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4.7 INNOVATIVE ECONOMY IN THE POMERANIAN REGION OF POLAND

Abstract: Research and experimental development activity (R&D) comprises basic research, applied research and experimental development. R&D entities are defined as economic entities which, along with their primary activity, have their own R&D facility and conduct R&D activity, mostly in the area of experimental development.

The purpose of this study is to present the progress in research and development activities in the Pomeranian region (comprising two provinces: West-Pomerania and Pomerania) in the years 2004-2010. Employment rate, expenditure and revenue in entities involved in research and development were considered. Employment in R&D activities refers to employees directly engaged in R&D and dedicating at least 10% of their nominal work time to R&D work. Expenditure on R&D includes types of expenditure, structure of resources, as well as the scope of industrial product and process innovation. The revenue considered is the revenue generated from the sales of new or significantly improved industrial products. Statistical and econometric methods were used in the study to present the dynamics of change and interconnections between the factors affecting the progress in R&D activities in the region analyzed.

Keywords: R&D activity, innovation, innovative enterprises, employment in the R&D sector

1. INTRODUCTION

„In times of great economic challenges and global vulnerability, innovativeness is perceived as a way to overcome difficulties, ensure and reinforce economic growth, and in result, as a chance for an efficient solution of social problems. In Europe in particular, innovations can play a significant role in pulling economies from recession and in identifying new sustainable sources of growth and competitiveness. Lasting competitive advantage can be achieved, above all, by continually expanding the country’s innovation potential. Innovativeness is indispensable to prosper and thrive in today’s extremely competitive global economy. Implementation of new, significantly improved products, processes and methods becomes the key to enhance efficiency and create new jobs. The policy of innovation is extremely important for the recovering from crisis, yet it should take into account the dynamics observed in global economy and transformation of processes, therefore statistical surveys must be taken into consideration when formulating this policy” (Innowacyjność, 2010).

The State Development Strategy points to the “Enhancement of Economic Competitiveness and Innovation Potential” as the 1st Priority. Overall expenditure on research and development in Poland amounted to less than 1% GDP and in 2010 this ratio was 0.74% GDP (foreseen at 1.5%). However, this ratio was above 1% GDP in other EU member states and in 2010 it reached 2% GDP (source EUROSTAT)

“In developed economies the main driving power behind increased productivity is actually innovation based on three pillars: research and development (R&D), knowledge and education. Innovativeness becomes one of the key indicators of competitiveness. Innovative activities generate added value for industry and services, as well as enhance the country’s competitive capacity on the international market.

Innovativeness is the key element in increasing efficiency and economic growth, especially today, with the instant technological changes taking place all the time. The growth trends in highly developed countries show that only by creating competitive advantage based

on knowledge and innovation, a country can ensure sustained development and guarantee new, more attractive jobs for its citizens. Currently, Poland finds itself in a specific moment of development. Hitherto competitive advantages, based on low labour costs, are increasingly losing their importance. It thus becomes necessary to create new competitive advantages based on knowledge and innovation, as they are the basic determinants of long-term economic development. From this perspective, it is important to focus on and strengthen the innovation capacity of enterprises, and especially their R&D activities, as these are the determinants of competitive advantage in a globalized world.” (Innowacyjność 2010, p.9)

In modern days, the development of regions is increasingly being more determined by skilful management and application of knowledge. Developmental success of a region depends mostly on adequate knowledge, which is a prerequisite for introducing innovation in any region. The capacity to absorb innovation depends on the region’s status in terms of research and experimental development, quantity and quality of personnel employed in the R&D sector, overall expenditure on R&D, as well as educational potential reflected in the number of university and college students.

Only the regions, which are innovative, can compete efficiently. An innovative region can be defined as a region capable of changing, improving, implementing reforms and innovative solutions in various areas of socio-economic life with the aim of boosting mechanisms supporting development in the region. Regional innovation can be determined by measuring the innovation level of particular groups of factors, inter alia:

- Innovation level of enterprises located in the region,
- R&D potential of the region,
- existence and organization of the environment for entrepreneurship,
- level of the social and human resource capital in the region.

Knowledge and information are the determinants of competitiveness of both present day enterprises and entire regions. If knowledge possessed by regional economic entities is unique and difficult to acquire by competitors, it enables the acquisition of competence, which will in turn reinforce the region’s strong position among other regions, and the innovations in the region will stimulate its development in a lasting way. (Kamińska, Fryc, Majecka 2007)

Innovation should be understood as the capacity and motivation of enterprises to constantly seek and practically apply the findings of R&D work, new concepts, ideas and inventions. The term ‘innovation’ also refers to improvement and development of existent production and application technologies, service-related technologies, as well as implementation of new solutions in organization and management, improvement and development of infrastructure, in particular infrastructure related to the gathering, processing and diffusion of information (National Strategic Reference Framework 2007-2013).

