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Innovativeness of Poland's Economy - Conditions and Prospects for Development

Abstract

This paper considers the very important issue of innovativeness of Poland's economy with particular attention given to its innovation strategy. The major thesis of the paper argues that the growth of innovativeness of the Polish economy requires structural, institutional, and financial changes in the long run. The analysis is based on the set of indices reported by the European Commission, the Information Technology and Innovation Foundation, Washington, and UNU – MERIT Maastricht University.

The structure of the article is as follows: the introduction is followed by an assessment of the level of innovativeness of Poland's economy, explanation of the reasons of poor innovativeness, and then the conditions for innovation in Poland are outlined with particular emphasis on strategic aspects and the final part presents synthetic conclusions derived from the analysis.

1. Introduction

It is characteristic that modern economy tends to overestimate the importance of the factors influencing the economic growth and prosperity of society. The role of knowledge and innovation increases while the importance of traditional material factors decreases. The IT revolution has given rise to great transformations in the structure of the capitalist economy. These transformations

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consist in the fact that capitalism has moved from the industrial phase to the cognitive (knowledge-based) phase, i.e. the one in which knowledge and innovation are the main source of value. Recent experience of highly developed economies clearly shows that the achievement of competitive advantage based on knowledge and innovation is a guarantee of sustainable economic development and progress of civilization (The Global …, 2011, pp. 3-9).

At the present stage of development of Poland's economy the existing possibilities of increased rate of economic growth are depleting, and above all the reserves of cheap labour, the availability of cheap raw materials, abundant inflow of EU funds, etc. There are however new threats; the growing competitiveness of the economies of China, India, and Brazil, the collapse of public finances, and adverse changes in the natural environment, which are becoming increasingly expensive (the EU energy and climate package). Therefore one should seek new factors of competitive advantage and modernization of the economy, using mainly innovation and knowledge.

This article aims to assess the level of innovativeness of Poland's economy in comparison with other European Union countries and to answer the question concerning the possibility of development of innovation in the context of choice of appropriate strategy for strengthening the technological potential of the economy and creating conditions conducive to pro-innovative behaviour of business entities.

The structure of the article is as follows: the introduction is followed by an assessment of the level of innovativeness of Poland's economy, and then the conditions for innovation in Poland are outlined with particular emphasis on strategic aspects and the final part presents synthetic conclusions derived from the analysis.

2. Assessment of the innovativeness of Poland's economy in the light of statistical analysis

The level of innovativeness in the economy depends on many different factors, the important ones include: human resources, financial resources (budget, business and venture capital), entrepreneurship, the ability to build networks between companies, co-operation of R&D with industry, IT infrastructure, institutional solutions, etc. Therefore, it is a complicated task to make a competent and comprehensive assessment of the innovation economy. There is no universal measure that can be applied for this evaluation, it is necessary to use a set of indicators that reflect different dimensions of activity of innovative economy. The method suggested in the reports of the European

Commission (European Innovation Scoreboard) has been a successful attempt to measure innovation. The reports evaluate the innovative achievements of EU Member States based on the Summary Innovation Index - SII, calculated as a weighted arithmetic mean of 29 partial indicators for 27 countries of the European Union and Croatia, Turkey, Iceland, Norway, Switzerland, USA, and Japan[1]. The indicators used to assess the innovativeness represent both the expenditures on innovation and the results achieved in terms of innovation of economies of individual countries. The expenditures on innovation are described by measures associated with human resources. The measures reflect the level of public education, funding and support for innovative activity, as well as characterize the innovativeness of small and medium enterprises. On the other hand the results of innovative activity are described by such indicators as the number of patent applications submitted to the European Patent Office per one million inhabitants, the number of new community industrial designs per one million inhabitants, and indicators demonstrating economic effects of enterprises active in innovation (e.g. share of exports of medium-high and high-tech products in total exports, the share of sales of new or upgraded products in total companies' sales, etc.).

