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THE STRUCTURE OF FINANCING INNOVATIONS IN THE POLISH AND UKRAINIAN ECONOMIES

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Анотація. У статті представлено порівняльний рівень витрат на інновації в різних європейських країнах, особливо в Польщі та Україні. Проаналізовано структуру інструментів, за допомогою яких відбувається фінансування інновацій. Робиться висновок про те, що менш розвинені, найбідніші країни потребують державних коштів для фінансування їх інноваційного розвитку, в той час як високорозвинені країни, мають більш ефективний фінансовий ринок, відповідно їх підприємства не потребують субсидій або будь-яка іншої допомоги з боку держави.

Аннотация. В статье представлен сравнительный уровень затрат на инновации в различных европейских странах, особенно в Польше и Украине. Проанализирована структура инструментов, с помощью которых происходит финансирование инноваций. Делается вывод о том, что менее развитые, беднейшие страны нуждаются государственных средствах финансирования их инновационного развития, в то время как высокоразвитые страны, имеют более эффективный финансовый рынок, соответственно их предприятия не нуждаются субсидий или любой другой помощи со стороны государства.

Summary. The paper compared the level of expenditure on innovations in different European countries, especially in Poland and Ukraine. The structure of instruments financing innovations was analysed. The conclusion is that less developed, poorer countries need public funds to finance their innovation development, whereas highly developed countries have more efficient financial market so their enterprises do not require subsidies or any other public aid.

Ключові слова: *інновації, фінансові інструменти, зростання.*
Ключевые слова: *инновации, финансовые инструменты, рост.*
Key words: *innovations, financial instruments, growth.*

Statement of the problem. The countries of Central and Eastern Europe underwent huge changes both political and economical at the turn of the 80-ties and 90-ties of the 20th century. Their economies compared with the ones of the Western Europe lacked competitiveness, oriented towards to heavy industry, mining and exploiting low-tech. High-tech enterprises were scare while research and development (R&D) sectors were underdeveloped. Due to political transformations and the necessity to adjust these economies to new circumstances, they were affected by deep inflation processes, falls in Gross Domestic Product, which subsequently make their societies impoverished.

The policies of the particular countries and their cooperation with well-developed states, namely the European Union and Russia, increasingly influenced the change in the structures of their economies including the ones of Poland and Ukraine. Innovations played and still do play a leading role in these transformations. This is the factor fostering technological advances and encouraging the rate of the economic growth. Yet, introducing them threatens business entities with high risk and costs. Therefore, entrepreneurs who want to mitigate potential negative effects of innovations seek for the most secure and cheapest ways of financing their innovation actions. The paper aims to compare the ways of financing innovations in Poland and Ukraine against economic development and entrepreneurship there. The Analysis carried out in this paper is a part of the research project No NN 113 303038 financed by the Ministry of Science and Higher Education in Poland.

The selection of optimum sources of financing innovation. The literature on financing business units devotes relatively little space to financing innovation [1]. The selection of optimum sources of financing innovation is dependent on a phase of lifecycle of the enterprise which intends to implement them as well as on the financial needs resulting from the innovation itself. Smaller entities

only at the start of their activities and due to the lack of their financial history have a limited access to bank credits, and entering the Stock Market is legally restricted for them. Meanwhile, larger entities operating on the market for a while may enjoy a position rooted deeply enough to make the use of private/equity funds ineffective (Table 1).

The selection of optimum sources is also significant for the efficiency of the innovation itself. The research shows that external financing is much more effective than the internal one [3, p. 16]. Equally important is the ownership structure of the entity implementing innovations. Enterprises with the majority of public capital are more reluctant to finance innovation in general, and in particular they realize innovations financed by external in a limited manner [3, p. 18].

Table 1

Optimum sources of financing innovation in different phases of enterprises development

Seed phase	**Start-up phase**	**Early growth**	**Expansion phase**
Funder,Three fools		Debt/Bridge Loans,	
Feasibility grants			Public Stock Market
Business angels			
	Venture capital		

Source:[2, p. 3].