“The largest catalogue of instruments supporting innovation is offered by the *Operational Program Innovative Economy, 2007-2013* (OP IE), aimed at boosting Polish economy through innovative enterprises. In a knowledge-based economy, innovation is one of the factors building competitive advantage, since the creation of new products and technologies is necessary which enables an economy to compete successfully on the global market. OP IE funds are allocated mostly to investment projects that result in new or significantly improved products. The support is given mostly to implement product and process innovations.

OP IE support instruments are addressed to, inter alia, entrepreneurs, including Ministry of Treasury, institutions providing support to innovative enterprises, as well as business environments institutions and their networks.” (Poland 2011, p.247)

Herein below the description of the Pomeranian region of Poland is presented, with focus on broadly understood resources, significant in the context of building innovative economy.

2. DESCRIPTION OF THE REGION

The Pomeranian Region of Poland comprises two provinces: the West-Pomeranian and Pomeranian province. These are neighbouring provinces, located in the northwestern and northern part of Poland, in the same climatic and geographical area.

General outline of the subject provinces in the Pomeranian region has been presented in Table 1.

Table 1: General outline of the Pomeranian Region (as for 31.12.2010r.)

Basic facts	Pomeranian Region			
	Including provinces		total	% Poland
	West-Pomeranian	Pomeranian		
Territorial area (thousand ha)	2 289	1 831	4 120	13,2
Population (thousand persons)	1 693,3	2 219,5	3 912,8	10,2
Persons per 1 km ²	74	121	95	-

Source: own study based on data from the Polish Central Statistical Office

The Pomeranian Region covers the total of 4120 thousand hectares, that is 13.2% of Poland's territory. Population of this Region makes up for 10.2% of Poland's population. Population density in the Region is not uniform, with population 63% bigger on average in the Pomeranian province.

The Pomeranian Region is considered economically well-developed, which is reflected, e.g., in its GDP, as well as the revenue and expenditure of the two provinces. Gross Domestic Product, as a basic indicator of national accounts and national output, reflects the condition of the economy. Increase or decrease of real GDP is a measure of economic growth of the region. In the two provinces being the focus of this study, GDP has been rising continually, although the rate at which it grew wasn't steady.

Table 2 presents the revenue and expenditure for years 2002, 2005 and 2010, and their dynamics in the Pomeranian Region provinces.

Table 2: Revenue, expenditure and GDP in the Pomeranian Region provinces

Indicators	Provinces									
	West-Pomeranian					Pomeranian				
	2002	2005	2010	2005/2002	2010/2005	2002	2005	2010	2005/2002	2010/2005
Province's total revenue (mln PLN)	201,5	272,7	735,8	1,35	2,70	248,3	391,1	724,6	1,58	1,85
Province's total expenditure (mln PLN)	200,7	328,3	786,1	1,05	2,39	249,8	442,7	872,0	1,77	2,00
Revenue/exp. expenditure (%)	100,4	83,1	93,6	-	-	99,4	88,3	83,1	-	-
Overall GDP (mln PLN)	35 234	40 533	52389	1,15	1,29	46 023	55 602	76243	1,21	1,37
Share in national GDP (%)	4,51	4,12	3,33	-	-	5,89	5,65	5,39	-	-

Source: own study based on data from the Polish Central Statistical Office

The economic potential of the two provinces is proven by the fact that overall GDP in 2002 of the West-Pomeranian and Pomeranian provinces was respectively 4.51% and 5.89% of Poland's GDP. In the following years, this share declined slightly, remaining at the level of

over 5% of share in national GDP in the Pomeranian province, whereas in 2010 it dropped down to 3.33% in the West-Pomeranian province. For the whole Region, in the year 2010 the share in national GDP was approx. 9% and it was lower than in 2002 by approx. 1%.

In 2002 the West-Pomeranian province revenue to cover its expenditure, whereas the Pomeranian province showed a minor shortage of revenue to cover its expenditure (approx. 0.6%). However, in 2005 both provinces had difficulty in raising sufficient revenue to cover their expenditure (shortage of approx. 17% in West-Pomerania and approx. 12% in Pomerania). In the following years, an improvement was observed only in the West-Pomeranian province. In 2010 the province's expenses were covered in approx. 94% by its revenue, partly thanks to the subsidies received (about 51% of revenue). Unfortunately, the Pomeranian province fell short of revenue by about 17%, though also in this province subsidies had a significant share in the province's revenue (approx. 38%).

The Region's potential, besides its financial situation, is also reflected in labour force available, expressed in the number of working and professionally active persons. The term 'professionally active' encompasses all working persons (employers, employees, self-employed persons, family members rendering their work without payment) and officially unemployed persons. Students doing their internships, housewives and persons living off their equity are excluded from this group. Table 3 presents changes in the population structure.

Working-age population in both provinces constitutes about 60% of the total inhabitants. Considering the three sectors: farming, industry and services, the biggest number of people work in the last sector. In the West-Pomeranian province, it was about 63% of the working population, remaining on roughly the same level throughout the study period, and about 60% in the Pomeranian province. It is commonly believed that such a big number of people employed in the service sector indicates the general well-being of the society.