Interesting statistical analyses are included in two reports, demonstrating the level of innovation in the leading economies in the world: the first report was developed by the Information Technology and Innovation Foundation (ITIF), an American non-profit think tank specializing in the study of innovation and digital economy, the other prepared by H. Hollanders and A. van Cruysen from the University of Maastricht. The first report applied a wide range of indicators to assess the competitiveness of economies. The indicators directly or indirectly illustrate the level of innovation[2]. On the other hand, the Dutch researchers describe in the second report their analysis of potential creativity of the European society. The analysis uses a synthetic index (rate) of creativity (Hollanders & van Cruysen, 2009, pp. 20-22). It was assumed in the analysis that the level of innovation in the economy depends on the creative potential of the society. To assess synthetically the level of creativity of societies of the European Union a set of 30 indicators was used demonstrating the creative potential of the society, a climate conducive to its development and effects of this creativity in the form of achievements in the field of patenting inventions, innovative capacity of companies, activity in the field of industrial design, export of design services, etc. (Hollanders & van Cruysen, 2009, pp. 8-9). The

[1] The Summary Innovation Index has a range between 0 and 1, the closer the value to 1, the higher the level of that creativity.

[2] The ITIF report uses 16 indicators divided into 6 categories: human capital, innovative capacity, entrepreneurship, IT infrastructure, economic policy, and economic performance.

range of social creativity index is between 0 and 1, where 0 indicates minimum creativity and 1 indicates maximum creativity.

Statistical studies show that the economy of Poland is not among the giants in the field of innovation and ranks far in various rankings of innovation. The analysis of EIS 2009 shows that the value of many indices that illustrate the level of innovativeness of Poland's economy is below the average values for the countries of the European Union (25 among 29 indicators are lower than the EU-27 average). The information in Table 1 allows relating the values of these indices in Poland to average EU-27 values.

Table 1. Innovativeness of the Polish economy against the background of the European Union in 2009, according to the European Innovation Scoreboard 2010

Details	Poland	EU-27	Swede	Bulgar
I. Enablers				
Human resources				
S&E and SSH* graduates per 1,000 population aged 20-29 (first stage of tertiary education)	56.50	40.50	28.00	34.50
S&E and SSH doctorate graduates per 1,000 population aged 25-34 (second stage of tertiary education)	0.70	1.03	2.25	0.40
Population with tertiary education per 100 population aged 25-64	19.60	24.30	32.00	22.80
Participation in life-long education per 100 population aged 25-64	4.70	9.60	32.40	1.40
Youth education attainment level (aged 20-24)	91.30	78.50	87.90	83.70
Finance and support				
Public R&D expenditures (% of GDP)	0.410	0.670	0.970	0.330
Venture capital (% of GDP)	0.045	0.107	0.288	--
Private credit (% of GDP)	0.500	1.270	1.300	0.740
Broadband access by firms (% of firms)	59.00	81.00	89.00	62.00
II. Firm activities				
Firm investments				
R&D expenditures (% of GDP)	0.19	1.21	2.78	0.15
IT expenditures (% of GDP)	2.60	2.70	3.80	2.00
Non-R&D innovation expenditures (% of turnover)	1.03	1.03	0.66	0.79

Linkages & entrepreneurship				
SMEs innovating in-house (% of SMEs)	17.2	30.0	41.8	15.1
Innovative SMEs collaborating with others (% of SMEs)	9.3	9.5	16.6	3.8
Firm renewal (SME entries plus exits) (% of SMEs)	--	4.9	2.5	--
Public-private co-publications per million population	1.6	36.1	128.0	1.3
III. Intellectual property indicators				
EPO patents per million population	3.4	114.9	269.6	3.5
New EU trademarks per million population	41.9	122.4	175.3	36.2
New EU designs per million population	49.8	120.3	176.0	12.5
Technology Balance of Payments flows (% ofGDP)	0.35	1.00	1.	0.2
IV. Outputs				
Innovators				
SMEs introducing product or process innovations (% of SMEs)	20.40	33.70	40.70	17.80
SMEs introducing marketing or organizational innovations (% of SMEs	29.10	40.00	--	15.70
Resource efficiency innovators - reduced labour costs (% of firms) - reduced use of materials and energy(% of firms)	13.80 11.60	18.00 9.60	7.00 7.10	15.90 13.20
Economic effects				
Employment in medium-high & high-tech manufacturing (% of workforce)	5.50	6.59	6.20	5.13
Employment in knowledge-intensive services (% of workforce)	10.33	14.92	18.45	8.35
Medium and high-tech manufacturing exports (% of total exports)	51.1	47.4	51.9	24.2
Knowledge-intensive services exports (% of total services exports)	27.2	48.8	42.5	19.1
Sales of new-to-market or substantially improved products (% of turnover)	4.56	8.60	18.29	6.70
Sales of new-to-firm or substantially improved products (% of turnover)	5.55	6.28	5.10	3.59

* S&E (Science and Engineering) and SSH (Social. Sciences and Humanities)

Source: Based on European Innovation Scoreboard 2009. Comparative Analysis of Innovation Performance 2010, www.proinnoeurope.eu/metrics, pp. 59-62.

