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Alternative scenarios of after-crisis conditions for regional growth in the context of the Cohesion Policy: An example of the Polish region of Warmińsko-Mazurskie

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Alternative scenarios of after-crisis conditions for regional growth in the context of the Cohesion Policy – an example of the Polish region of Warmińsko-Mazurskie

Abstract

The main aim of the paper is to present a methodology to evaluate the regional efficiency of the EU Cohesion Policy in the various development scenarios. The outcome might be crucial for the decision-makers both on the national and regional level in the 2014-2020 EU financial framework. The methodology is a fusion of the foresight method with the HERMIN macromodelling framework. This methodological combination will be highlighted using an example of the Polish NUTS-2 region of Warmińsko-Mazurskie. Firstly, in the research process major tendencies in the region itself and its environment are sketched. Emphasis is to be put upon an analysis of closer and broader conditions for the regional growth including possible macroeconomic, social, demographic, political, environmental, institutional, technological and policy-based ones. It enables us to set up extreme conditions for regional development. The space between the two extremes is filled up with a number of more likely scenarios. Secondly, a counter-factual analysis of the Cohesion Policy impact on the economic growth of Warmińsko-Mazurskie is carried out. The research tool to be used is the macroeconomic HERMIN model for the economy of. The results imply that the implementation of Regional Operational Programme for Warmińsko-Mazurskie 2014-2020 will produce the strongest effects if the pessimistic development scenarios for the region come true. Moreover, the HERMIN-based simulations indicate that innovation-oriented EU funding is expected to have the greatest impact on the socio-economic development of the region. However, sustainability of this effect is limited and should be augmented by additional investments.

1. Introduction

The comprehensive and complex category of territorial capital is regarded as a crucial driving force behind regional development. It does, however, function in the context of increasingly growing tangible and intangible interlinks and interdependencies of a particular region with its closer and further surrounding. An important element of this context is the EU Cohesion Policy that is expected to affect territorial capital and allow a region to more efficiently cushion and more creatively deal with changes going on outside. The main aim of the paper is to present a methodology to evaluate the regional efficiency of the EU Cohesion Policy in the various development scenarios. The outcome might be crucial for the decision-makers both on

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the national and regional level in the 2014-2020 EU financial framework. The methodology is a fusion of the foresight method with the HERMIN macromodelling framework. This methodological combination will be highlighted using an example of the Polish NUTS-2 region of Warmińsko-Mazurskie in Poland and its Regional Operational Programme (ROP WM) 2014-2020.

Warmińsko-Mazurskie Voivodeship belongs to the group of Polish regions that are characterised by a relatively lower level of development as approximated by GDP per capita (72.2% of the national average and 47% of the EU-28 average in 2011⁵). The LFS-based unemployment rate in Warmińsko-Mazurskie was at a level of 11,4% in 2013, while the employment rate was 46,1% in that year⁶. It is classified as one of Poland's problematic NUTS-2 regions that are included in a special support programme under Cohesion Policy.

The next section of this paper presents the research methodology. Then, using the example of Warmińsko-Mazurskie, alternative development scenarios for this region are shown. Thus, a basis is provided to present in the fourth section the alternative impacts of the Regional Operational Programme for Warmińsko-Mazurskie 2014-2020 (ROP WM) on its development. The paper ends with the main conclusions.

2. Methodology

The study was carried out using the macroeconomic HERMIN model for the economy of Warmińsko-Mazurskie. This model belongs to the family of HERMIN models created by dr. John Bradley of the Economic and Social Research Institute in Dublin as part of the Cohesion System of HERMIN Models (CSHM).

The HERMIN methodology is described in detail in the scientific literature [among others, Bradley and Untiedt, 2008]. Nevertheless, the most important features of these models are worth mentioning:

- They are macroeconomic models consisting of several behavioural equations whose parameters need to be calibrated. The other part is composed of identity equations which follow from the logic of the regional accounts;
- They combine elements of neo-Keynesian models (oriented towards the demand side of the economy) with elements characteristic of the neoclassical school, which is

⁵ Source: Central Statistical Office (GUS) and Eurostat.

⁶ GUS.

reflected, among others, in the inclusion of competitiveness as a determinant of manufacturing output;

- They are models that allow sectoral analysis of economic processes (5 sectors – agriculture, manufacturing, building and construction, market services, and non-market services).