Table 3. Population structure in the Pomeranian Region provinces

Indicators	Provinces									
	West-Pomeranian					Pomeranian				
	2002	2005	2010	2005/ 2002	2010/ 2005	2002	2005	2010	2005/ 2002	2010/ 2005
Overall % of working-age population	63,7	65,6	65,7	1,03	1,00	62,8	64,3	64,4	1,02	1,00
Structure of working population in sectors (%):										
- agricultural	9,7	9,2	9,8	0,95	1,07	9,7	9,3	8,9	0,95	0,96
- industrial	27,8	27,6	26,9	0,99	97,5	30,7	30,1	30,0	0,98	1,00
- service	62,5	63,2	63,3	1,01	1,00	59,6	60,6	61,1	1,02	1,01
Employment rate (%)	45,0	41,8	46,2	0,93	1,11	48,2	43,5	50,7	0,90	1,17
Unemployment rate (%)	-	25,6	17,8	-	0,70	-	19,2	12,3		0,64
Population growth (‰)	0,5	0,5	0,5	1,00	1,00	2,0	2,2	3,4	1,1	1,5

Source: own study based on data from the Polish Central Statistical Office

The employment rate in both provinces was reported at less than 50%, which is not an optimistic indicator. In Pomerania it exceeded 50% in 2010, whereas the rate for Poland was approx. 60% and approx. 66% for the European Union. The unemployment rate was also very high, though it shows a declining trend. In West-Pomerania it dropped from 25.6% in 2005 to 17.8% in 2010 (decrease by approx. 30%). In Pomerania, the unemployment rate was much lower and it declined from 19.2% in 2005 to 12.3% in 2010 (decrease by approx. 36%).

It is believed that the population growth depends on economic development, that is the higher the level of economic development, the lower the population growth. However frequently this trend is exhibited, it can yet not be treated as a rule. In the study period, the population growth in West-Pomerania remained on a steady level of 0.5‰ and in Pomerania it showed a rising trend from 2‰ in 2002 to 3.4‰ in 2010. Yet, it cannot be concluded that

the West-Pomeranian province is more developed economically than the other province considering the economic indicators presented in Table 4.

The economic potential of the Region is reflected in the per capita values, i.e. gross added value, investment expenditure, industrial sales and Gross Domestic Product. In both provinces these indicators are on the increase. Investment expenditure in both provinces was on a comparable level and in the period analyzed, their growth rate was the same.

In West-Pomerania GDP per capita was 20.7 thousand PLN in 2003, increasing by 15% in 2005 and by astounding 50% in 2009, as compared to the year 2003. The growth dynamics was even more pronounced in Pomerania, with the initial levels in 2003 slightly higher than in the other province. In 2009 GDP per capita in Pomerania was higher by approx. 11% than in West-Pomerania.

The dynamics of professionally active persons also shows certain differences. In the West-Pomeranian province the number of professionally active persons decreased by 3% in 2005 as compared to 2002, while in 2010, compared to 2005, the employment rate was higher by over 4%. In the Pomeranian province, the professionally active population remains on the same level over the study period.

Table 4: Economic indicators per capita in the Pomeranian Region provinces

Indicators	Provinces									
	West-Pomeranian					Pomeranian				
	2002	2005	2010	2005/ 2002	2010/ 2005	2002	2005	2010	2005/ 2002	2010/ 2005
Overall working population (thousand persons)	486,5	483,8	507,6	0,99	1,04	660,7	667,0	744,9	1,01	1,12
Professionally active (thousand persons)	734*	713	664,0	0,97	0,93	862*	856,0	917,0	0,99	1,07
Average gross monthly remuneration (PLN)	2 068	2 308	3120	1,12	1,35	2176	2511	3384	1,15	1,35
Gross added value per 1 working person (thousand PLN)	60,4*	70,7	86,1**	1,17	1,22	59,2*	71,3	88,8**	1,20	1,25
Investment expenditure per capita (thousand PLN)	2,3	2,8	4,9	1,22	1,75	2,8	3,4	5,8	1,21	1,71
Industrial sales per capita (thousand PLN)	9,0	12,6	15,2**	1,40	1,21	14,2	18,9	28,2**	1,33	1,49
GDP per capita (thousand PLN)	20,7*	23,9	30,9**	1,15	1,29	21,1*	25,3	34,3**	1,20	1,36

*data for 2003; ** data for 2009

Source: own study based on data from the Polish Central Statistical Office

These changes did not correspond to the number of working persons. In West-Pomerania this number fell down in 2005 by 1% as compared to 2002, whereas in 2010 a 5% increase was recorded, as compared to 2005. In Pomerania the number of working persons initially decreased by 1% in 2005, to be followed by a 7% increase in 2010. Such dynamics is caused by, i.a., liquidation of large enterprises, as well as creation of working places in newly set up companies.