Poland was placed in a group of moderate innovators with SII index below Eu-27 average in the innovation scoreboard based on the Summary Innovation Index[3]. Table 2 shows the SII values in 2004–2009 and the ranking of EU economies in terms of innovation. According to the EIS 2009 method Poland ranked 23rd in 2004 and 2008 and 24th in 2005–2007. In 2009 the SII value ranged from 0.636 to 0.231, Sweden scored highest and Bulgaria the lowest on this indicator. Poland with 0.317 is below European Union average of 0.478.

Table 2. The European Union Summary innovation index (SII), in 2004-2009

No.	Country	2004	#	2005	#	2006	#	2007	#	2008	#	2009	#
1	Sweden	0.607	1	0.610	1	0.637	1	0.630	1	0.637	1	0.636	1
2	Finland	0.551	3	0.546	3	0.541	5	0.585	3	0.610	2	0.622	2
3	Germany	0.538	4	0.543	4	0.548	4	0.569	4	0.581	3	0.574	5
4	Denmark	0.566	2	0.572	2	0.605	2	0.602	2	0.570	4	0.596	3
5	Great Britain	0.522	5	0.534	5	0.550	3	0.556	5	0.547	5	0.575	4
6	Austria	0.480	8	0.494	7	0.509	8	0.523	7	0.534	6	0.536	6
7	Ireland	0.486	6	0.504	6	0.513	6	0.528	6	0.533	7	0.515	9
8	Luxembourg	0.486	7	0.486	8	0.513	7	0.497	9	0.524	8	0.525	7
9	Belgium	0.467	9	0.477	9	0.486	9	0.498	8	0.507	9	0.516	8
10	France	0.460	10	0.461	10	0.465	10	0.495	10	0.497	10	0.501	10
11	Holland	0.450	11	0.447	11	0.458	11	0.474	11	0.484	11	0.491	11
12	Cyprus	0.370	14	0.363	14	0.381	14	0.433	13	0.471	12	0.479	13
13	Estonia	0.413	12	0.409	12	0.421	12	0.443	12	0.454	13	0.481	12
14	Slovenia	0.388	13	0.393	13	0.412	13	0.429	14	0.446	14	0.466	14
15	Czech Rep.	0.344	15	0.346	15	0.368	15	0.392	15	0.404	15	0.415	15
16	Spain	0.329	16	0.344	16	0.352	16	0.359	17	0.366	16	0.377	17
17	Portugal	0.290	18	0.317	18	0.337	18	0.340	18	0.364	17	0.401	16
18	Greece	0.271	20	0.279	20	0.295	20	0.332	19	0.361	18	0.370	18
19	Italy	0.314	17	0.320	17	0.343	17	0.361	16	0.354	19	0.363	19
20	Malta	0.274	19	0.280	19	0.292	21	0.315	20	0.329	20	0.343	20
21	Hungary	0.266	21	0.273	23	0.287	23	0.305	21	0.316	21	0.328	22

[3] In 2009 the average EU-27 SII was 0.478.

22	Slovakia	0.257	24	0.273	22	0.298	19	0.299	22	0.314	22	0.331	21
23	**Poland**	**0.264**	**23**	**0.272**	**24**	**0.282**	**24**	**0.293**	**24**	**0.305**	**23**	**0.317**	**23**
24	Lithuania	0.264	22	0.273	21	0.287	22	0.294	23	0.294	24	0.313	24
25	Romania	0.209	25	0.205	25	0.223	25	0.249	25	0.277	25	0.294	25
26	Latvia	0.194	26	0.204	26	0.215	26	0.239	26	0.239	26	0.261	26
27	Bulgaria	0.172	27	0.174	27	0.178	27	0.206	27	0.221	27	0.231	27
	UE-27	0.429		0.431		0.447		0.466		0.475		0.478	

Source: Based on European Innovation Scoreboard 2009. Comparative Analysis of Innovation Performance, op. cit. p. 72.

