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Leaders and outliers in the race of regions - EU Cohesion Policy in Poland in the light of macroeconomic modelling

ABSTRACT

The main aim of this paper is not simply to compare and contrast the impacts of EU cohesion policy on the three Polish NUTS-2 regions (Dolnośląskie, Mazowieckie and Świętokrzyskie), but also to confront them with the theoretical expectations. The analysis is carried out using such macroeconomic indicators as GDP per capita, employment, labour productivity and it focuses on the period 2004-2020 in order to capture both short- and long-term effects of the EU intervention. The research draws on the regional HERMIN macroeconomic models of Mazowieckie (HPL5MZ), Dolnośląskie (HPL5DL) and Świętokrzyskie (HPL5SW) which are regionalised versions of the Polish national HERMIN macroeconomic model (HPL5). The results of our analysis point to the role of EU cohesion policy in the process of socio-economic convergence both at the national and European level. However, they are presented from a perspective of the three Polish regions characterized by the different levels of socio-economic development in order to show how EU funds affect economic leaders and outliers of the country. On the basis of the conducted analysis several conclusions are drawn with regard to macroeconomic modelling at the regional level which might be used to improve robustness and credibility of the evaluation of EU cohesion policy.

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1. Introduction.

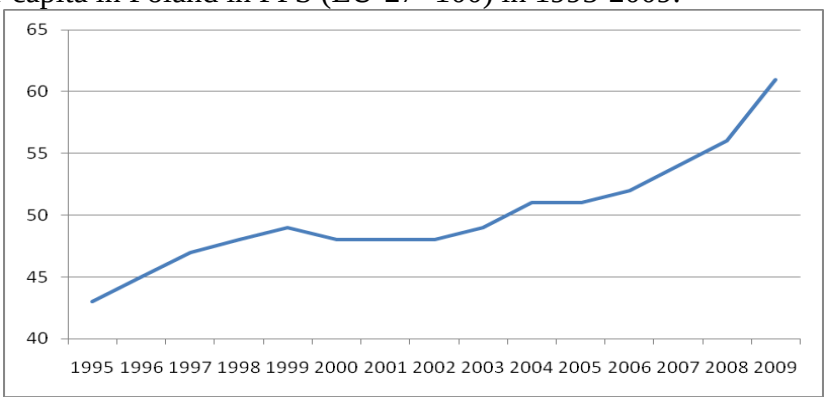
As Poland has benefited from cohesion policy since its accession to the EU in 2004 and is currently the largest national beneficiary of EU cohesion policy expenditure in the financial perspective 2007-2013, the analysis of the impact of the EU funds in this country seems to be an important part of the overall evaluation of this policy. The outcome is especially interesting at the beginning of the debate on the future of EU cohesion policy, the results of which will certainly have an effect on the development of many regions in the EU. In our analysis, we concentrate on three Polish NUTS-2 regions: Mazowieckie – the capital region with the overwhelming economic supremacy; Dolnośląskie – one of the leading Polish regions; Świętokrzyskie – a representative of the regions lagging behind Poland's average in terms of socio-economic development. The main aim of this paper is not simply to compare and contrast the impacts of EU cohesion policy (understood as total payments under the National Development Plan (NDP 2004-2006) and the National Strategic Reference Framework (NSRF 2007-2013) together with domestic public co-finance) on the above mentioned regions, but also to confront them with the theoretical expectations. The analysis is carried out using such macroeconomic indicators as GDP per capita, employment, labour productivity and it focuses on the period 2004-2020 in order to capture both short- and long-term effects of the EU intervention.

The second part of this article presents a synthetic analysis of historical socio-economic trends occurring in the three voivodeships (NUTS-2 regions) in question. This aims to locate these regions on the economic map of Poland and of the EU and to create an appropriate context for further analysis. The third part is devoted to the presentation of the regional HERMIN models – tools that are used for macroeconomic simulations whose results form the basis for the analysis performed in this article. The fourth section presents a comparison of NDP/NSRF payments. The fifth section contains an analysis of the effects of funding allocated under cohesion policy on the convergence trends (relative to both the national and EU average) and on the labour market. The present article culminates with conclusions and recommendations.

2. Socio-economic trends in Dolnośląskie, Mazowieckie and Świętokrzyskie against the trends characterising Poland and the EU.

Poland, as a country of Central and Eastern Europe, belongs to the group of states that joined the mainstream of the free market economy at the turn of the 1980's and 1990's by starting the process of socio-economic transformation. Poland's attempts to become a member of the European Union, with this membership entailing the gradual liberalisation of the flow of goods, services and production factors, were an extremely important element of the transformations. These attempts finally culminated in Poland's accession to the EU in 2004. The goal to significantly shorten the distance to the richest countries belonging to this organization dominated the economic priorities of the Polish authorities for many years. The existing results of the economic transformations in Poland, as reflected in the level of GDP per capita relative to the EU-27 average, are graphically presented in Fig. 1.

Fig. 1 GDP per capita in Poland in PPS (EU-27=100) in 1995-2009.



Source: Eurostat.

As can be easily noticed, Poland has made substantial progress to catch up with the level of economic development compared to the EU-27 average. In 2009 the value of the indicator in question was 61%, that is, 18 percentage points more than in 1995. In other words, it can be said that we have to do with the advancing process of real convergence between the Polish economy and the EU average, although the position of the country (the 5th place from the end in the EU) shows that a lot of effort needs yet to be put in order to fully implement the plan designed to equalise the standard of living in Poland and in the richer EU states.

Likewise in many EU countries, the spatial analysis of the Polish economy disaggregated to the level of NUTS-2 regions (voivodeships) shows relatively large variation in the economic level inside the country (Figs 2 and 3).