3. APPLIED RESEARCH METHODS

In this study, to present the dynamics of factors affecting the Region's innovation capacity, the following statistical and econometric methods were applied (Nowak 2002, Kukuła 2003):

- absolute increase rates with variable base: $\Delta y = y_n - y_{n-1}$
- one-base indexes with variable base: $I_{n/n_0} = \frac{y_n}{y_{n-1}}$;

where y_n – value of the feature over n period;
 y_0 – factor value in the period $n-1$;

- linear trend function: $y_t = a_0 + a_1 t$
 estimated using MNK – Least Squares Method and verified on the validity level 0,05.

$$a_1 = \frac{\text{cov}(y, t)}{S_t^2}$$

$$a_0 = \bar{y} - a_1 \bar{t}$$

where: a_0 – regression constant; a_1 – regression coefficient; t – time variable.

4. HUMAN RESOURCES

Human resources constitute one of the indicators reflecting the capacity for innovation and creativity, since individuals are able to take up work related to the creation, development, dissemination and application of knowledge thanks to their education and qualifications (Table 5).

Table 5: Percentage of population by level of education in the Pomeranian Region in the years 2002 and 2010 (%)

Territorial unit	Tertiary education			Secondary and post-secondary education		
	2002	2010	2010–2002	2002	2010	2010–2002
Poland	11,2	19,3	8,1	32,6	33,6	1,2
Pomeranian Region	10,9	17,8	6,9	32,9	33,2	1,4
West-Pomerania	10,4	17,1	6,7	32,9	32,7	-0,2
Pomerania	11,3	18,4	7,1	32,9	33,7	1,6

Source: BAEL

In the Pomeranian Region of Poland, in the year 2002 43% of the population completed at least their secondary education (secondary, post-secondary and tertiary). In the period until 2010 the share of people with higher education increased by 7%, and the share of people with secondary and post-secondary education rose by 1.4%. It is easy to gain education and qualifications thanks to numerous higher education institutions (51) operating in the Region.

In the Pomeranian Region, the educational indicators show a reverse trend. In West-Pomerania, in 2010, as compared o 2004 (no data available for 2002), a 17% decline in the number of students per 10 thousand inhabitants was recorded, while at the same time this number rose slightly (by 5%) in Pomerania. In the first province, the amount of students in public schools decreased (by about 25%) and the amount of students in private school increased (by about 6%), to be contrasted with the Pomeranian province where the number of public school goes increased slightly (by 0.4%), and by an astonishing 40% in case of private schools. In Poland, the student ratio per 10 thousand persons was only 32, and the decrease in the overall number of students was observed for both types of schools (Table 6).

Table 6: Tertiary education students in the Pomeranian Region in the years 2004-2010

Territorial unit	Public schools (thousand persons)		Non-public schools (thousand persons)		Total per 10 thousand inhabitants	
	2010- 2004	2010/ 2004	2010- 2004	2010/ 2004	2010- 2004	2010/ 2004
Poland	-93,260	0,9299	-2,036	0,9965	-32	0,94
Pomeranian Region						
West-Pomerania	-19,323	0,7445	0,929	1,0639	-84	0,83
Pomerania	0,314	1,0042	9,213	1,3966	23	1,05

Source: own study based on data from the Polish Central Statistical Office

As the correlation coefficient for both provinces was very high, the dynamics of the student ratio per 10 thousand inhabitants could be described by using the linear trend function. For West-Pomerania this correlation is negative (-0,9880), which means that year after year the number of students kept falling by 17, on average, while for Pomerania the correlation was positive (0,9683) and the regression coefficient equal to 5 reflected the annual average increase in the number of students per 10 thousand inhabitants.

Most commonly, universities and college enjoy a greater popularity in regions where graduates can, simply, find jobs. This trend has been confirmed by the analysis of changes in employment in the Pomeranian Region, with focus on enterprise and tertiary education sector, presented in Table 7.

Table 7: Changes in employment in R&D units in the Pomeranian Region in the years 2005-2010 (in persons)

Territorial unit	Total		In enterprise sector		In tertiary education sector	
	2010-2005	2010/2005	2010-2005	2010/2005	2010-2005	2010/2005
Poland	6361	1,05	4835	1,27	-2515	0,97
Pomeranian Region	554	1,04	322	1,27	-265	0,96
West-Pomerania	13	1,00	29	1,28	-501	0,86
Pomerania	541	1,08	293	1,26	236	1,05

Source: own study based on data from the Polish Central Statistical Office

The persons employed in R&D are all persons involved in R&D activities, including professional and auxiliary staff. It is considered that employees directly involved in R&D are the ones who devote to this activity at least 10% of their overall working time. Data, subdivided into sectors, are given in FTE. FTE – Full Time Equivalent is a unit of measurement used to determine actual working time in R&D; one FTE means one person-year devoted exclusively to R&D. An essential component of research on creative human resources involved in innovation is the share of employment in R&D activity (creative class).