In 2008, Poland ranked 34th out of 40 countries and regions in a study that benchmarks innovation and competitiveness, conducted by the Information Technology and Innovation Foundation (Table 2).

Table 3. Ranking of competitiveness and innovativeness of countries and regions in 2008

Ranking	Country	Points	Ranking	Country	Points
1	Singapore	73.4	21	Czech Republic	47.9
2	Sweden	71.0	22	Estonia	46.1
3	Luxembourg	66.2	23	Spain	43.7
4	Denmark	64.5	24	Hungary	42.5
5	South Korea.	64.2	25	Lithuania	40.8
6	USA	63.9	26	Italy	40.2
7	Finland	59.6	27	Portugal	38.7
8	Great Britain	59.2	28	Slovenia	37.6
9	Japan	59.0	29	Slovakia	37.0
10	NAFTA	58.6	30	UE–10[3)]	36.9
11	The Netherlands	58.4	31	Latvia	36.5
12	France	57.3	32	Malta	36.2
13	Ireland	56.4	33	China	36.0
14	Belgium	56.3	**34**	**Poland**	**35.4**
15	Germany	55.0	35	Russia	35.1
16	Canada	54.4	36	Cyprus	33.2
17	Austria	52.6	37	Greece	31.5

18	UE–15[1)]	52.5	38	Brazil	30.1
19	Austria	51.5	39	Mexico	26.0
20	UE–25[2)]	50.6	40	India	21.6
				average	36.5

[1)] UE–15 includes the „old" EU member states.

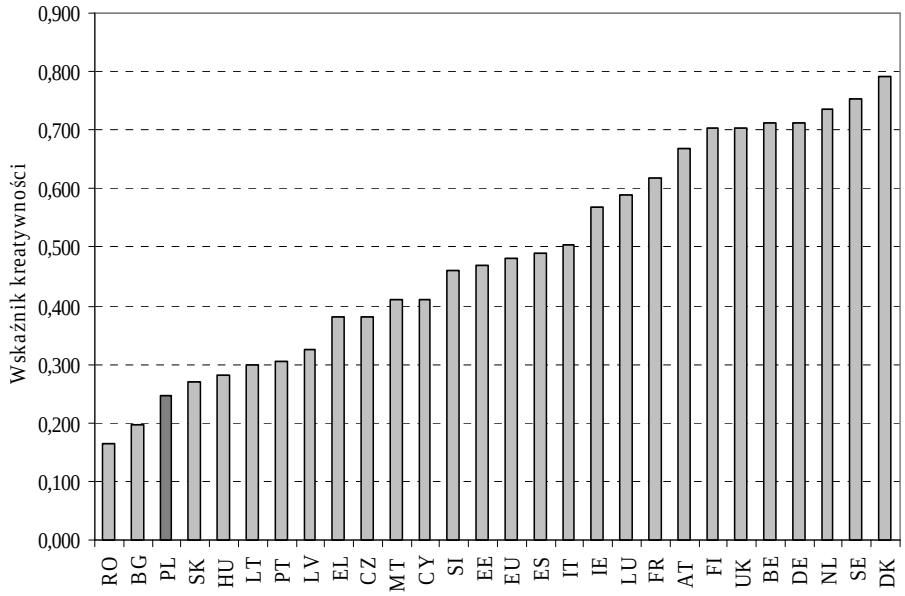
[2)] UE–10 includes the EU member states admitted to the Union in 2004.

[3)] UE–25 includes all member countries except Bulgaria and Romania.

Source: R. D. Atkinson S.M. Andes, Benchmarking EU and U.S. Innovation and Competitiveness, The Information Technology and Innovation Foundation, Washington 2009, p. 2.

Poland came equally far in the European social creativity scoreboard. The scoreboard, developed by H. Hollanders and A. van Cruysen, ranks Poland 25th out of 27 countries covered by the evaluation. Only Bulgaria and Romania are behind Poland. The creativity index for Poland was 0.230 in 2008, while the average value for the European Union was 0.410 (Fig. 1).