Fig. 2: GDP per capita in PPS (EU-27=100) - Polish NUTS-2 regions (2008)[4]

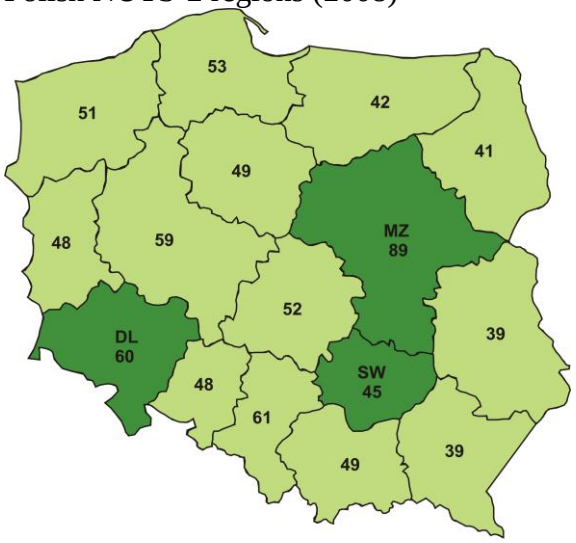
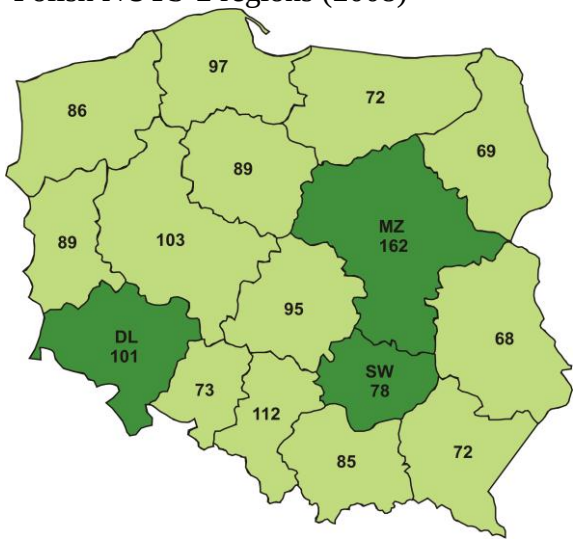


Fig. 3: GDP per capita[5] (Poland=100) - Polish NUTS-2 regions (2008)



Source: Eurostat and own calculations based on the database of GUS (Polish Central Statistical Office)

It can be seen on the basis of Figures 2 and 3 that the divergence in GDP per capita between the richest region and the poorest one is 94.6 percentage points in relation to the national average and 50 percentage points compared to the EU-27 average. As mentioned at the beginning of this article, the main subject of the analysis will be three different regions of Poland: **Mazowieckie** – a region that clearly dominates in terms of its economic development (its GDP is 162% of the national average) and in which the country's capital, Warsaw, is located – a dynamically developing metropolis that aspires to become the economic centre of Central and Eastern Europe; **Dolnośląskie** – a representative of the group of relatively affluent regions (101% of the national average), characterised by high investment attractiveness, large human and social capital stocks as well as other endogenous potentials that predestine this region to be one of the leaders of socio-economic development in Poland; **Świętokrzyskie –** a voivodeship that belongs to the group of regions marked by a relatively low level of development as approximated by GDP per capita (78% of the national average) and which is included in the problem NUTS-2 regions in Poland covered by a special support programme under cohesion policy. The basic characteristics of the above-mentioned regions are shown in Table 1.

[4] DL- Dolnośląskie; MZ- Mazowieckie; SW- Świętokrzyskie.

[5] GDP in constant prices.

Table 1: Selected indicators characterising Dolnośląskie, Mazowieckie and Świętokrzyskie against Poland and EU-27.

	Dolnośląskie	Mazowieckie	Świętokrzyskie	Poland	EU-27
Population (2009)	2.88 mn	5.22 mn	1.27 mn	38.17 mn	499.71 mn
Area (2009)	19947 km2	35558 km2	11711 km2	312679 km2	440 3357 km2
Population density (2009)	144 /km2	147 /km2	108 /km2	122 km2	116.0 /km2 (2008)
Share of agriculture in GVA (2008)	1.8%	3.60%	5.3%	3.70%	1.6% (2009)
Share of manufacturing in GVA (2008)	31.20%	15.00%	27.50%	23.90%	18.1% (2009)
Share of building and construction in GVA (2008)	7.10%	5.70%	7.60%	7.00%	6.3% (2009)
Share of market services in GVA (2008)	42.00%	58.50%	39.70%	46.50%	49.9% (2009)
Share of non-market services in GVA (2008)	17.90%	17.20%	19.80%	18.80%	24.1% (2009)
Unemployment rate according to LFS (2010)	11.30%	7.40%	12.00%	9.60%	9.60%
Employment rate 15-64 (2009)	57.90%	64.80%	59.30%	59.30%	64.20%
Total intramural R&D expenditure % GDP (2008)	0.44%	1.21%	0.27%	0.60%	1.92%

Source: GUS and Eurostat.

As shown in Table 1, Dolnośląskie and Mazowieckie are characterised by higher population density compared to both the national and EU average, which indicates the greater endogenous potential of these regions resulting from higher agglomeration effects. The analysis of the economic structure considered through the prism of Gross Value Added (GVA) allows one to conclude that Mazowieckie is a region that is marked by a relatively high share of the market services sector relative to the national share of this sector, but also in comparison with the structure of the EU economy as a whole. Such a situation arises from the fact that Poland's capital, Warsaw, is located in this region and this city contributes to the increased importance of services in the economic development of the entire region.[6] As far as the other two regions are concerned, the dominance of the market services sector is not as significant as it is in the case of the Mazovia region (Mazowieckie), which is largely attributable to the greater importance of manufacturing. It should be noted that the markedly higher – compared to the national and EU average – share of the above-mentioned sector in the Lower Silesia region (Dolnośląskie) results to a large extent from many foreign direct investments that stimulate the development of the automotive and electronics industries as

[6] It should be stressed at this place that Warsaw definitely dominates in terms of its share in GDP of the whole region (ca. 60%).

well as home appliance production. Moreover, worth stressing is the fact that the agricultural sector has a relatively high importance in GVA generation in Świętokrzyskie, which shows relatively low development potential of this region.[7] The leading position of Mazowieckie also finds its reflection in the measures monitoring the situation in the labour market. As shown in Table 1, in terms of both the employment rate and unemployment rate, this region is characterised by a fuller use of labour force resources than it is in the case of Poland as a whole and EU-27. As far as R&D expenditure is concerned, the Mazovia region also plays the role of the leader, outpacing the national average (it significantly surpasses R&D expenditure for Świętokrzyskie). Nevertheless, there is a relatively large distance between Mazowieckie and the EU-27 average in terms of innovation expenditure.