In the years 2005-2010, there was an average increase of 4% in employment in entities involved in R&D the Pomeranian Region (compared to 5% increase for Poland). Looking at general trends, one may conclude that in West-Pomerania employment remained on the same level; while in Pomerania it escalated by 8%. However, the trend differed in particular sectors. Overall, in the entrepreneurial sector, employment increased by 27% (all-Poland rate was the same), whereas in the tertiary education sector employment diminished by 265 persons. However, there were differences between the provinces: employment in tertiary education sector dropped by 14% in West-Pomerania and rose by 5% in Pomerania.

5. ENTREPRENEURIAL FINANCE

There are two main sources of financing enterprises (Bień, 1998): internal and external funds. When choosing the optimal source of finance, an enterprise should consider numerous factors, both endo- and exogenic. The use of external capital is necessary for company's proper, continuous development, as it allows to set and achieve new goals, as well as expand company's activities. However, the relationship between internal and external finances must take into account the company's individual situation, its growth prospects, its innovation policy, competitive business environment, the potential of the output market and many other essential factors accounted for in the company's business strategy. An enterprise should decide on its sources of finance in a logical and rational way, with the emphasis put on the stability of its operations and efficiency of its growth.

One of the purposes of financing is to generate new products, technologies, or product and process innovations, as well as to conduct R&D activity. Polish enterprises spend increasingly more on innovation. According to the 2010 Report by the Polish Agency for Enterprise Development (PARP) in 2008, as compared to 2006, there was an overall 21% increase in expenditure on R&D in Poland, 17% in West-Pomerania and 25% in Pomerania. In the two following years this rising trend was even more dynamic (Table 8).

Table 8: Expenditure on R&D in the Pomeranian Region in the years 2008-2010 (mln PLN)

Territorial unit	Total		Including technical and engineering sciences	
	2010-2008	2010/2008	2010-2008	2010/2008
Poland	2 709 935,3	1,35	1 155 012,0	1,3
Pomeranian Region	138 832,6	1,31	-84 029,7	0,8
West-Pomerania	48 619,8	1,39	20 687,5	1,3
Pomerania	90 212,8	1,23	-104 717,2	0,7

Source: own study based on data from the Polish Central Statistical Office

Average increase in total expenditure on R&D in the two-year period, both on the national and regional (Pomerania) scale was very big and amounted to over 30%. In 2008 expenditure on R&D in the Region accounted for 6.8% of overall expenditure invested in R&D in Poland. In 2010 this share decreased by 0.4%. However, what is worth emphasizing, expenditure on technical and engineering sciences accounted for over 42% of the overall increase in expenditure. Other fields of science played a smaller role in that increase, that is 12% medical and health sciences and 7% agricultural sciences. As it comes to the two provinces of the Region expenditure grew dynamically in West-Pomerania, with a 39% increase versus 23% increase in Pomerania. Overall expenditure on technical and engineering sciences in the Region declined by 20%, although in West-Pomerania it rose by 30%. Average R&D expenditure per capita in Poland was 189.1 PLN and this indicator was higher by approx. 42% in the Region. The lowest expenditure and the biggest variation in expenditure were observed in the West-Pomeranian province, that is 62.7 PLN with 33% variation (Table 9).

Table 9: Expenditure on R&D per 1 inhabitant of the Region in the years 2003-2010

Territorial unit	M	SE	V	CC	RC
Poland	189,1	47,4	25,1	0,9716	23,0
Pomeranian Region	111,0	26,8	24,2	0,9678	13,0
West-Pomerania	62,7	20,9	33,4	0,9447	9,9
Pomerania	159,4	33,0	20,7	0,9752	16,1

Source: own study based on data from the Polish Central Statistical Office

CC – correlation coefficient, RC – regression coefficient, V – variability coefficient, SE – standard deviation, M – mean value.

There was a linear trend in R&D expenditure per capita with a very strong correlation with time (CC), therefore the regression coefficients (RC) can be interpreted as average yearly increase in expenditure. The average yearly increase in expenditure in the Region constituted 56% of the national increase. The smallest dynamics, almost half the amount invested in Pomerania, was showed by expenditure in West-Pomerania.

Another indicator, which captures changes in financing R&D is expenditure in the three sectors: entrepreneurial, government and tertiary education. Linear trend function was used to analyze overall R&D expenditure and specifically expenditure in entrepreneurial and tertiary education sectors. Such regularity was not identified in the government sector (Table 10).