Innovations are closely related to the scale of expenditures on research and development activity. Well developed countries being aware of this reliance allocate minimum amounts for R&D in their long-term strategies, which may ensure a sustainable development of their economies. It is best illustrated by the Europe 2020 strategy adopted by the European Union [4]. It assumes, that different countries belonging to the Union should spend on R&D activity minimum 3 % of their GDP per year.

Expenditures on research and development activities in selected countries. Despite adopted strategies, the actual amount of spending on R&D in particular EU countries differ from the assumptions. In 2010 the average spending remained at the level of 2 % of GDP (table 1). Only Finland, Denmark and Sweden exceeded the recommended level of expenditures, while Germany and Austria reached the level close to 3 %.

The low funds on research and development activity have been also transposed on the total low share of expenditures on innovation in the Gross Domestic Product. This effect was enhanced by the financial crisis of 2007, which was reflected in the ongoing economical crisis and additionally resulted in decreasing these spending. Table 2 shows, the indexes of rations of the relations of investment expenditures to GDP published by Eurostat every two years, In many countries there is a noticeable fall of this index in the years 2008–2010.

A similar lowering of expenditures on research and development was noted in Ukraine in the years 2008–2009 (table 3), wherein the GDP was on average four times lower than the GDP of Poland [6].

The low level of expenditures on innovations and research and development activity, though not the only one, is an essential factor affecting ranking of different countries in terms of innovation (Table 4)

Global Innovation Index includes, apart from the access to the source of funding, indexes grouped in seven areas. These are institutions, human capital & research, infrastructure, business sophistication, knowledge & technology outputs, creative outputs. In the years 2007–2012 Ireland, the USA, Switzerland were ranked the highest. Poland for some time has been systematically ranked as 45, while Ukraine close to 60. The reasons for the lower positions in the ranking of these two countries are varied. In Poland poorly rated are such factors as the ease of setting up a business, complexity of taxation, the access to micro financing, yet with a high rating for the ease of obtaining credits. In the case of Ukraine institutional factors were ranked the lowest, including legislation, business environment as well as infrastructure. Equally low ratings were assigned to the sources of financing, including credit.

The structure of innovation funding in Poland and Ukraine against the rate of economical development. As mentioned above innovation activity may be financed with different instruments coming from various sources. Therefore, in international comparative analysis there are juxtaposed amounts of internal expenditure on research and development activity (GERD) in relation to GNP, where the sources of capital raised are taken into account. In the world of well developed economies in which a large part of investment expenditures is allocated to innovation, the company's expenditures are the basic source of financing innovation activity. This occurs, among others, in the United States, Japan and Germany, where the share of private sector in financing innovation exceeds 60 %. Less developed economies

require an impulse to develop innovation, which is the financial support provided by the public sector. Poland is one such country, where in the years 2002–2009 the average spending of the public sector on innovation activity in economy accounted for slightly more than 60 % (pic. 1). In such countries as the USA or Germany the share of this sector stayed at the level below 30 % of the total funds assigned for this purpose.

Inconclusive results appear for the whole European Union. It results from the fact that the EU is made up of countries which vary considerably in terms of the degree of development and the level of welfare. The situation of the poorer and less developed countries, for example, Romania, Bulgaria or Poland brings about the decrease in the share of the private sector and the increase of the public one in analyzed sources of financing innovation while

Table 2

Innovation spending in selected countries (% of GDP)