Taking into account the volume limitations of this article, the next section presents the trends in the development of the regional economies of the: Mazowieckie, Dolnośląskie, Świętokrzyskie, considered through the prism of the indicators that were applied in the analysis of the impacts of cohesion policy on the convergence processes and the labour market (Figs 4-8).

The analysis of Figures 4-5 makes us conclude that all the three regions were characterised by a growth in GDP per capita compared to the European Union average, which shows the advancing economic convergence between these regions and the EU-27. In this respect, the greatest progress took place in the case of Mazowieckie (16 percentage points in 2000-2008), Dolnośląskie ranked second (10 pp), while Świętokrzyskie was in the last place (8 pp). It should be however noted that in the period 2002-2007 there was an increase in labour productivity in relation to the EU average only in the case of the national leader - Mazowieckie Voivodeship. The above fact shows too high labour intensity of many economic sectors in both Świętokrzyskie and Dolnośląskie, which slows down the process of catching up with the EU average by these regions.

[7] This is also confirmed by the data relating to the labour market structure, where the share of employment in agriculture in the total number of people employed was at the level of 22% in 2009. For Poland, Dolnośląskie and Mazowieckie, it was respectively: 13.3%; 7.3%; 11.7%.

Fig 4: GDP per capita in PPS (EU-27=100)

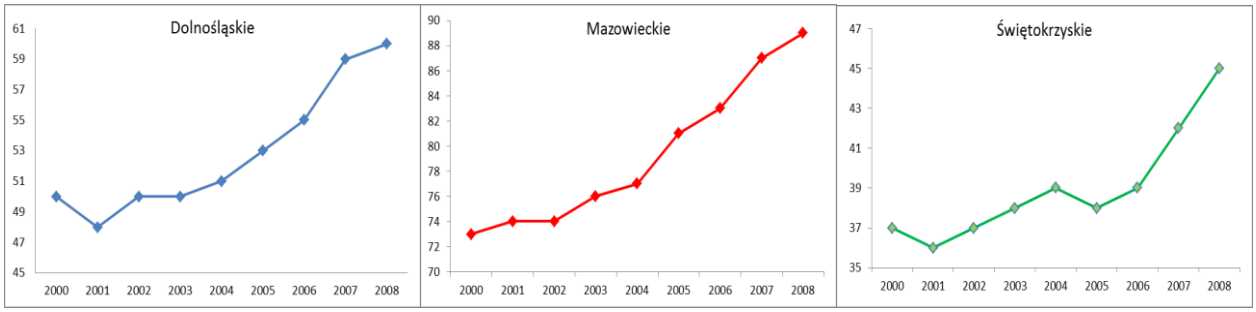


Fig 5: Labour productivity (EU-27=100)

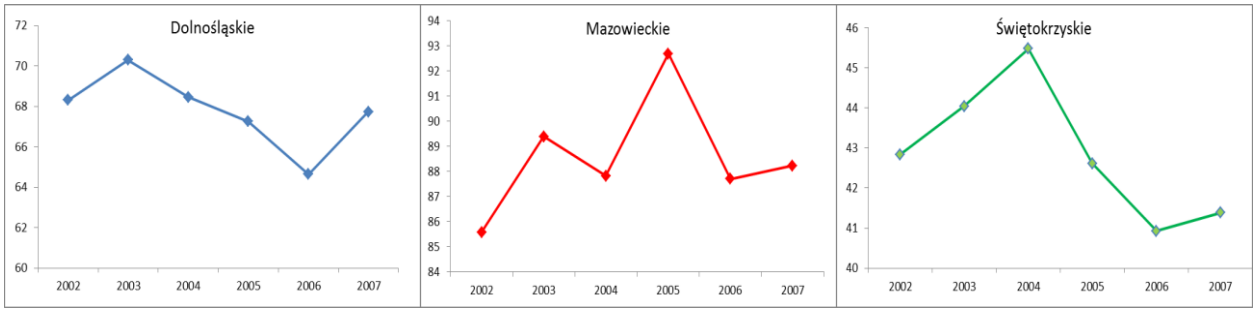


Fig. 6: Employment (in thous.)

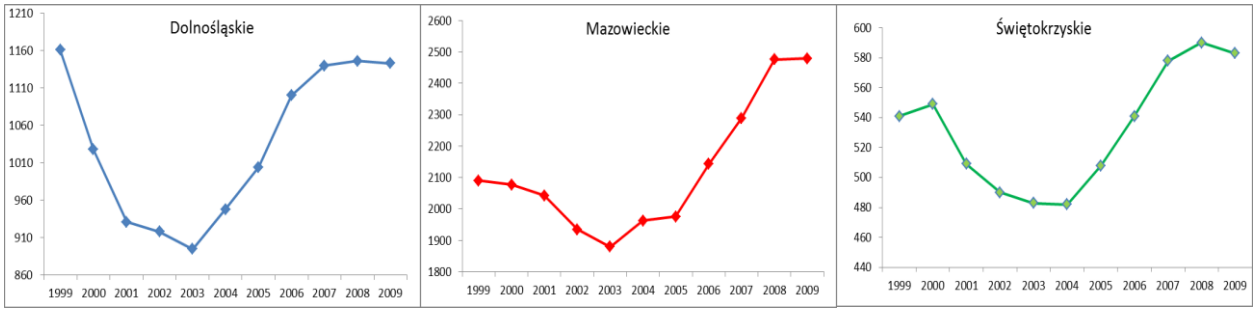


Fig 7: GDP per capita (Poland=100)