Table 10: Expenditure on R&D in the Pomeranian Region in the years 2006-2010 (mln PLN)

Territorial unit	Total		In the sector of			
			Enterprises		Higher education	
	CC	RC	CC	RC	CC	RC
Poland	0,9709	878,1	0,9771	238,9	0,9911	519,4
Pomeranian Region	0,9698	53,5	0,9676	31,5	0,8469	12,7
West-Pomerania	0,9445	16,7	0,8807	6,4	0,2408	22,3
Pomerania	0,9760	36,8	0,9777	25,1	0,8950	11,1

Source: own study based on data from the Polish Central Statistical Office

CC – correlation coefficient

RC – regression coefficient

On the national scale there was a very strong positive linear correlation between time and expenditure on total R&D activity, as well as in the higher education and entrepreneurial sectors, which is why the linear regression coefficients can be interpreted as average yearly increase in expenditure. Also with respect to the Region and its provinces, with the exception of expenditure in the higher education sector in West-Pomerania, a strong linear correlation could be observed.

In the Pomeranian province the dynamics of overall expenditure was twice as big as in West-Pomerania, and interestingly, four times bigger in the sector of enterprises. In West-Pomerania the linear dependence between expenditure and time occurs only in overall expenditure and in the entrepreneurial sector. For overall R&D expenditure in West-Pomerania the regression coefficient was 16.7 mln PLN, thus over twice smaller than in Pomerania. Similarly, the regression coefficient in the sector of enterprises is four times lower than in the other province that is 6.4 mln PLN. It was not possible to calculate the trend in the higher education sector for lack of fitting models and data validity.

As mentioned before, innovation-focused activities generate significant added value for industry and services and enhance the competitive capacity of an enterprise. Analysis of expenditure on innovation according to the source of finance, plus their structure in service and industrial enterprises has been presented below. All expenditure on product and process innovation (current and capital), regardless of the source of finance, incurred in the reporting year and spent on successfully completed works (that is resulting in implementation of innovation), unfinished (continued) as well as interrupted or abandoned (definition after the Polish Central Statistical Office). In 2005 and 2007, the research covered only industrial enterprises with more than 49 employees – comprehensive survey. In the remaining years the comprehensive survey embraced industrial enterprises with over 49 employees and the survey on a representative sample covered industrial enterprises with 10 to 49 employees, whereas the survey on innovative activities in the service sector was conducted on a representative sample (Table 11).

The structure of expenditure in service sector enterprises in 2006, both in Poland and in the Pomeranian Region, was dominated by enterprises' own resources, accounting for more than 80% of total funds. A similar situation was observed in the Pomeranian province, with approx. 90% of own resources. In West-Pomeranian province, however, the proportion of own resources was about 50%, the second important source of finance being bank loans, making about 30% of total funds. Other sources accounted for 18% of the total enterprise finance.

In 2010, the expenditure structure of the enterprises residing in the Pomeranian Region underwent certain change. Own resources still prevail, but do not exceed 70% of the total resources. More bank loans (approx. 22%) are used, as well as funds acquired abroad (over 7%).

Table 11: Expenditure on innovation regarding product and process innovations according to the sources of finance in the Pomeranian Region in the years 2006 and 2010

Territorial unit	Expenditure (thousand PLN)						Structure (%)				
	Overall	Own funds	Budget funds	Funds from abroad	Bank loans	Other	Own funds	Budget funds	Funds from abroad	Bank loans	Other
Service sector enterprises											
2006											
Poland	8 256 051	7 345 486	69 026	88 465	595 387	157 687	88,97	0,84	1,07	7,21	1,91
Pomeranian Region	401 932	343 756	368	2 004	47 526	8 278	85,53	0,09	0,50	11,82	2,06
West-Pomerania	43 652	21 736	333	501	12 823	8 259	49,79	0,76	1,15	29,38	18,92
Pomerania	358 280	322 020	35	1 503	34 703	19	89,88	0,01	0,42	9,69	0,01
2010											
Poland	10 790 284	9 247 613	52 410	268 862	1 129 197	92 202	85,70	0,49	2,49	10,46	0,85
Pomeranian Region	521 020	352 431	8 126	39 604	114 473	6 386	67,64	1,56	7,60	21,97	1,23
West-Pomerania	64 039	37 779	651	12 855	7 130	5 624	58,99	1,02	20,07	11,13	8,78
Pomerania	456 981	314 652	7 475	26 749	107 343	762	68,85	1,64	5,85	23,49	0,17
Industrial enterprises											
2006											
Poland	17 249 325	13 482 211	274 538	363 612	2 587 601	5413 63	78,16	1,59	2,11	15,00	3,14
Pomeranian Region	1 298 962	1 022 608	22 820	22 353	183 415	47 766	78,72	1,76	1,72	14,12	3,68
West-Pomerania	329 861	186 772	6 284	5 846	113 119	17 840	56,62	1,91	1,77	34,29	5,41
Pomerania	969 101	835 836	16 536	16 507	70 296	29 926	86,25	1,71	1,70	7,25	3,09
2010											
Poland	23 757 776	17 874 655	270 708	1 878 952	2 089 657	1 643 804	75,24	1,14	7,91	8,80	6,92
Pomeranian Region	2 439 951	1 381 615	8 224	210 217	816 550	23 345	56,62	0,34	8,62	33,47	0,96
West-Pomerania	530 239	473 794	2 321	18 738	34 056	1 330	89,35	0,44	3,53	6,42	0,25
Pomerania	1 909 712	907 821	5 903	191 479	782 494	22 015	47,54	0,31	10,03	40,97	1,15

Source: own study based on data from the Polish Central Statistical Office

In West-Pomerania the share of own resources grew by 10% in 2010, compared to 2006, the share of loan capital declined by 11% and funds acquired abroad accounted for 20% of total funds (in 2006 only for 1%).