For many years, the HERMIN models have been used to estimate the impact of Cohesion Policy on socio-economic development viewed through the prism of a number of macroeconomic indicators [among others, *Investing in Europe's future, Fifth report on economic, social and territorial cohesion* 2010]. They are also used to construct alternative development scenarios at the national and regional level.

The research process consists of three stages:

- Definition – narratively and quantitatively – of forecasting assumptions for various alternative development scenarios for Warmińsko-Mazurskie;
- HERMIN-based simulations to construct alternative development scenarios for this region over the period 2014-2030 based on the assumptions adopted;
- Running of HERMIN-based simulations of the impact of EU funds on selected macroeconomic indicators in various development scenarios for this region (counterfactual analysis).

The forecasting assumptions for the various development scenarios for Warmińsko-Mazurskie were categorised in the following way:

- Group I: assumptions concerning the external situation:
 - An optimistic alternative (development);
 - An moderate alternative (stagnation);
 - A pessimistic alternative (crisis);
- Group II: assumptions concerning the situation in Warmińsko-Mazurskie:
 - An optimistic alternative (development);
 - An moderate alternative (stagnation);
 - A pessimistic alternative (crisis);

- Group III: assumptions concerning the economic structure of funds under the Regional Operational Programme for Warmińsko-Mazurskie (ROP WM) 2014-2020:⁷
 - The structure assumed in the draft ROP WM document;
 - An innovation-oriented structure;
 - An infrastructure-oriented structure.

Processes occurring outside of the region (the first group of assumptions) are characterised in the HERMIN model for the economy of Warmińsko-Mazurskie primarily by the following:

- The growth rate of manufacturing output and of manufacturing output prices in the main trading partners of the region (Poland, Germany, France, United Kingdom, Italy, Russia);
- The growth rate of GDP in Poland and in the EU;
- The EUR/PLN exchange rate.

The situation within the region (the second group of assumptions), on the other hand, is quantified through the following variables:

- The region's total population;
- The working-age population;
- The scale of external (interregional) migration;
- The scale of internationalisation of the economy (through foreign trade);
- Technological progress in the sectors of manufacturing, market services, and construction and building;
- The consumer price level;
- Expenditure on research and development (R&D);
- Public sector investment.

The third group of assumptions used in the simulations designed to vary the development scenarios for Warmińsko-Mazurskie, thus to differentiate the impact of Cohesion Policy on the socio-economic processes, is related to the economic structure of funds. For the needs of simulations, the HERMIN methodology groups funding in four categories:

⁷ Given the main aim of this paper, which is the effect of Cohesion Policy on socio-economic development, and also taking into account the fact that the Regional Operational Programmes (ROP) are the most important tools to operationalise regional strategies, the analysis of the impact of various investment mixes under the ROP on the trajectory of development processes should be considered to be important.

- 1) Physical Infrastructure (PI) – expenditure related, among others, to the construction or modernisation of transport and telecommunications infrastructure, sewage treatment plants, power plants, etc.;
- 2) Human Resources (HR) - expenditure related to a quantitative increase and qualitative improvement in human capital by, *inter alia*, training, courses, lifelong learning;
- 3) Direct aid to the Productive Sectors (ASP) – expenditure oriented towards the expansion and upgrade of machinery and equipment of enterprises to enhance their competitiveness;
- 4) Research and Development (R&D) – expenditure designed to increase the innovativeness of businesses and thereby to increase value added generated in the whole economy.

The allocation of funds between the above categories forms the economic structure of financial intervention which plays an role in shaping long-term development effects.

The above presented categories were used to reflect in quantitative terms the trends assumed for the region and its environment as well as the final form of the Cohesion Policy interventions (ROP WM 2014-2020). This, in turn, enabled us to use the HERMIN model to construct alternative development scenarios for Warmińsko-Mazurskie (Table 1).