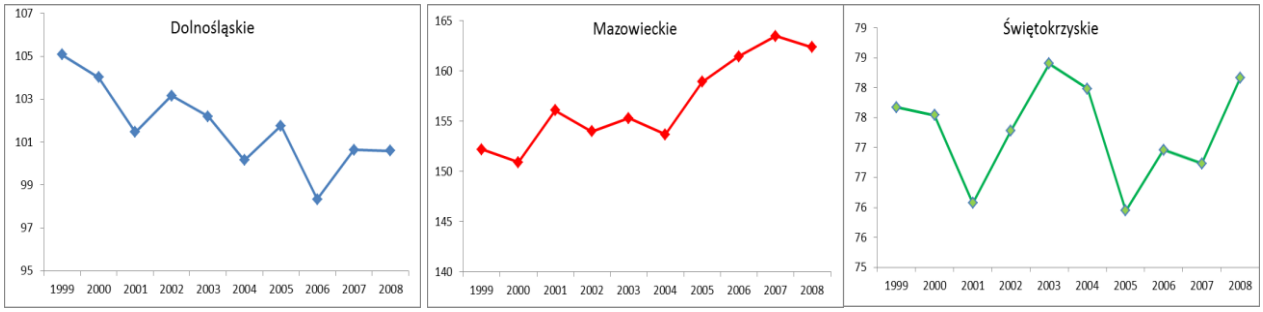
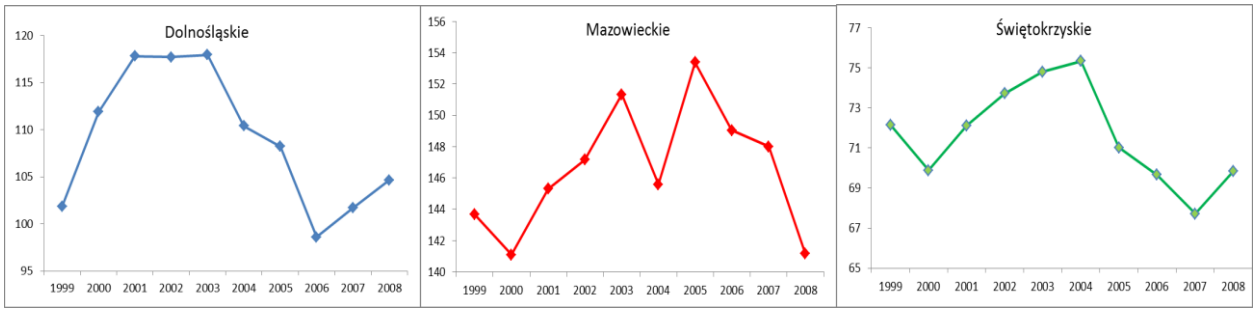


Fig. 8: Labour productivity (Poland=100)



Source: GUS.

The analysis of the convergence processes taking place inside Poland demonstrates that in the period 1999-2008 the Mazovia region showed a clear increasing trend in GDP per capita relative to the national average (Fig 7). The situation in the case of Lower Silesia (Dolnośląskie) was different, since the position of this region dropped compared to Poland as a whole, though it dropped to a level that was still above the national average. As far as Świętokrzyskie is concerned, which is the least affluent region of those under consideration, one cannot speak here of any clear growth trend in the whole period in question in spite of the fact that this region reported a slight increase in the measure concerned. The progress that was made as regards the relation of this region's GDP per capita to the national average following Poland's accession to the EU suggests positive effects of the integration processes on the improvement of the position of Świętokrzyskie in the national arena. Given the above considerations, one may venture to say that the special nature of the Mazovia region with the Warsaw metropolis, which performs the role of a dynamic growth pole, limited the possibility to clearly level out the differences between this region and the relatively less affluent Świętokrzyskie, at the same time decreasing the importance of Poland's another relatively richer region, Dolnośląskie.

In analysing the labour market (Fig. 6), it can be noticed that there is a clear increase in numbers employed in the three regions in question in the period during which Poland was a member of the EU (starting from 2004). However, this increase was associated with a decrease in labour productivity compared to the national average (Fig.8), though it is worth noting the fact that in the case of Dolnośląskie and Świętokrzyskie the value of this measure has improved in recent years. The continuation of this trend in the future would create an opportunity to reduce the distance between the unquestioned leader, the Mazovia region, and the other two regions that are analysed in the present article, thereby contributing to the convergence at the national scale.

3. A synthetic presentation of the HERMIN methodology in the regional dimension.

The HERMIN model[8] was originally constructed in the 1st half of the 1990's to model the Irish economy. Subsequently, it was used to model the impacts of EU funding on economic processes in the so-called cohesion countries, i.e. Greece, Spain, and Portugal [Bradley 2002]. Together with the next enlargements of the European Union, the HERMIN-type models were

[8] A detailed description of the HERMIN model can be found in [Bradley, Untiedt, Zaleski 2008].

constructed for the next member states covered by EU funding support [e.g. Gáková et al 2009]. In Poland work on the evaluation of the impact of European Union funds on the macroeconomic situation using the Polish adaptation of the HERMIN model started in 2002 [e.g. Bradley, Zaleski 2003; Bradley et al 2009; Kudełko et al 2010]. In 2005 the Ministry of Economy and Labour commissioned the Wroclaw Regional Development Agency to build 16 models for the regional economies; subsequently, these models were used to estimate the effects of the implementation of cohesion policy at the regional level [e.g.Bradley et al 2008; Kudełko et al 2010a, b, c; Kudełko et al 2011]. The results of the HERMIN simulations for the Polish regions were also included in the *Fifth Report on Economic, Social and Territorial Cohesion.*

The 5-sector[9] HERMIN models of the economies of the following Polish regions: Mazowieckie, Dolnośląskie, and Świętokrzyskie, were used for the needs of this article. These models are an extension of the originally used 4-sector versions.

It should be added that the HERMIN methodology combines elements of Keynesian models (oriented towards the demand side of the economy) with elements characteristic of the neoclassical school, which is reflected, among others, in the inclusion of competitiveness as a determinant of manufacturing output.

Two essential groups of parameters are responsible for the scale of supply effects produced by the implementation of EU funding injections into the economic system: the first group directly affects output (output spillovers), while the other group impacts labour factor productivity (labour productivity spillovers). Either of the aforementioned groups consists of three parameters approximating the effects of cohesion policy on an economy through three main channels: physical infrastructure, human capital, and R&D. In order to increase the precision of simulation results, the HERMIN methodology uses separate parameters for the manufacturing and market services sectors (Table 2).

[9] In the HERMIN model, the above-mentioned 5 sectors are as follows: manufacturing, building and construction, market and non-market services, agriculture.