	Year			
Country	**2010**	**2008**	**2006**	**2004**
Germany	3,69 %	4,00 %	4,60 %	4,40 %
Sweden	3,58 %	4,38 %	3,80 %	4,20 %
Spain	1,14 %	1,29 %	1,40 %	1,20 %
Netherlands	1,78 %	1,78 %	1,70 %	1,60 %
Belgium	2,42 %	2,32 %	3,50 %	3,40 %
Poland	1,81 %	1,93 %	1,80 %	1,90 %
Ireland	1,63 %	2,93 %	2,60 %	3,80 %
Czech Republic	2,16 %	3,01 %	2,80 %	3,00 %
Romania	0,72 %	2,00 %	1,70 %	1,80 %
Portugal	1,32 %	1,56 %	1,60 %	1,70 %
Hungary	1,64 %	2,22 %	1,90 %	1,80 %
Slovakia	1,26 %	1,37 %	2,90 %	3,10 %
Slovenia	1,76 %	2,18 %	2,30 %	
Luxembourg	1,50 %	1,98 %	2,90 %	2,60 %

Source: prepared by the author on the base of [5]

Table 3

Research and development expenditures (% of GDP)

Country Name	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
European Union	1,781	1,753	1,837	1,800	1,861	1,829	1,861	1,826	1,822	1,847	1,849	1,947	2,041
Poland	0,652	0,667	0,689	0,644	0,623	0,559	0,541	0,558	0,567	0,556	0,567	0,604	0,675
Ukraine	1,192	1,070	0,970	0,962	1,023	0,998	1,112	1,082	1,169	0,949	0,853	0,845	0,856

Source: [7]

Table 4

Global Innovation Index Ranking

Country	**Ranking position**				
	2007Y	**2008/9**	**2009/10**	**2011**	**2012**
Germany	16	2	16	12	15
Japan	13	9	13	20	25
United States of America	11	1	11	7	10
Poland	47	56	47	43	44
Ukraine	61	79	61	60	63

Source: [8]

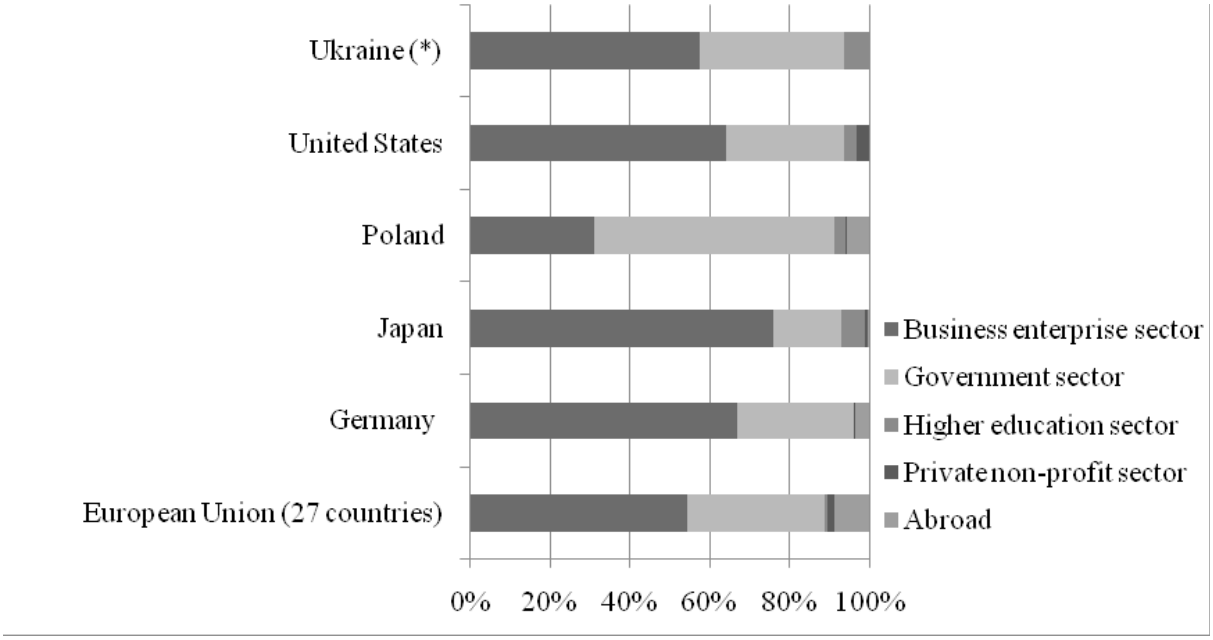

Fig. 1. GERD by source of funds – the average of 2002–2009 (%)
(*) for Ukraine average of 2005–2011

Source: [9] and [10, p. 80]

calculating average values for the whole European Union.