Figure 1. Overall creativity index in EU countries in 2008



Source: H. Hollanders, (2009, p. 22).

3. The reasons of poor innovativeness of Polish economy

While analysing the low degree of innovativeness of the Polish economy one should pay attention to the duality of understanding of innovativeness. The first viewpoint consists in treating innovativeness as an ability and motivation of economic entities to create and apply in practice new or updated products, technologies, and organizational and marketing solutions. The other viewpoint sees innovativeness as an ability of the economy to improve technology and organization through application of innovative technical, economic, and organizational solutions resulting in increase in total productivity of factors of production or in productivity of particular factors (Fiedor, 2009, p. 280).

The latter approach proves that the Polish economy is on the right track. Owing to the use of foreign technical innovation through direct foreign investments and import of foreign scientific and technical thought the Polish economy has noted a rapid increase in work performance and productivity of capital. Between 1993 and 1999 the performance measured in terms of GDP value (in real terms) per one employee rose on the average at a 5.7% yearly rate and between 2003 and 2007 at a rate of 5.4% (Heston, Summers & Aten, 2009). The high innovativeness of Polish economy examined through this viewpoint is a result of the restructuring process of enterprises. This process has contributed to increased competitiveness of Polish products in European markets.

A look at the reasons of low innovativeness of the Polish economy from the standpoint of its ability to create and manufacture new products, technologies and organizational solutions requires the analysis of conditions and factors which define internal mechanism of generating scientific and technological knowledge, and innovation. In this case, the questions of the volume and performance of domestic research and development potential, R&D financing system, the scope of public support in this field, the nature of cooperation between scientific institutions and industry, and tendency of enterprises to undertake their own research and development projects.

Understanding the reasons of inadequate innovativeness of the Polish economy through the first approach should result from the in-depth study but some initial comments can be made even at the outset.

Firstly, the weakness of the Polish system of innovation can be attributed to the lack of clear and internally coherent strategy for the development of science and technology. The strategy should designate the preferred by the State directions of the development of scientific research and fields of technology in which national research capacity and achievements of Polish inventors could be used. Such strategy could be a base for the development of programs for

enhancement of innovativeness and competitiveness of the economy (Dworak, 2011, pp. 213-214).

The previous approach to the innovation strategy of the Polish economy resembles a ritual involving development of various programs and reports. During the past several years, the Polish governments presented numerous documents on innovation policy, but none was dedicated to the strategy that would start breakthrough in the approach to solving problems of the innovation system in Poland. The following documents ranked by the increasing degree of detail, include a number of proposals which are often vague or controversial, and became the subject of analysis in the preparation of this paper: *Narodowy Program Foresight "Polska 2020"*, *Strategia Rozwoju Kraju 2007-2015*, *Krajowy Program Reform na lata 2008-2011 na rzecz realizacji Strategii Lizbońskiej*, *Kierunki zwiększania innowacyjności gospodarki na lata 2007-2013*, *Strategiczny Plan Rządzenia* (version of March 2008 r.), *Strategia rozwoju nauki w Polsce do 2015 roku* (version of March 2009), *Raport o Kapitale Intelektualnym Polski* (version of July 2008 r.), *Raport "Polska 2030. Wyzwania rozwojowe"*.

The said documents can hardly be regarded as a synthesis of a novel, holistic thinking about strengthening the innovation capacity and increased efficiency of its use. Some of these documents and programs, such as "*Polska 2030. Wyzwania rozwojowe"* developed by a team of strategic advisors to the Prime Minister, draw a great vision of Poland in 20 years. In 2030, Poland would be the sixth economy in Europe and the 16th in the world, and GDP per capita would reach the EU average. The words "innovation" or "innovativeness" appear 129 times in the report, the terms "knowledge based economy" and "intellectual capital" appear there often too. Out of over one hundred development recommendations exhibited are those of strategic importance in stimulating the innovative economy: the development of intellectual capital, the coupling of scientific research with the needs of the economy, increased investment in R&D up to 4% of GDP in 2030 (Polska 2030, …). The latter recommendations can be considered extremely optimistic if you remember the earlier announcement of successive governments that this index would be significantly increased (up 1.5% in 2010).