Table 1. Development scenarios for Warmińsko-Mazurskie for 2014-2030

		Assumptions concerning the optimistic situation in Warmińsko-Mazurskie	Assumptions concerning the pessimistic situation in Warmińsko-Mazurskie	Assumptions concerning the moderate situation in Warmińsko-Mazurskie
Assumptions of the optimistic scenario for the external economy development	The innovation-oriented economic structure of ROP WM funds	Scenario 1	Scenario 2	Scenario 3
	The infrastructure-oriented economic structure of ROP WM funds	Scenario 4	Scenario 5	Scenario 6
	The economic structure of ROP WM funds assumed in the draft document	Scenario 7	Scenario 8	Scenario 9
Assumptions of the pessimistic scenario for the external economy development	The innovation-oriented economic structure of ROP WM funds	Scenario 10	Scenario 11	Scenario 12
	The infrastructure-oriented economic structure of ROP WM funds	Scenario 13	Scenario 14	Scenario 15
	The economic structure of ROP WM funds assumed in the draft document	Scenario 16	Scenario 17	Scenario 18
Assumptions of the moderate scenario for the external economy development	The innovation-oriented economic structure of ROP WM funds	Scenario 19	Scenario 20	Scenario 21
	The infrastructure-oriented economic structure of ROP WM funds	Scenario 22	Scenario 23	Scenario 24
	The economic structure of ROP WM funds assumed in the draft document	Scenario 25	Scenario 26	Scenario 27

Source: Authors' own research.

During the third stage for the selected most likely development scenarios for Warmińsko-Mazurskie, simulations were run for the impact of 2014-2020 EU funds 2014-2020 on: GDP

in constant 2005 prices and unemployment rate. Those impacts were estimated by performing 2 macroeconomic simulations for each regional development scenario. In the first one, the data on Cohesion Policy funding were included in the equations. The other simulation assumed that there was no such financial injection. The differences between the values of the macroeconomic indicators obtained from these two simulations allowed us to determine the impact of Cohesion Policy on the indicators in question.⁸

2. Assumptions of the development scenarios

Assumptions concerning the external situation

Below are outlined the main assumptions of the three scenarios relating to the closer and further surrounding of Warmińsko-Mazurskie over the period 2014-2030. Of course, they do not exhaust all possible vectors of change. Their task is to illustrate in a more transparent way two extreme, though likely development scenarios (optimistic and pessimistic) and an averaged scenario. In other words, the point is to present the reasons for the occurrence of three different development trajectories.

The optimistic scenario:

In this scenario, the following main assumptions were made:

- The growth of the global economy at a rate close to the average values characterising the period of boom during the last business cycle before the 2008 crisis;
- The geopolitical situation will improve – the threat of escalation of potential conflicts (among others, the Russia-Ukraine or Iraq-Iran conflicts) will be removed;
- The negative demographic trends, which mainly occur in European countries, will be offset by an increase in labour force immigration;
- The absence of factors causing anxiety and uncertainty in the financial markets at a scale similar to the events that took place during the period 2008-2012 (such as, among others, the collapse of Lehman Brothers, the problems with debt servicing by Greece, Portugal, and Ireland, etc.);
- Reduced uncertainty and prices in the natural gas market by a gradual increase in shale gas exports by the United States. An implication of the above situation should be an improvement in the competitiveness of U.S. and European companies;

⁸ In all the scenarios it was assumed that all the EU projects under the ROP WM are fully effective and efficient. In future analyses this assumption might be relaxed in order to show the Cohesion Policy effects at various levels of effectiveness and efficiency of the EU operational programmes.

- The climate policy will not restrict the competitiveness of industry.

The pessimistic scenario:

In this scenario, the following main assumptions were made:

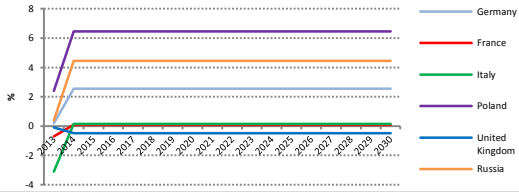
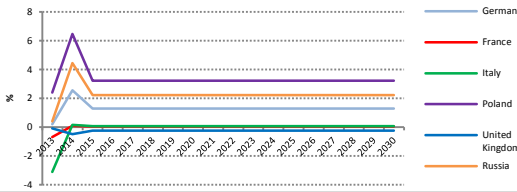
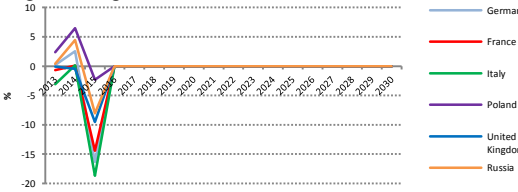
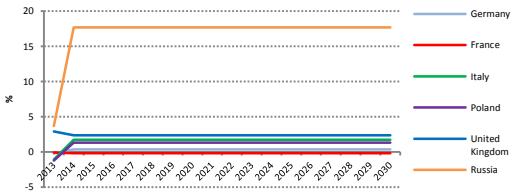
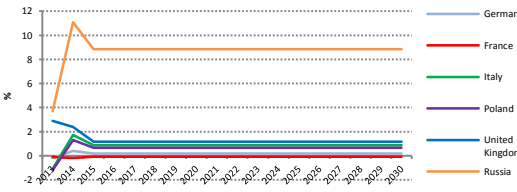
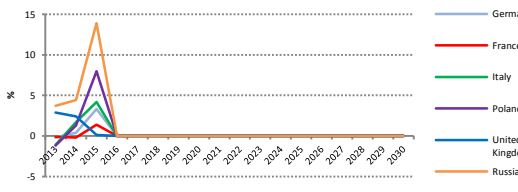
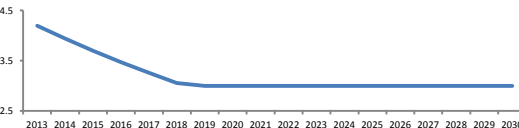
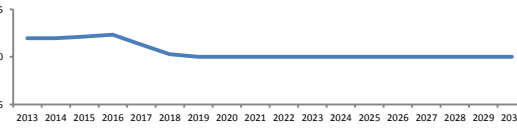
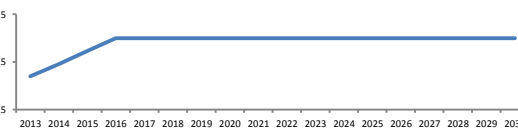
- A slump in the global economy manifested in a contraction of output in 2015 – after a drastic decline in economic activity, there will be a long-term stagnation;
- The geopolitical situation will deteriorate, primarily due to the exacerbating conflict between Russia and Ukraine. In EU countries the anti-integration and protectionist tendencies will become more evident;
- The negative demographic trends in Western Europe will intensify;
- An increase in prices of natural resources (including oil and natural gas) will imply a decline in the competitiveness of industry;
- The climate policy will restrict the competitiveness of industry.

The moderate scenario:

An assumption was made that the moderate scenario for the external situation would be reflected in the growth rate of manufacturing output and its prices in the main trading partners of Warmińsko-Mazurskie at a level corresponding to the arithmetic mean of the values for the optimistic and pessimistic scenarios.

The above presented scenarios for the development of the global socio-economic situation are reflected in the following exogenous assumptions made in the HERMIN methodology (Table 2):

Table 2. Fulfilment of the scenarios at the level of the exogenous assumptions of the HERMIN model for Warmińsko-Mazurskie – the assumptions concerning the external situation

Scenario Variable	Optimistic scenario	Moderate scenario	Pessimistic scenario
Growth rate of manufacturing output in the main trading partners of Warmińsko-Mazurskie [%]	<p>- At a level corresponding to the geometric mean for the period 1999-2008 which includes the last business cycle:</p> 	<p>- At a level corresponding to the arithmetic mean of the values in the optimistic and pessimistic scenarios:</p> 	<p>- In 2015 at a level of the growth rates in 2009 which was the peak year of the financial crisis. In the case of Poland's manufacturing output, the growth rate for the above-mentioned indicator in 2015 will be at a level -2.3% assumed. After a drastic decline in economic activity, there will be a long-term stagnation:</p> 
Growth rate of manufacturing output prices in the main trading partners of Warmińsko-Mazurskie [%]	<p>- At a level corresponding to the geometric mean for the period 1999-2008 which includes the last business cycle:</p> 	<p>- At a level corresponding to the arithmetic mean of the values in the optimistic and pessimistic scenarios:</p> 	<p>- As above</p> 
EUR/PLN exchange rate	<p>- A return to the appreciation trend of the Polish currency vis-a-vis the euro, which is determined, among others, by the Balassa-Samuelsen effect or higher interest rates; the Polish zloty will appreciate in relation to the common European currency in line with the average growth rate for the period 2004-2008. The exchange rate of 1 EUR = 3 PLN was assumed to be the limit for the appreciation of the Polish currency:</p> 	<p>- At a level corresponding to the arithmetic mean of the values in the optimistic and pessimistic scenarios:</p> 	<p>- Depreciation of the Polish currency vis-a-vis the euro; the Polish zloty will depreciate in relation to the common European currency. The exchange rate of 1 EUR = 5 PLN was assumed to be the limit for the depreciation of the Polish currency:</p> 

Source: Authors' own research.