Tab 2. Values of spillover elasticities in the regional HERMIN models.

Labour productivity spillovers in the services sector through expenditure on:	human capital development	0.03
	physical infrastructure	0.03
	research and development	0.0
Output spillovers in the services sector through expenditure on:	human capital development	0.03
	physical infrastructure	0.03
	research and development	0.03
Labour productivity spillovers in the manufacturing sector through expenditure on:	human capital development	0.1
	physical infrastructure	0.1
	research and development	0.03
Output spillovers in the manufacturing sector through expenditure on:	human capital development	0.1
	physical infrastructure	0.2
	research and development	0.03

Source: Regional HERMIN models for the Polish regions.

In the course of the investigations, two macroeconomic simulations are performed for a particular regional economy. The first one of them includes the impacts of the EU funds (baseline scenario), while in the other simulation an assumption is made that there is no impact of EU funding injections (alternative scenario). A comparison of the differences between these two scenarios allows the determination of the effect of the implementation of cohesion policy on the economy under study. At the stage of the construction of the baseline scenario, assumptions are made regarding the future values of a number of exogenous variables that characterise the economy under investigation and of the indicators characterising its external activity in dealings with foreign partners (they are largely based on an analysis of historical trends and available economic forecasts). The most important of them for the regions under consideration are presented in Table 3.

Table 3. The main assumptions of baseline scenarios (with EU funds) for the period 2010-2020 - Mazowieckie, Dolnośląskie and Świętokrzyskie

	Main assumptions of the baseline scenario for 2010-2020		
	Mazowieckie	Dolnośląskie	Świętokrzyskie
PLN/EUR rate	4		
Main foreign trade partners	Germany, France, United Kingdom	Germany, France, Czech Republic, Belgium, United Kingdom	Germany, Czech Republic, United Kingdom, Netherlands
Annual growth rate of manufacturing output for foreign trade partners	Germany: 2.3%, France: 1.0%, Czech Republic: 4.5%, Belgium: 2.3%, United Kingdom: 0.2%, Netherlands: 1.9%		
Annual growth rate of GDP in EU	1.8% (2010), 1.7% (2011), 2.0% (2012-2020)		
Annual growth rate of productivity in EU	3.5%		
Annual average change in working age population	-0.01%	-0.34%	-0.41%

Source: Wroclaw Regional Development Agency.

4. Actual and predicted cohesion policy payments for Dolnośląskie, Mazowieckie and Świętokrzyskie.

The document that programmed structural aid for Poland with respect to the implementation of cohesion policy in the financial perspective 2004-2006 was the National Development Plan (NDP). In 2007 the implementation of the next document setting out the directions for using Community funds started – the National Strategic Reference Framework (NSRF) 2007-2013. Under these programmes, transfers from the EU budget to the national budget increase; these transfers are then allocated from the national budget to the sixteen regional economies. This section presents the distribution of the above-mentioned funds to Poland's three regions under consideration: Mazowieckie, Dolnośląskie, and Świętokrzyskie. The information on payments comes from the Polish Ministry of Regional Development and it includes data on actual (until 2010) and predicted (2011-2015) amounts of EU funding and domestic public co-finance.

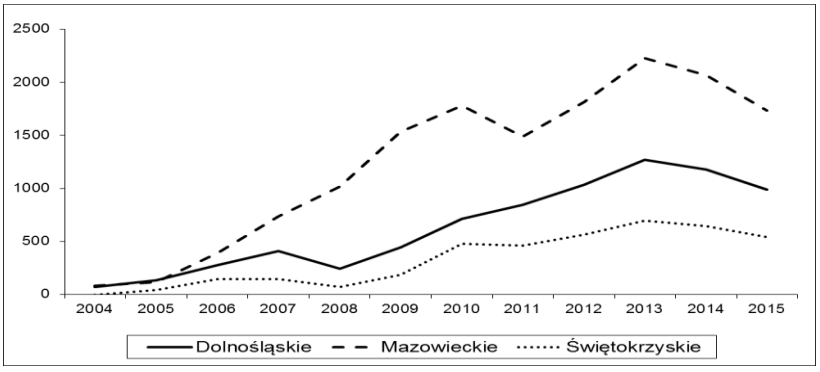
In accordance with the information obtained, an amount of € 15 billion is allocated for the implementation of cohesion policy in Mazowieckie in the period 2004-2015, in Dolnośląskie it is € 7.6 billion, whereas in Świętokrzyskie slightly less than € 4 billion (Fig. 9 shows the expenditure profiles). In the period 2004-2015, the average domestic public co-finance contribution in these regions is similar and accounts for approx. 22%[10] of total financial support. It is worth indicating that, as at the end of 2010, Mazowieckie managed to spend the highest amount from the total pool of funding allocated for the implementation of the NDP and NSRF in the financial perspective until 2015 (25.9%), followed by Dolnośląskie and Świętokrzyskie that spent respectively 20.7% and 15% during this period.

The analysis of the structure of EU funds spending in the regions under study shows that the largest part of the total amount of support allocated for the period 2004-2015 is assigned for the development of physical infrastructure (on average 60%). Support to the enterprise sector provided in the form of direct aid to the productive sector ranks next (on average 23%), while the remaining part of EU funding is allocated for activities related to human capital development (on average 17%).

[10]Forecasts for the period 2011-2015 assume a constant 15% share of domestic public co-finance in total funding assigned for the implementation of cohesion policy in all the regions. In the historical years, this share significantly varied and ranged 15%-37% per year in the case of the regions under analysis.

