fitting all countries does not exist. Rodrik [33] argues that institutional changes cannot simply be copied from the West, instead they have to be adjusted to the local environment. Undoubtedly, the necessary condition of building the knowledge economy in Poland seems to be social and cultural environment that promotes values such as diligence, thriftiness, creativeness and lifelong learning. In conclusion, in spite of the fact that the government should create and maintain supportive, predictable, innovation friendly environment, there is also a need to change the values and attitudes of Polish society without which the process of knowledge creation will be hampered.

6. CONCLUSION

Knowledge and innovation are an important source of future growth across the European countries. The observed increase in intangibles should be perceived as the expression of transition towards knowledge economy. In this process the most advanced economies are Nordic countries, the UK, the Netherlands, Belgium or France. The increase in expenditure on education and R&D in these countries has a positive effect on their competitiveness. It is possible then when a friendly institutional environment exists. Unfortunately, the expenditure on intangibles and what is more the effectiveness of using them in new Member States is far lower. Poland with the amount of investment in intangibles at the level of 4, 8% GDP is still in the group of ten countries which spend less than half compared to the leaders.

On the basis of the carried out analysis it can be said that Polish economy is not as advanced in the process of knowledge creation as the countries which particularly demonstrated high levels of intangible capital investment. The key weakness in the field of human capital is the poor quality of education and training. In order to generate and absorb new knowledge and boost innovation the improvements in the structure of higher education, skills and competences of Polish society are necessary. The education changes should be accompanied not only by the increasing public and private investment in human but also structural capital. In case of R&D intensity Polish economy ranks low against the background of the EU-27 with gross domestic expenditure on R&D at the level of 0,74% GDP. The amount of investment on ICT in Poland is also lower compared to the average EU. One of the serious consequences of permanent underinvestment in the field of structural capital are poor results obtained in innovation activity in the form of patents, licenses, trademarks, etc.
There have been a number of studies that show institutions as a deep determinant of economic growth. The institutional approach is also helpful in explaining the limitations in the process of knowledge creation in Polish economy. It concerns not only fiscal, monetary, innovation and education policies but also values and norms typical for Polish society, including the lack of trust and common unwillingness to mutual cooperation which impedes knowledge creation.

To sum up, it turns out that the quality of institutions, including high standards of governance, has not only a key importance in the process of knowledge creation, but also determines the most effective use of expenditures and the achieved results with respect to knowledge capital which enable the economy to improve its competitiveness. The conducted analysis confirmed the strong, positive correlation between investment in knowledge capital

and competitiveness of the UE-27 countries. What is more, the even stronger correlation was noticed in case of old member states the EU and it can be explained by the existence of high quality institutions which effectively support the process of knowledge creation in these countries, contributing to the increase in their global competitiveness.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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