Assumptions concerning Warmińsko–Mazurskie

The assumptions concerning the situation in Warmińsko-Mazurskie were divided into three scenarios: optimistic, pessimistic, and moderate.

The optimistic scenario:

In the optimistic version of the development of Warmińsko-Mazurskie, it is assumed that:

- The inter-regional transport infrastructure will significantly improve, which will markedly enhance the transport accessibility of this region and thereby its investment attractiveness, also for transnational corporations. In this context, the importance of relatively low labour costs as a stimulator for the inflow of foreign direct investment will increase;
- The economic relations with Kaliningrad Oblast will become more intensive (by better exploiting the region's border location);
- The capital city of Olsztyn will develop dynamically (among others, by strengthening its scientific, research and academic potential), becoming a significant driving force for regional economic development. Other regional centres, such as Elbląg or Ełk, will also gain in economic importance, creating additional growth poles for this region (the exploitation of the polycentric spatial system);
- The transport infrastructure within the region will improve, effectively enabling the periphery-growth centre relations to be strengthened (enhanced economic complementarity);
- One of the characteristics of this region, which is the high quality of its natural environment, and an improvement in housing infrastructure will be factors contributing to increased attractiveness of the region as a place where both older people and representatives of the younger generation settle down;
- There will be a quantitative and qualitative increase in human capital (among others, through the promotion of lifelong learning);
- The education system will be consistently adapted to the needs of the labour market;
- The revitalisation of the areas of the former State Agricultural Farms will become more dynamic;
- An improvement in the investment climate will induce a growth in investment, including foreign investment, which may also increase the inflow of new technologies;

- Branches of industry important from the point of view of regional development, such as manufacture of food products and beverages (including health food), manufacture of tyres, timber industry (including the furniture industry), or manufacture of machinery and equipment, will stimulate a further increase in the relative importance of the manufacturing sector for the generation of gross value added of Warmińsko-Mazurskie. Due to the unique European-scale values of this region's natural environment, agricultural processing will play a special role in the development of manufacturing. With the support of foreign capital in the form of foreign direct investment, the above-mentioned progress will still continue in the medium term. As the affluence of this region increases, the contribution of the manufacturing sector to the generation of gross value added will be reduced in favour of the market services sector (also on account of the progressive increase in manufacturing-related services). In the long term, the structure of the manufacturing sector itself may change in the direction of branches generating higher value added, which will be dependent on an improvement in the quality of human capital (and also on an increase in its quantity) and social capital in the region. Throughout the entire period covered by the forecast (2014-2030), we will observe a progressive increase in the importance of tourism and spa services – one of the main drivers determining the region's development, which will result from increasingly skilful exploitation of the potential of Warmińsko-Mazurskie as regards the richness of its natural environment, landscape values, or its abundant flora and fauna. The relatively high unit costs of agricultural production and its lower profitability will contribute to a reduction in the role of agriculture in the generation of gross value added of the region.

The pessimistic scenario:

The pessimistic scenario assumes that the region's current situation will deteriorate in the below areas:

- The inter-regional transport infrastructure will not be upgraded and expanded, while the existing resources will depreciate. This, in turn, will result in a deterioration of the already poor transport accessibility of the region and thereby its investment attractiveness. In this context, the importance of relatively low labour costs as a stimulator for the inflow of foreign direct investment will decrease;