Secondly, the current low level of innovativeness of the Polish economy is also a result of a number of negative, politically motivated phenomena. The problem is that every change of government is followed by a change in long-term plans for reforming the system of science and technology. As a result, none of the programs designed to last 10-15 years has survived longer than a parliamentary term. The strategy prepared in 2004 by Minister M. Kleiber was withdrawn by the Minister of Science of the successive government. The

strategy of the new minister was criticized by the Council for Science and because after two years the government was replaced, an intensive work began on a new strategy for the reform.

The point is that without a permanent political will on part of the government the systemic changes in the Polish system of innovation have no chance of success. It follows from the observation of political life that short-term interests of the ruling parties and influential lobbies are the main obstacle to concentrated actions of the state aimed at the reforms strengthening the innovative potential of the economy. The ratio of outlays earmarked for military purposes (defence) to outlays earmarked for research and development demonstrates which fields of state activity benefit from preferences in distribution of financial resources. The result of this comparison shows what particular countries consider as their main threat. The ratio is approximately equal to one in the developed economies, and sometimes even lower than one. For example, in France, the share of military expenditures is 2.6% of GDP and the share of R&D expenditure 2.2% of GDP, 1.2% and 1.16% in Spain respectively, 2.7% and 3.1% in South Korea, 1.5% and 2.51% in Germany. In 2008, the share of military spending in Poland was 1.64% of GDP while the share of R&D expenditure was 0.61 % of GDP (Statistical … 2009, p. 432). Even in the United States, a country that allocates huge amounts for armaments the ratio is 1.45 while it is 2.72 in Poland[4].

Thirdly, there is no coordination between relevant ministries which should collaborate in the construction of the development strategy for science and technology. Innovativeness of the economy is a problem of supra-sectoral nature. It makes no sense, therefore, to increase the budget for research, if you do not take into account the incentives for entrepreneurs to innovate. Innovation essentially reflects the cultural functioning of the state. Therefore, it should be a subject of an agreement between parties and sectors. Meanwhile, strategic thinking and coordination dissolve in various ministries. Formally, it is a responsibility of the Ministry of Economy but the Ministry of Science and Higher Education and Ministry of Regional Development also take certain regulatory projects.

Fourth, the fragile cooperation between R&D realm and enterprises is the Achilles heel of the Polish system of innovation. The latest report made by the Polish Agency for Enterprise Development (PARP) shows that only 6% of Polish companies cooperate with universities, while in Finland the proportion is five times higher.

[4] In 2008, the U.S. spent 4.06% of GDP on armaments and 2.8% of GDP on R&D.

The R&D institutions (universities, institutes, and laboratories) and enterprises as well as wrong regulations are to blame for this state of affairs. Poor cooperation between science and economy has led to a kind of "vicious circle" of impossibility in this field. On the one hand, companies complain that the innovative designs offered by the R&D realm do not meet their needs or are too expensive, on the other hand, researchers and inventors believe that entrepreneurs are not interested in innovation because their mentality is focused on the use of simple reserves.

Fifth, the low innovation of enterprises results from their structure in terms of volume (number of employees, turnover value, and total balance). The vast majority of Polish enterprises are micro- and small enterprises (99.1%). It is worth noting that the level of companies' innovativeness in the Polish industry is positively correlated with their size. Between 2007 and 2009 the share of innovative enterprises in the sector of industrial enterprises was (Działalność …, 2010, p. 11):

- 10.9% among small enterprises (10 to 49 employees)
- 30.1% among medium enterprises (50 to 249 employees)
- 59.0% among huge enterprises (over 250 employees).

During the period under consideration the overall share of innovative enterprises among all industrial enterprises accounted for 18.1% while for 27 countries of European Union it was 41.5% (Działalność …, 2010, p. 12).

Due to the high costs of technological innovation and a lack of funds (from internal and external sources) interest of micro- and small enterprises in this type innovation is negligible. These companies mainly implement marketing and organizational innovation. Medium-sized and large enterprises are mainly the carriers of technological innovation.

Sixthly, in the context of analysing the impact of the structure of Polish enterprises on the level of innovation in the economy it can be assumed that the causes of the weakness of the Polish system of innovation lie in the absence of strong, Polish capital groups that would be able to compete in the global market. The current stage of globalization is characterized by oligopolization of markets and technological race. Large companies base their expansion strategies on investments in R&D, allocating for this purpose about $ 5–10 million per annum (GE, Microsoft, Toyota, Sony, Siemens, etc.). In addition, the R&D sphere is supported by governments that generally finance basic research and development of research infrastructure. For comparison, the national expenditure on R&D (financed by the budget and companies) amounted to approximately PLN 9.1 billion and accounted for only 0.61% of GDP (Small …, 2011, p.293).