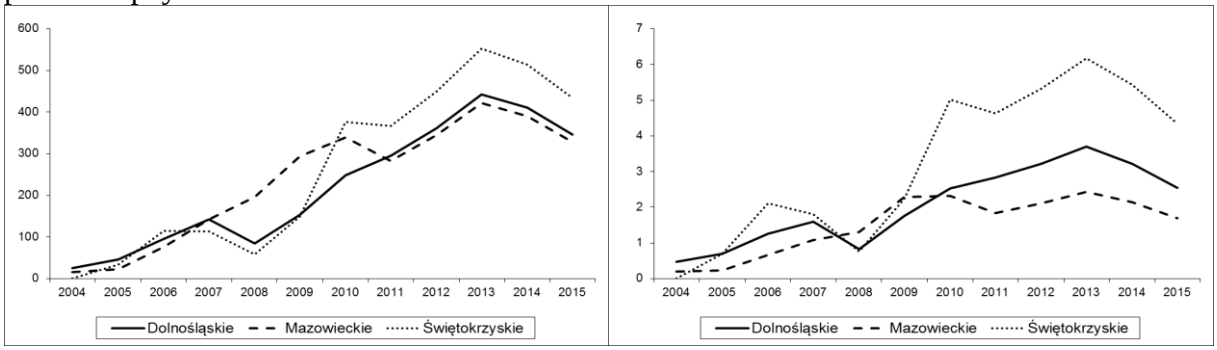
A very important aspect of the investigation of financial flows under cohesion policy is to refer them to the level of GDP and population. This allows one to determine the real weight of EU transfers in the economy of an area under study. The analysis of Fig. 10 shows that in the first five years of the NDP/NSRF implementation, which are characterised by low transfers of EU funds, Community funding accounts for not more than 2.1% of GDP of the investigated economies. The differences between the regions are relatively small in this period. In the next years, together with an increase in funding inflows under the new financial perspective, there will be observed large variations in the relation of EU funding to GDP between the regions in question. In the peak year of 2013, Świętokrzyskie will reach the highest value of the analysed indicator (6.2% of GDP), whereas this value will be the lowest for Mazowieckie (2.4%). Similar trends are found in the case of the volume of transfers in relation to population, though the differences between the economies under study are relatively smaller. In the peak year in terms of funding injections (2013), payments per capita will exceed € 420 and the value of this indicator will be the highest in Świętokrzyskie (€ 553).

Fig. 9. EU transfers (EU funds + domestic public co-finance) under the NDP and NSRF in nominal terms (EUR million) – actual payments in 2004-2010 and predicted payments for 2011-2015.



Source: Own calculations.

Fig. 10. EU transfers (EU funds + domestic public co-finance) under the NDP and NSRF per capita (EUR) (left) and in relation to GDP (%) (right) – actual payments in 2004-2010 and predicted payments for 2011-2015.



Source: Own calculations.

5. Comparative analysis of the results relating to the impacts of Cohesion Policy on the social and economic development of the regions under study.

Taking into account the trends in the labour market that are outlined in the section 2 of this article and also the processes of convergence both in relation to the EU-27 and at the national level, it is worth focusing on the role of cohesion policy in shaping the above-mentioned trends. In connection with the above, this section will present the results of the macroeconomic simulations related to the impacts of NDP and NSRF payments on the economies of the three regions subjected to analysis. In addition to the effects of cohesion policy on the labour market and on the convergence processes in the historical years (2004-2008/2010)[11], the investigation results for the future years (until 2020, inclusive) will also be presented.

As already indicated earlier, in the HERMIN methodology the results of the quantitative impact of cohesion policy on the socio-economic development of a region are an effect of the creation of two scenarios of this development: the first scenario that includes NDP and NSRF payments (baseline scenario) and a second scenario that excludes their effect (alternative scenario). The difference between the values of the aforementioned scenarios determines the magnitude of the analysed impact.

Figures 11-12 present the impact of NDP/NSRF funding on GDP per capita (in PPS) and labour productivity relative to the EU-27 average.

Fig. 11 GDP per capita in PPS (EU=100) in 2004-2020

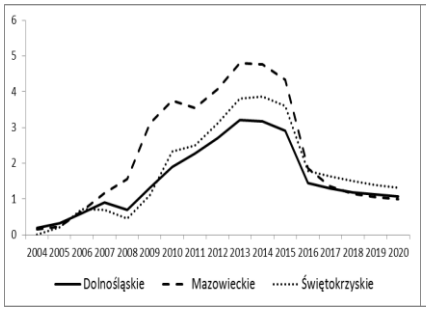


Fig.12 Labour productivity (EU=100) in 2004-2020

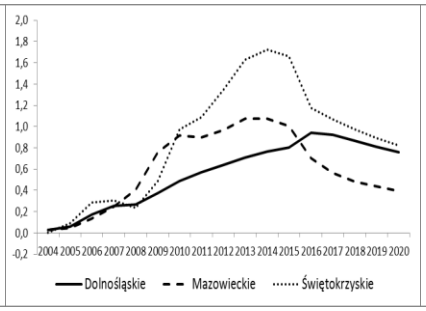
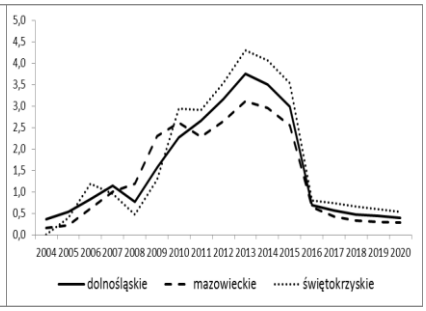


Fig.13 Numbers employed in 2004-2020 (%)



Source: Own calculations.

[11] Due to data availability, the historical years for GDP and productivity are 2004-2008, whereas for employment these are 2004-2010.

The analysis of Figures 11-12 shows that the implementation of NDP and NSRF funds contributes to making more dynamic the socio-economic convergence between the three regions in question and the EU average in the whole period 2004-2020 that is being analysed. The strongest effect of cohesion policy is recorded during the 2004-2015 period of implementation of EU funds. Such a situation is determined by the impact of demand effects. In other words, funding injections into the economic system contribute to an increase in disposable income and demand that stimulates the growth of GDP through the Keynesian multiplier mechanism. The supply effects play here a relatively smaller role, although their influence cannot be completely neglected, as it occurs even through direct aid to the enterprise sector (e.g. through the provision of financial aid to a given firm for the purchase of new machinery, technologies, etc.). The occurrence of supply effects related to the expansion of transport and telecommunications infrastructure and human capital is fully shown in the period 2016-2020 when EU support terminates. As presented by the simulation results, the impact of funding in question on GDP per capita and labour productivity compared to the EU average as well as on numbers employed will continue to be positive all the time during this period.