- The economic relations with Kaliningrad Oblast will deteriorate (the failure to take advantage of the border location);
- The strength of the impact of Olsztyn on the development of other areas in the region will be diminished. The above-mentioned city will not develop its metropolitan functions. Other regional centres, such as Elbląg or Elk, will also become less important in terms of their impact on the peripheral areas of the region. Hence, the region's polycentric spatial system will not be exploited;
- As a result of the failure to upgrade and expand the region's transport infrastructure, the periphery-growth centre relations will be weakened;
- The region's attractiveness as a place to settle will diminish;
- There will be a quantitative and qualitative decrease in human capital (among others, due to the drain of human resources by other regions and foreign countries);
- The education system will not be adapted to the needs of the labour market;
- The economic degradation of the areas of the former State Agricultural Farms will further continue;
- A deterioration in the investment climate will induce a decline in investment, including foreign investment, which may also reduce the inflow of new technologies;
- As far as the economic structure is concerned, the importance of the manufacturing sector in the regional economy will be radically reduced. The development of the region will be primarily determined by the services sector (mainly tourism and spa services). A marked decline in manufacturing as an extremely important factor stimulating the development of the region (the driver of development) and enabling its transformation through a dynamic increase in labour productivity will reduce the status of Warmińsko-Mazurskie to a region with a relatively monocultural economy based on tourism. This, in turn, will make this region more dependent on business cycle fluctuations in Poland and abroad than in the case of a diversified economic structure. A significant reduction in the role of industry will not allow this region to achieve a long-term growth rate at a level that would allow it to effectively narrow the development gap in relation to Poland's economically stronger regions. Even though a dominant services sector is a characteristic of developed regions, but its driving force should be manufacturing which contributes to the development of a wide range of services (including manufacturing-related services) and which also allows, through increased labour productivity, the affluence of the region's residents to rise, thus inducing the development of a diverse

market services sector. Moreover, the significance of agriculture, building and construction, and non-market services will decline.

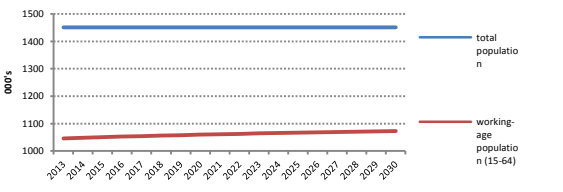
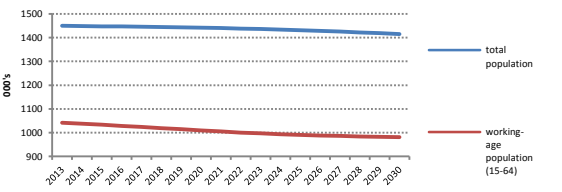
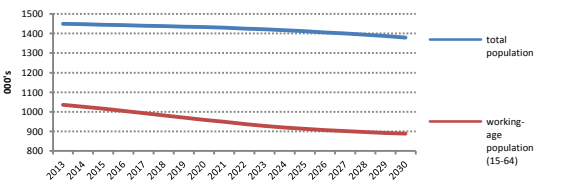
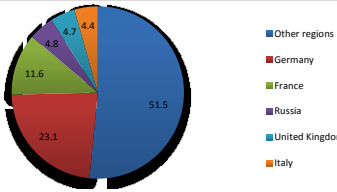
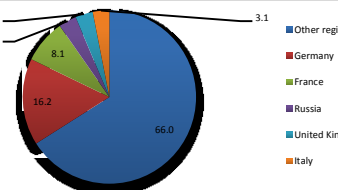
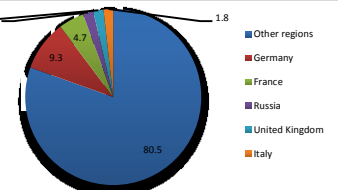
The moderate scenario:

The moderate scenario assumes that the region's current situation will not change in the below areas:

- The exploitation of resources in the form of the unique natural environment;
- The inter-regional transport infrastructure;
- The investment attractiveness, including for transnational corporations;
- The economic relations with Kaliningrad Oblast (taking advantage of the border location);
- The strength of the impact of Olsztyn, Elbląg and Elk on the development of other areas in the region (exploitation of the polycentric spatial system);
- The region's transport infrastructure, the periphery-growth centre relations;
- The region's attractiveness as a place to settle;
- Human and social capital;
- The education system;
- The level of development of the areas of the former State Agricultural Farms;
- Expenditure on research and development;
- As regards the economic structure, the moderate scenario will be a resultant of the processes assumed in the optimistic and pessimistic scenarios.

The fulfilment of the scenarios at the level of the exogenous assumptions of the HERMIN model is shown in Table 3.