4. Conditions for development of innovativeness in Poland

In a modern world a system of knowledge-based economy, whose core is innovation, exceeds the boundaries of developed countries and its elements gradually grow into the structure of economies which catch-up the world forefront (India, China, Brazil, and Malaysia). Therefore, Poland faces a serious challenge of increasing innovation capacity. The success of this project depends on many different factors that affect not only the realm of economic policy, but also social and cultural conditions.

Firstly, to raise the level of innovativeness of Polish economy it is essential to develop and consistently implement the strategy of socio-economic development of the country based on the use of knowledge and innovation as the main driving forces behind this process. Without such strategy it will be impossible to build an internally coherent innovation policy which determines favoured by the state development directions of scientific research and conditions necessary to improve the level of innovation in the economy. All countries which in recent decades have made a great leap forward have created mechanisms and measures to foster the development of innovative economies. It is not easy is to construct a policy which should set realistic goals and conditions for implementation of these goals. The policy cannot be a discretionary one, nor can it substitute the market, but only correct its mechanisms.

Secondly, in order to develop innovativeness it is important to provide a stable macroeconomic environment which forms the background for the implementation of modernization programs. Clear rules for fiscal and monetary policy, as well as low and predictable inflation are a framework for operation of economic entities. In this context, of particular importance is the state of public finances which determines the possibilities of government participation in development projects, especially in areas such as education, R&D, support for innovation companies, or energy and transport infrastructure. Discipline and transparent rules on public spending are the foundation of solid economic growth.

Thirdly, the development of innovation requires a well-functioning institutional system. Availability of qualified human capital and high investment in R&D are important drivers of innovation processes but do not automatically guarantee either effective commercialization of new technologies or acceleration of GDP growth. What is necessary is an appropriate institutional order, which affects the use of technological potential of the economy and diffusion of innovation. Empirical studies confirm the existence of statistically significant positive relationship between the degree of development of knowledge-based

economy and the activity of government systemic actions in shaping the institutional order (Płowiec, 2010, p. 657).

Conditions of doing business, broadly understood, are a key element of institutional environment. Building a friendly institutional environment is mainly based on the introduction of regulations that facilitate the development of entrepreneurship and innovation. This implies the need to simplify complicated regulations which often do not catch up with technology changes, as well as lengthy administrative and judicial procedures. The government's deregulatory actions in Poland are made at random and at a slow pace. It took a long time to create the deregulatory Act and when it was finally adopted it was in a truncated version.

Fourthly, to create effective support system for innovation it is necessary to increase and appropriately allocate financial outlays for R&D and implementation, financed by the state budget and business. Changes in this area should involve not only significant increase in budget expenditures, but above all increase in business expenditure on R&D by facilitating access to capital.

The development of venture capital, private equity, and business angels is very important for financing business innovative projects. Previous involvement of these funds in the financing of innovative activity has been highly inadequate. The nature of important binding Acts (relating to public procurement and public-private partnership) is not sufficiently pro-innovative. Development of a system of public-private partnership in financing strategic technology offers opportunities to overcome barriers to capital, which discourage, particularly small and medium enterprises, to undertake innovation (Dworak, 2011, pp. 219-222).

Fifthly, for the effective functioning of the innovation system it is necessary to develop permanent relations and ways of knowledge transfer between R&D entities and the sphere of business. There is no effective system of cooperation between the two spheres in Poland. There is a kind of "vicious circle" impossibility in this area.

Building a system of relations between the institutions of R&D sphere and companies should be targeted on the development of projects involving:

- support for the flow of personnel between R&D institutions and economy (including internships of R&D personnel in enterprises and business employees at universities),
- development of cooperation within the clusters which increase the ability of economic entities to create, absorb, and diffuse innovation. Of particular importance in this process are technology clusters that group together research units of universities, innovative and service enterprises,

- conducting research funded with public funds in scientific and industrial consortia.