It should be noted that during the period of implementation of EU funds Mazowieckie is characterised by the highest values of the impact of cohesion policy on GDP per capita in relation to the EU average. This is so in spite of the fact that in most years of the period 2004-2015 this region is marked by relatively lower NDP/NSRF transfers in relation to its GDP and population, which shows the smaller real weight of EU support compared to Dolnośląskie and Świętokrzyskie (see the section devoted to NDP/NSRF payments). The dominant position of Mazowieckie results to a large extent from two facts. Firstly, this region is characterised by a stronger multiplier mechanism compared to the two other regions, which stimulates the effects of cohesion policy during the period of implementation of EU funds (this is confirmed by a fall in the position of Mazowieckie in the period after the assumed termination of Community support[12]). Secondly, as a result of the nature of the above approach used to capture the effects of cohesion policy (in percentage points), the highest values of NDP/NSRF impacts on the convergence to the EU average characterise those regions that are at the same time marked by the highest values of the impact on GDP per capita in nominal terms (in PLN). In connection with the above, the regions with the highest transfers in relation to their

[12] The fall is also due to relatively weaker supply effects in relations to the Świętokrzyskie and Dolnośląskie.

GDP or population are not always ranked in the first positions, but often the very large regions at a higher level of economic development (such as Mazowieckie). As far as Dolnośląskie and Świętokrzyskie are concerned, the magnitude of the effects of cohesion policy is determined primarily by the relations of NDP/NSRF payments to GDP and population – that is why Świętokrzyskie outpaces Dolnośląskie in terms of GDP per capita (EU=100) in most years of the period 2004-2020.

As shown in Fig. 13, the impact of cohesion policy on the labour market, as captured through numbers employed, is a function of the volume of payments in relation to GDP and population. Thus, Świętokrzyskie has a leading position here in most years of the period in question. The above correlation also takes place in the case of labour productivity compared to EU-27, though Mazowieckie is an exception here in the years of the highest EU transfers (it ranks second) due to the earlier mentioned stronger effects of the multiplier mechanisms, contributing to a higher increase in GDP than in employment.

The impacts of cohesion policy on the convergence processes at the national scale are illustrated in Figures 14-15.

Fig. 14: GDP per capita (Poland=100)

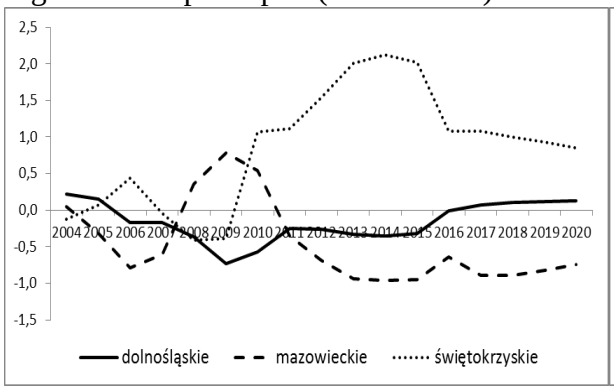
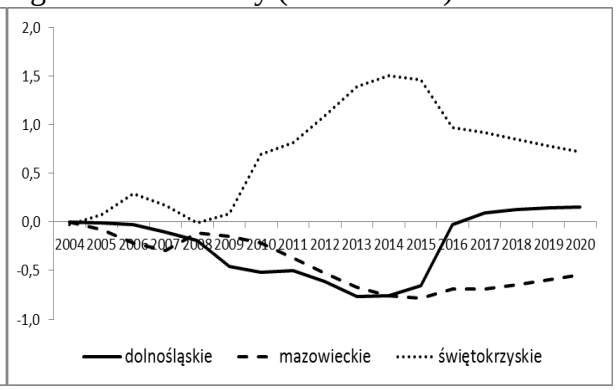


Fig. 15: Productivity (Poland=100)



Source: Own calculations.

The analysis of Figures 14-15 shows that in the case of GDP per capita in relation to Poland as a whole NDP/NSRF funding injections did not have a clear effect on the disparity between the regions in question in the period 2004-2008. The situation in labour productivity looked more optimistic, since in this respect cohesion policy reduced the differences between Mazowieckie and Dolnośląskie, on the one hand, and Świętokrzyskie, on the other hand. However, it should be emphasised that transfers assigned under the NDP/NSRF programmes will play an increasingly more important role in eliminating the differences in the levels of

development or in slowing down the divergence processes[13] - in particular between Mazowieckie and the relatively less affluent Świętokrzyskie. In the case of Dolnośląskie, a positive impact of cohesion policy will take place in the period 2016-2020, thus after the assumed termination of EU transfers. This indicates that the position of this region will be strengthened mainly as a result of the impact of supply effects manifesting themselves over the longer time horizon.

6. Conclusions.

In a theoretical approach, the strength of the effects of NPR/NSRO funding on a region's economic development is primarily determined by the following:

1) The real weight of transfers in the scale of the whole region (as measured, for example, by referring payments to GDP and population) and their structure (the division into economic categories);

2) The strength of the Keynesian multiplier mechanism that is conditioned by, *inter alia*, the marginal propensity to consume, import intensity of the economy, the public sector deficit;

3) The scale of supply effects that demonstrate to what extent the expansion/modernisation of physical infrastructure (among others, transport and communications infrastructure), human capital and R&D as well as the upgrade of machinery and equipment in enterprises stimulate the economic development in the long term;

4) The socio-economic conditions of the regions under study – the demographic processes taking place in them, their economic potential at the beginning of the period of support (e.g. in the form of fixed capital stock, etc);

5) A reliable projection of regional socio-economic development;

6) The scale of effects accompanying EU financial support (*inter alia*, crowding-out effect, deadweight effect).

Taking into account the above considerations, it should be said that cohesion policy contributes – in accordance with the results of the macroeconomic simulations carried out

[13] Depending which of these scenarios will be implemented. However, forecasting the levels of GDP and labour productivity goes beyond the scope of this article whose main subject is the impact of cohesion policy funding.

using the regional HERMIN models – to making more dynamic the process of economic convergence between the Polish NUTS-2 regions that are studied in this article and the EU-27 average. The above fact confirms that it is justified to assign EU funding to the programmes designed to shorten the distance between the poorer regions of Central and Eastern Europe states and the EU-27 average in terms of the socio-economic level.