Table 3. Fulfilment of the scenarios at the level of the exogenous assumptions of the HERMIN model for Warmińsko-Mazurskie – the assumptions relating to Warmińsko-Mazurskie

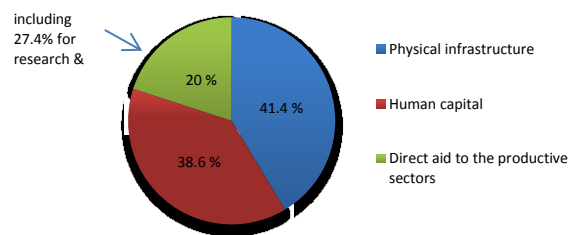
Scenario Variable	Optimistic scenario	Moderate scenario	Pessimistic scenario
Total population and working-age population [in 000's]	<p>- An increase in the region's working-age population until 2030 as a result of immigration of the population encouraged by employment opportunities in the relatively dynamically developing region (immigration from countries such as Ukraine, Belarus, or Russia). Given the above, the total population will not decline:</p> 	<p>- At a level corresponding to the arithmetic mean of the values in the optimistic and pessimistic scenarios:</p> 	<p>- A decline in the region's working-age population until 2030 as a result of emigration (interregional and international) of the population encouraged by employment opportunities in the relatively faster developing regions in Poland and abroad. Given the above, the total population will decline:</p> 
Rate of technological progress in manufacturing, services, building and construction	An increase compared to historical data	At the level of historical data	A decline compared to historical data
Scale of internationalisation of regional business activity – the shares of the main trading partners of Warmińsko-Mazurskie in its exports			
Regional consumer price index	An increase in the price index (up to the upper limit of the range determined by the National Bank of Poland, i.e. 3.5%), arising from an improvement in consumer sentiment as a result of good economic conditions in the region, will result in higher aggregate demand contributing to an increase in consumer prices.	It is assumed at the level of the direct inflation target of the National Bank of Poland, i.e. 2.5%.	A decrease in the price index (down to the lower limit of the range determined by the National Bank of Poland, i.e. 1.5%), arising from a deterioration in consumer sentiment as a result of bad economic conditions in the region, will result in weaker aggregate demand contributing to a decline in consumer prices.
Growth rate in expenditure on research and development	An increase relative to the average growth rate for 2000-2012	At the level of the average growth rate for 2000-2012	A reduction relative to the average growth rate for 2000-2012
Growth rate in public sector investment	An increase relative to the average growth rate for 2000-2012	At the level of the average growth rate for 2000-2012	A reduction relative to the average growth rate for 2000-2012

Source: Authors' own research.

Assumptions concerning the economic structure of transfers under the regional operational programme for Warmińsko-Mazurskie 2014-2020

The structure proposed in the draft ROP WM 2014-2020 document was adopted as the baseline scenario (Fig. 1).

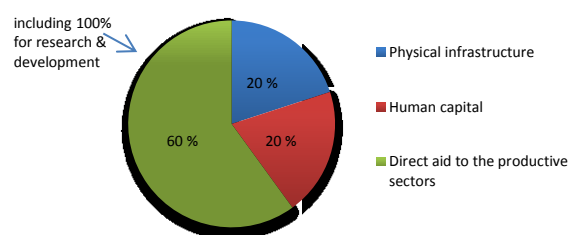
Figure 1. The economic structure of ROP WM 2014-2020 funds assumed in the draft document



Source: Authors' own calculations.

The next scenario for the thematic distribution of EU funds is characterised by a relatively high proportion of funding assigned to innovation-oriented activities (associated with the implementation of the thematic objective: *Strengthening research, technological development and innovation*). This is a hypothetical projection of the distribution of EU funds aimed at showing the macroeconomic significance of an increase in expenditure on the implementation of new products, technologies, and processes. The selection of this type of an alternative scenario is dictated by the extremely important role of innovation in determining the competitive position of enterprises, regions, and countries. In the situation of gradual loss of the cost-based competitive advantage, innovation-oriented activities are becoming of key importance in the development of non-cost competitiveness of the regions of Central and Eastern Europe, allowing these regions to increase value added generated there and to avoid the so-called middle income trap. In view of the above, it is worth showing what long-term effects might be generated by an alternative allocation of funding more oriented towards supporting innovative projects (Fig. 2).