In the case of Ukraine in the years 2005–2011 on average over 57 % of expenditures on development and research activity were incurred by enterprises, while 36 % – by the government sector. The rest of spending for this purpose was realized by higher education sector. Such a structure of expenditures was affected to a large extent by a low production value. A smaller, than e.g. in Poland (where the expenditure share of the government sector is much similar to those of developed countries) the expenditure share of the government sector unfortunately results rather from low resources being at its disposal, than a high level of economical development.

While comparing changes in expenditures on innovation activity and analyzing the structure of their financing one should, first of all, consider the fact that Poland due to its membership has got the access to a number of external funds. In turn, Ukraine is a country of a larger size, more densely populated, affluent in natural resources, therefore, with significant development potential, based however, on low technology industries. In both cases the fact that Ukraine stayed behind as well as a political situation from before 1989–1991 considerably affected the situation in the first half of the nineties of the 20th century. The subsequent years 2001–2002 are those of dramatic downturn (crisis in Russia), and the years 2008–2010 brought an economical crisis connected with the financial crisis noticeable all over the world (fig. 2).

A dynamic growth of Ukraine's GDP in the period 2001–2004 was the consequence of the high demand in the world demand for steel, coal, ores, which allowed to maintain in the country a high level of exports. The increase in fuel prices, however, which took place on the world markets after 2005, resulted in a significant fall in the exports and therefore the decrease in the use of production capacity in many economy sectors of Ukraine, quite often coming to the level below 50 %. As a result the value of Ukraine's GDP remains much lower than indicated by the economical potential of the country.

The majority of publications including the analysis of expenditure on research and development activity, and in a narrower perspective on the innovation activity, present comparisons bases on the share of this expenditure in the GDP of particular countries. For the economical development the value of such expenditure is also crucial. It may be concluded from the data presented in Table 3 that Ukraine spends on research and development much higher amounts than Poland, considering the potential of this country to generate added value. As it turns out, this is not the case. Ukraine despite being one of the biggest countries in terms of size and labour resources, enjoying also considerable scientific potential, does not make use of its abilities. [11, p. 11] It is only proved by the data in Table 5, in which there is a comparison of the volume of expenditure on research and development expressed in $, including Purchasing Power Parity, which both investigated countries incurred in the years 2000 and 2007.