In the three investigated regions, during the period of implementation of EU funds (2004-2015) the impacts of cohesion policy occur mainly through demand effects associated with the multiplier mechanism; the role of supply effects related to the development of transport and communications infrastructure as well as to an increase in human capital stock and in the capital/labour ratio is smaller in this period. The supply effects are manifested with a greater strength in the long term, therefore in the case of the three regions under consideration the positive effect of the cohesion policy impact on GPD per capita relative to the EU average can be observed even in the last analysed year - 2020.

The differences between the studied regions with respect to the magnitude of the impact of NPR/NSRO funding on the economic convergence to the EU-27 average and on the labour market are largely determined by the real weight of transfers (in relation to the population and GDP). Świętokrzyskie, relatively the least affluent voivodeship among the regions in question, receives the relatively highest values of funding compared both to its GDP and population. Hence, in most of the years of the analysed period the aforementioned region plays the role of the leader in terms of the strength of cohesion policy effects on employment and labour productivity as well as it dominates in terms of the magnitude of the impact of NDP/NSRF funding injections on GDP per capita relative to the EU average in the period after the assumed termination of EU financing (2016-2020), which indicates the strongest supply effects among the three regions under consideration. The dominance of Mazowieckie in terms of the impact of cohesion policy on GDP per capita (EU=100) during the period of NDP/NSRF implementation results, among others, from stronger multiplier effects than in the two other regions and from the size of its economy. The above fact allows one to say that a relatively low level of payments in relation to GDP can be compensated by a stronger multiplier mechanism (as in the case of Mazowiceckie) as well as by the structure of transfers, stronger supply effects or a relatively low level of public and human capital stocks at the beginning of the period of Community support.

In the context of the above conclusions, it is worth noting that the absence of reliable research on the impacts of cohesion policy on the supply side of the economies of the individual regions of Poland (*spill-over elasticities parameters*) implies the need to base the simulations on the results of the analysis of the economic processes and mechanisms taking place in countries that similar to Poland as regards their socio-economic conditions [Bradley, Untiedt 2008]. From the point of view of the quality of the analysis of the cohesion policy impacts on regional socio-economic development, an optimal solution would be to estimate the values of the above-mentioned parameters for each of the main economic categories (physical infrastructure, human capital development, and direct aid to the enterprise sector) [Zaleski 2011].

It is also worth mentioning that the division of NDP/NSRF payments into these economic categories (physical infrastructure, human capital development, and direct aid to the enterprise sector), which is made available for macroeconomic simulation exercises, is frequently derived as a result of imprecise aggregation of the projects under implementation. A part of payments included in the category of physical infrastructure, which impact the scale of supply effects in the models through this channel, are actually purely demand-side projects (e.g., the construction of a road that is not in practice frequented and stimulates no supply effects whatsoever, but influences the economic growth only in the short term through the growth in money supply). Given the above, the division of projects in terms of their real effects on regional development in the long run should be considered to be an important phase of research (significance of the quality of actual values and forecasts of NDP/NSRF transfers is presented in [Mogiła, Zaleski 2011]).

Furthermore, an extremely important step designed to enhance the quality of the macroeconomic analysis of the impacts of cohesion policy on the Polish regions would be to conduct reliable research that enables the estimation of the *deadweight* effect and the *crowding-out* effect (reduction of private investment due to government spending). The determination of what part of the effects of cohesion policy would also exist without EU support (*deadweight* effect) and what part of the NDP/NSRF -financed projects was implemented at the cost of a reduction in private sector investment (*crowding-out* effect) would allow us to increase the precision of the macroeconomic simulation outputs. In the context of the latter effect, one should also account for the fact that real EU funding injections into the economic system of a region take place with a certain time delay. During the initial

period, domestic public funds are the main source of financial support. In other words, we have to do here with a shift of funds being in circulation within the economic system, and not with the implementation of new funds.

In considering the convergence/divergence processes inside Poland, one can distinguish several basic reasons that argue for the varying magnitude of the impacts of cohesion policy in the relatively more affluent and poorer regions of Poland:

- As a result of a relatively larger scale of support allocated to the less affluent regions (under the NSRF there is even a separate programme dedicated to the poorest regions located in the eastern part of Poland), stronger demand effects should occur there, compared to the richer regions that are characterised by lower values of EU transfers in relation to their GDP and population.

- It may be assumed that the inflow of NDP/NSRF transfers – through a rise in disposable income – will increase the sense of financial security, which will in turn contribute to an increase in the marginal propensity to consume in the poorer regions of Poland, producing a stronger effect of the Keynesian multiplier mechanism and hence a higher growth in GDP. In the case of the more affluent regions, the increase in the marginal propensity to consume will be relatively smaller due to the earlier higher standard of living.

- The poorer regions should be characterised by a larger scale of supply effects due to the relatively lower "baseline" resources of both public and human capital. In the case of the richer regions, in which the status of technical infrastructure is better and whose production capacities were already upgraded earlier with the participation of foreign capital to a large extent, EU support will generate smaller effects (the baseline effect will occur in the case of the poorer regions).

- The variation in the intensity of the *crowding out* effect between the regions could be a certain justification for the higher effects of cohesion policy in the case of Poland's richer regions. Enterprises from the richer western regions, which are characterised by a stronger market position (often supported by foreign capital) compared to firms located in the poorer regions, can cope more effectively with the restrictions in

external financing of business, and this will be translated into a larger scale of private sector investment.

- Finally, one should keep in mind non-economic factors (e.g., administrative factors, lack of appropriate experience, inventiveness of local authorities, etc.) that may substantially affect the differences in the degree of the impact of EU funding between the regions. In the above context, the lesser experience of the poorer regions' authorities in large economic projects could argue for the stronger effects of cohesion policy in the relatively more affluent regions.

The results of the simulations of the impacts of cohesion policy on the convergence inside the country, which were obtained by using the regional HERMIN models and are presented in this article, allow us to conclude that NDP/NSRF funding will play an increasingly larger role in the reduction of the divergence between the relatively more affluent and poorer regions of Poland; in the optimistic scenario, it will even contribute to making more dynamic the economic convergence considered at the national level.

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