In Pomerania the share of own resources in the expenditure structure in service sector enterprises in 2010 declined by 20% compared to 2006, with bank loans climbing to approx. 23% and funds acquired abroad made for only approx. 6% of the total funds. Budget funds in both provinces had a rather insignificant share, not bigger than 2%.

In the industrial enterprise sector the expenditure structure looked slightly different. In 2006, in Poland and in the subject Region, own resources accounted for 78% of total finance, bank loans – for 15%. Other sources of finance were insignificant, and generated up to 3% of resources. However, this structure was different in the two provinces. In Pomerania, own resources constituted over 86% of the funds, loans – only 7%. In West-Pomerania, it was respectively 56% and 34%.

In 2010, figures for Poland show that own resources make up to over 78% of total finance, with a decline in the share of bank loans (8.8%) and increase in other source of finance (up to 7%). In the Region on the whole, the share of own resources decreased to approx. 57%, with the share of loan capital up to 33%. Funds acquired abroad accounted for about 8% of total funds. In the provinces the situation is just the other way round compared to 2006. In West-Pomerania the share of own resources went up to over 89%, whereas in Pomerania it went down to 47%. In West-Pomerania, loans made up only 6.4% of funds, whereas in the other province – as much as 41%. In case of funds acquired abroad, in West-Pomerania it was merely 3.5% and in Pomerania – 10% of total finance.

Unfortunately, expenditure on R&D in relation to GDP was not high and remained below 1% of GDP (Table 12).

Table 12: Expenditure on R&D expressed as % of GDP (in current prices)

	Years					
	2004	2005	2006	2007	2008	2009
Poland	0,56	0,57	0,56	0,57	0,60	0,68
Pomeranian Region	0,70	0,70	0,70	0,80	0,80	0,70
West-Pomerania	0,17	0,17	0,19	0,24	0,24	0,22
Pomerania	0,48	0,52	0,51	0,51	0,57	0,52

Source: own study based on data from the Polish Central Statistical Office

The indicator for West-Pomerania is particularly alarming. In 2004 it was 0.17% GDP, to grow slightly in successive years up to 0.22% of GDP in 2010. In Pomerania, this indicator was also below the country's average, yet decidedly higher than in the other province, that is 0.48% of GDP in 2004 and 0.52% of GDP in 2010. In the study period only the Masovian province spent more than 1% of GDP on R&D.

6. INNOVATION CAPACITY OF POLISH ENTERPRISES

The economy's capacity to create and adopt innovation is one of the main factors affecting its competitiveness, especially in the long run. Innovation affects the way enterprises function in a number of ways – resulting in e.g. increased sales revenue, bigger market share market and increased efficiency.

The type and success of innovative activity undertaken by entrepreneurs depends on subject knowledge, technology used, management style, human and financial resources (Przedsiębiorczość w Polsce, 2010, s. 44).

Enterprises which have embarked on innovative activities play an essential role in building innovative economy. In 2010, the percentage of innovative companies in Poland was only 21%, 30% in West-Pomerania and 15% in Pomerania.

The share in R&D expenditure varied depending on the year and province. In 2003 business entities had a merely 4.9% share in overall R&D expenditure and came at the bottom

of the ranking for Poland. In 2010, it increased over threefold and amounted to 18%, thus taking the 11th position in the country's ranking. In the Pomeranian province, the share that business entities had in R&D expenditure was significantly bigger and reached 28.5% in 2003, placing the province on the 5th position in the country. In 2010, this province moved to the 2nd position with 48% of share.

Table 13 provides data on innovative enterprises by type of innovation implemented, that is product or process innovations.

Table 13: Innovative enterprises in the Pomeranian Region by type of innovation implemented in the years 2005 and 2010 (%)

Territorial unit	Indicators					
	2010–2006			2010/2006		
	Total	Products	Processes	Total	Products	Processes
Pomeranian Region	-7,09	-4,09	-6,26	0,76	0,83	0,77
West-Pomerania	0,00	0,00	0,00	1,00	1,00	1,00
Pomerania	-14,17	-8,17	-12,52	0,52	0,56	0,48

Source: own study based on data from the Polish Central Statistical Office

In the Pomeranian Region, a 24% drop in the number of units/ entities involved in R&D was observed in 2010, as compared to 2006. These changes took place mostly in the Pomeranian province, as West-Pomerania showed stagnation. The number of enterprises implementing process innovation dropped by about 23% and by about 17% for product innovation. The drop in the number of enterprises implementing innovation did not affect adversely their financial results from sales of innovative or significantly improved goods.