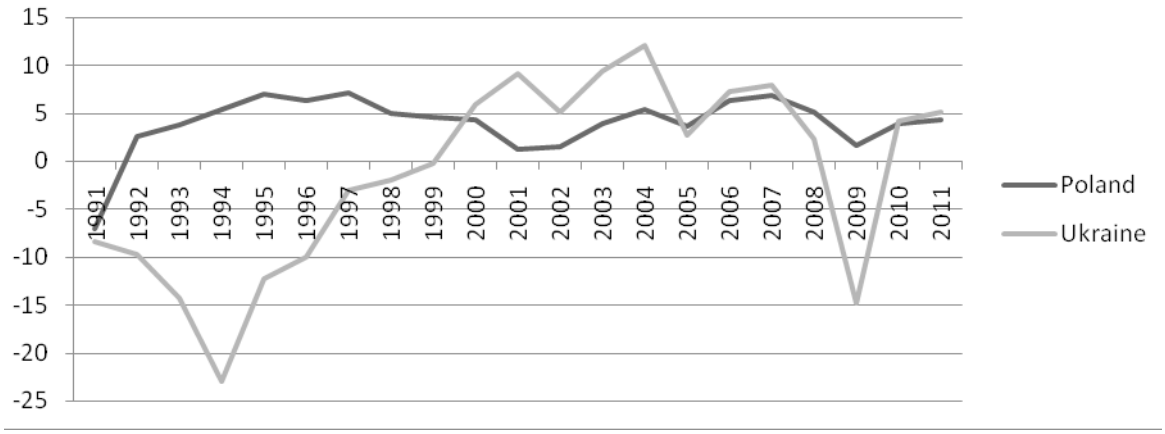

Fig. 2. GDP (% annual growth)

Source: World Bank data

Table 5

Expenditure on R&D in Poland and Ukraine in PPP$

	GERD in PPP$ in thousands		GERD per capita in PPP$	
	2002	2007	2002	2007
Poland	2 472 248	3 990 922	64,5	104,7
Ukraine	1 921 261	2 753 653	40,0	59,5

Source: [12, p. 479]

Despite the aforementioned fact that between the years 2002 and 2007 the dynamics of Ukraine's GDP and the share of expenditure on research and development activity was higher than the one in Poland, while comparing the data by value, it appears that in terms of amounts as well as per capita the value of GERD for Ukraine fell compared to Poland. In 2002 Ukraine's GERD accounted for 77 % of Poland's one with regard to amounts, and 62 % per capita. In 2007 these values were 69 % and 57 % respectively.

The economical situation is a decisive factor influencing the amount of funds on innovation activity. In the periods of downturns enterprises avoid introducing investments which bear the high risk of failure. Therefore, in the both countries there were noticed fluctuations of not only the share expenditure on innovation in the GDP (table 3), but also the high dynamics of changes of the very value of this spending (Table 6). It becomes clear that compared with Poland, Ukraine is more affected by ongoing changes in the world economy

Instruments of financing innovations. The main instrument of financing innovation in Poland are the own funds of business entities. They finance about 75 % expenditures on innovation in the enterprise sector and about 85% in the service sector. (Table 7)

This situation has been remained for many years. Bank credits are ranked second in the structure of instruments of financing innovation, non-returnable funds from abroad came third with a noticeably lower share though, mostly from in the form of subsidies from the European Union budget.

In the years 2005–2011 a considerable fall in the share of own funds in financing innovation is observed in Ukraine as it was from above 87 % down to 52,9. In the majority of the reviewed years bank credits were the second largest source of financing innovation. The period of 2009–2010, when respectively 19 % and 30 % of innovation was financed by foreign investors, is to be viewed as exceptional. At the same time these years mark the lowest level of investments, thus, a high share of foreign investors should be assessed with regard to a significant decrease in the amounts spent at that time by the domestic business entities both from the own funds and in the form of returnable funds, mostly credits taken from domestic banks (Table 8).

The data presented above reveal some regularities in respect of reliances between innovation financing instruments and the state of innovation in particular countries. In developed countries innovations are derived mainly from research carried out. They are often realised in cooperation of education with business sector. The source

of financing of conducted research are the means of enterprises committed to implement the results into their activities and public funds usually available for research institutions by means of organising competition. In turn, implementing innovative solutions is run to a large extent through returnable instruments and funds of high risk.

Both Poland and Ukraine are only aspiring to the group of countries of the highest level of development. However, their economical potential is not fully exploited, because of, among others, some backwardness in technological development and as well as relatively short time the societies o these countries had to develop their individual entrepreneurship. In countries like these economical development is specially related with implemented technological advances including innovations.