Sixthly, even the best macroeconomic financial and structural policy and institutional strengthening of competition and reduction of red tape will not be sufficient for the development of the Polish economy. It is necessary to improve continuously the quality of business management and systematically improve macroeconomic competitiveness. The lack of these skills cannot be substituted with good fiscal and monetary policy. Politics may only help in these areas, but it is really the ability of companies to effectively manage knowledge and introduce innovation that will determine the level of innovativeness of Polish economy.

There are still many simple reserves in many Polish enterprises involving increasing production efficiency without having to implement their own innovations; it is enough to copy well-proved methods. This situation will change soon, because the Polish economy opens to foreign markets and global economy. Therefore, companies will need innovation to survive and thrive. Meeting this challenge requires changes in business management model including:

a) the emphasis on the promotion of creative activities within the business development strategy,
b) building a business management model based on internal integration and cooperation, and openness to cooperation with environment,
c) creating an organizational culture focused on enriching the enterprise knowledge base and stimulating pro-innovation activities.

Seventh, a system of education with emphasis on developing creativity and collaboration skills, lifelong learning with wide range of possibilities to supplement knowledge, or even changing careers, and increasing the flexibility of shaping curricula and their internationalization are very important for the strategy of development of knowledge-based economy.

To effectively use human capital it is necessary to increase social capital understood as a set of informal values and ethical standards common to members of a specific community enabling them effective cooperation, substantive communication, and mutual trust. The indicators characterizing this capital in Poland are now among the lowest in the European Union. According to the "Diagnoza społeczna 2009" survey only 13.4% of Poles trust other people, while an average index of confidence in European Union is 32%.

5. Conclusion

Are there in Poland conditions conducive to the growth of innovation? Poland's infrastructure is underinvested, there are problems with maintaining correct macroeconomic proportion, and there are large areas of poverty. One can be sceptical while examining the current difficulties in the Polish economy and the nature of the economic policies of successive governments. The question then arises, whether one should simply follow the traditional prerequisites for economic development, mainly macroeconomic, and wait for innovation to develop itself as a result of market forces? It seems, however, that by accepting such an attitude, the economy will never be able to meet the challenges of modern economy. The economies without advantages that matter in the globalized economy are forced to perform slave, subcontracting roles in relation to world centres that actively use the most advanced science and technology. Fulfilling these roles brings little added value and results in increased competition based on low labour costs.

It is difficult to formulate a clear assessment of the opportunities of speeding up the process of laying the foundation of knowledge-based economy in Poland. On the one hand, the volume and dynamics of the Polish market for such goods as computer systems, computer equipment, internet services, medicines, medical equipment etc. undoubtedly speak for the optimistic forecast. This is an attractive market for companies that base their competitive advantage on knowledge. On the other hand, one should note that the domestic market of innovative products is supported largely by foreign companies which relatively rarely allocate in Poland the elements of value chain related to R&D and design.

The key issue is to give a significant priority to R&D outlays in economic policy, financed both from the state budget and by enterprises. It is generally accepted that the national expenditure on R&D lower than 1% in relation to GDP threatens in the long run to weaken the driving forces of economic development. To avoid such situation politicians and opinion-forming elites should make fundamental changes in their attitude towards the role of science and technology in the Polish economy. Poland needs a well-established awareness that the future prosperity depends largely on increased activity of innovative economy.

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Streszczenie

INNOWACYJNOŚĆ POLSKIEJ GOSPODARKI: WARUNKI I PERSPEKTYWY ROZWOJU

Celem artykułu jest dokonanie oceny poziomu innowacyjności polskiej gospodarki na tle innych krajów Unii Europejskiej i odpowiedź na pytanie dotyczące możliwości rozwoju innowacyjności w kontekście wyboru odpowiedniej strategii ukierunkowanej na wzmocnienie potencjału technologicznego gospodarki i stworzenie warunków sprzyjających proinnowacyjnym zrachowaniom przedsiębiorstw.

Struktura artykułu przedstawia się następująco: po wprowadzeniu dokonano oceny poziomu innowacyjności polskiej gospodarki, następnie zarysowano warunki rozwoju innowacyjności w Polsce ze szczególnym uwzględnieniem aspektów strategicznych, a w zakończeniu zawarto syntetyczne wnioski płynące przeprowadzonej analizy.