Table 14 presents the share in the production sold of new or significantly improved goods and innovative goods in industrial enterprises in the Pomeranian Region in the years 2006 and 2010.

Table 14: Share of new or significantly improved and innovative industrial goods in the overall value of sales of goods in the Pomeranian Region of Poland in the years 2006-2010 (%)

Territorial unit	Goods			
	New or significantly improved		Innovative	
	2006	2010	2006	2010
Poland	17,00	13,91	13,47	11,34
West-Pomerania	9,14	2,93	6,57	2,89
Pomerania	33,50	49,76	25,75	43,40

Source: own study based on data from the Polish Central Statistical Office

The share of new or significantly improved goods in the overall production sold increased in the Pomeranian province up to approx.50% in 2010 (from 33.5% in 2006), whereas in the West-Pomeranian province it dropped to meager 3% (from approx. 9%). The average for Poland in 2010 was 14%. A similar situation could be observed in case of innovative goods. In 2010 the share of these goods in the overall production sold soared to 43% in Pomerania (from approx. 26% in 2006), whereas in West-Pomerania it dropped to 3% (from 6.6%). The share of innovative goods in the production sold for the whole country was over 11% in 2010 and decreased by 2% compared to 2006.

In addition, the revenue generated by sales of innovative products in industrial enterprises being part of the enterprise net revenue is different in the two provinces (Table 15).

The share of revenue from sales of innovative products in overall net sales revenue in 2010 was over 11% for the whole country, and compared to 2006 it was down by more than 2%. What is worth noticing, there was a stark contrast between the two provinces in this respect. In Pomerania, the share of revenue from sales of innovative goods in 2010 was over

43%, increasing by about 68% in comparison to 2006, contrasting strongly with West-Pomerania where a decline from 6.6% to 3% was observed.

Table 15: The share of revenue from sales of innovative products in overall net sales revenue in Pomeranian Region provinces (%)

Territorial unit	Indicators			
	2006	2010	2010-2006	2010/2006
Poland	13,47	11,34	-2,13	0,8419
West-Pomerania	6,57	2,89	-3,68	0,4399
Pomerania	25,75	43,40	17,65	1,6854

Source: own study based on data from the Polish Central Statistical Office

As it comes to the revenue from sales of innovative export products, in the years 2006-2010 a regress was observed on the national and regional (Pomeranian Region) scale (Table 16).

Table 16: Share of net revenue from sales of innovative export products in overall net sales revenue in the two provinces of the Pomeranian Region (%)

Territorial unit	Indicators			
	2006	2010	2010-2006	2010/2006
Poland	5,25	4,93	-0,32	0,94
West-Pomerania	3,62	1,28	-2,34	0,35
Pomerania	8,05	7,15	-0,90	0,89

Source: own study based on data from the Polish Central Statistical Office

The share of net revenue from sales of innovative products for export in the overall net sales revenue in Poland in 2006 was 5.26%. In 2010 this share decreased slightly (by 6%). With regard to the subject provinces, the biggest decline occurred in West-Pomerania, that is to 1.28% in 2010. On the other hand, in the Pomeranian province in 2006 and 2010 this share was bigger than country's average and dropped to 7%.

7. CONCLUSIONS

It can be concluded that the Pomeranian Region is economically well-developed. This is proven by, i.a., its GDP as well as the provincial budgets' revenue and expenses. In 2010 the share of the Pomeranian Region in the country's overall GDP was about 9% and it decreased as compared to 2002 by approx. 1%. The employment rate in both provinces is below 50%, and concurrently, the unemployment rate is very high, though it shows a declining trend.

In the Pomeranian Region the quality of personnel is improving since individuals who completed higher education in 2010 amounted to 17% of the population (increase by 7%). However, in 2010 there was a 10% decline in the number of students as compared to 2004 (decrease by 141 students per 10 thousand inhabitants).

A positive phenomenon worth noticing is the fact that employment in R&D entities is on the rise, in particular in the enterprise sector. Expenditure on R&D is increasing, yet at the same time the number of entities/ companies involved in R&D is in decline, which is a puzzling phenomenon that sure deserves further investigation. A negative phenomenon observed is the level of R&D expenditure expressed as % of GDP, which both in the whole Region and in individual provinces does not exceed 1%, in West-Pomerania amounting merely to 0.22% of GDP.

In 2010 the main source of financing R&D activities were own resources, with bank loans and funds acquired abroad constituting other significant finance sources.

The increase in the revenue from sales of innovative products occurred only in enterprises operating in the Pomeranian province, by approx. 18%. The share of net revenue from sales of innovative export products in overall net sales revenue is decreasing. In the West-Pomeranian province it was as low as 1.28% in 2010.

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