Table 6

The dynamics of value changes of spending on innovation in Poland and Ukraine in 2006–2011 at current prices (previous year = 100)

	2006	2007	2008	2009	2010	2011
Poland	120,38 %	114,81 %	124,64 %	91,77 %	104,88 %	87,64 %
Ukraine	107,10 %	176,15 %	110,54 %	66,28 %	101,20 %	178,16 %

Source: calculations by the author on the base of the data of Central Statistical Office of Poland and State Statistics Service of Ukraine

Table 7

The structure of finance spending in Poland

Years	Total	Including means					
		Own funds	Home budget		Gained from abroad (nonreturnable)	From capital risk funds	bank credits
	In Plz mn						
Industry							
2007	19804,6	74,70 %	1,13 %	1,10 %	0,04 %	14,18 %	
2008	23686,1	71,90 %	1,20 %	1,59 %	0,16 %	20,64 %	
2009	21405,5	69,75 %	0,81 %	2,66 %	0,00 %	25,38 %	
2010	22379	77,31 %	1,04 %	7,25 %	0,00 %	7,31 %	
2011	19376,5	76,21 %	1,20 %	6,93 %	0,00 %	8,97 %	
Services							
2008	9794,6	86,86 %	1,06 %	0,65 %	0,00 %	8,86 %	
2009	7624,3	85,65 %	0,71 %	0,33 %	0,00 %	13,14 %	
2010	9921,1	86,65 %	0,39 %	1,96 %	0,00 %	10,45 %	
2011	10317,9	83,92 %	0,85 %	1,11 %	0,00 %	10,26 %	

Source: [13, p. 122]

Table 8

The structure of finance spending on innovation sources in Ukraine

	Own funds	Home budget and local budgets	Home investors	Foreign	Loans	Other sources
2005	87,70	0,80	1,40	2,70	7,10	0,30
2006	84,60	1,90	0,40	2,90	8,50	1,70
2007	73,70	1,40	0,20	3,00	18,50	3,20
2008	60,60	2,90	1,40	1,00	33,70	0,40
2009	65,00	1,70	0,40	19,00	11,80	2,10
2010	59,30	1,20	0,40	30,00	7,80	1,30
2011	52,90	1,10	0,30	0,40	38,30	7,00

Source: [14]

It is well worth noting, however, that a large part of innovation is not going to appear in them due to their own research and development activity, but by means of purchased technologies and ready-made solutions adopted from developed countries. Moreover, the less developed financial market is not efficient enough to provide business entities with financial instruments. That is why, in countries such as Poland or Ukraine, quite a lot of implementations of significant innovations are financed by public funds, wherein additionally Poland is able to draw on the European Union Budget.

In Poland credits are ranked second in the structure of financing innovation. Yet, one should take into account the fact that some part of them are preferential instruments, whose costs are lower than it would be indicated by the market conditions. They comprise, among others, technological credit and credits with payments provided by the Agency of Restructuring and Modernisation of Agriculture for farmers and entities dealing with food processing.

Conclusions. The situation of countries similar to Poland and Ukraine shows that for the optimum rate of innovation development of their economies it is essential to provide the means for financing innovations themselves. Entrepreneurs are not able to finance many of these technologies and organizational or marketing solutions with their own funds or returnable instruments available under market conditions. With not sufficient development of the financial market and a low level of activity of institutions from business environment which are to provide capital of high risk (venture capital, business angels), it becomes essential to create system solutions. They lie in providing business entities with non-returnable or preferential instruments of financing innovation by the public sector.

In the case of Poland the subsidies from The EU budget became the source of such additional means directed to the countries aspiring first to the membership, and since 2004 supporting the development of countries and regions with the lowest level of development in the Union.

As Ukraine is neither a country associated nor a member state of the EU, it is not able to take advantage of this kind of financing, apart from projects referred to the backup of border regions, which may be run together with Poland and Belarus. This makes the state budget and local governments budgets the only sources of financial support, which with the current situation is by no means easy.

The analysis presented in the paper underlies the importance of financing innovation activity for innovation of business entities and the economy itself. It seems to be evident that the more developed financial market the easier it is for business entities to raise means for innovation activity. It is essential to support innovation with nonreturnable or preferential financial instruments in countries with a lower level of financial market development.

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