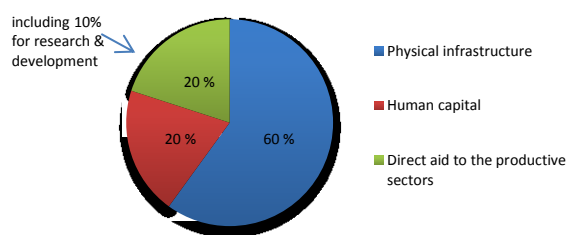
Figure 2. The innovation-oriented economic structure of ROP WM funds



Source: Authors' own calculations.

In turn, the third scenario of the economic structure of ROP WM 2014-2020 funds highlights the role of expenditure on projects involving the construction and modernisation of technical infrastructure. This only concerns **projects that would generate significant effects for the socio-economic development of Warmińsko-Mazurskie**, thus those relating to the regional transport routes and those of supralocal importance which would provide the necessary connection with the network of expressways and areas designated for manufacturing and service activities. Although the external accessibility of the region predominantly depends on the implementation of the national-level operational programmes, but it is extremely important to increase the support for the transport infrastructure within Warmińsko-Mazurskie (deficits in this area are clearly stressed in the diagnosis made in the ROP WM 2014-2020 document). In other words, **the issue of territorial cohesion of the region is of key significance**. Taking into account the above, a hypothetical scenario was created for the division of ROP WM 2014-2020 funding between the economic categories (Fig. 3).⁹

Figure 3. The infrastructure-oriented economic structure of ROP WM 2014-2020 funds



Source: Authors' own calculations.

3. The results and analysis.

This section presents the results of the simulations performed using the HERMIN model for the economy of Warmińsko-Mazurskie for, due to the volume limitation of this paper, 9 selected scenarios of the development of this region (Table 4) – 6 extreme scenarios and 3 moderate ones. The analysis covered the period 2014-2030 and was focused on two main macroeconomic indicators that quantify regional socio-economic development, i.e. GDP and employment rate.

⁹ Of course, the presented scenarios do not exhaust all possibilities of creating investment mixes. Due to the volume limitation of this paper, it focuses on an extremely important alternative that arouses numerous controversies in Poland: higher infrastructure-related expenditure versus a higher allocation for innovation-oriented projects.

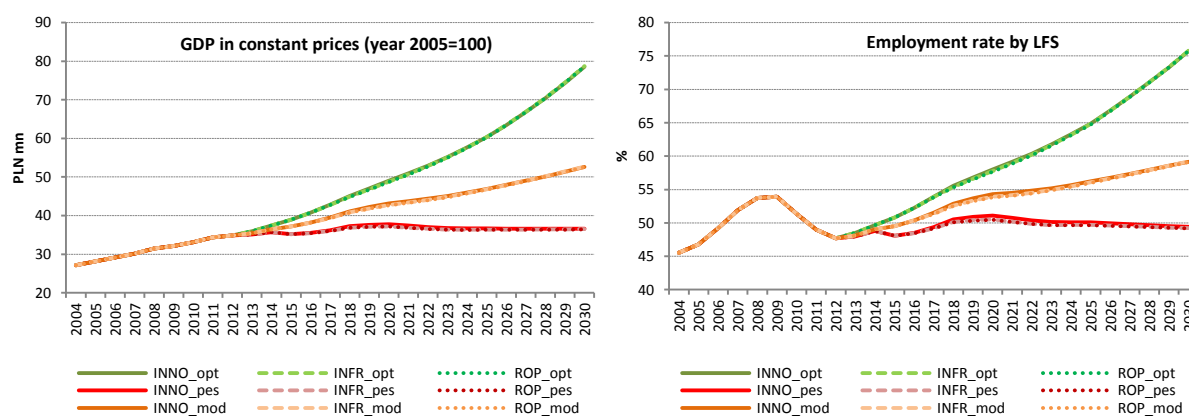
Table 4. 9 development scenarios for Warmińsko-Mazurskie

Scenario no.	Projection of the external situation	Situation in Warmińsko – Mazurskie	Economic structure of ROP WM 2014-2020 funds	Designation
1	DEVELOPMENT	DEVELOPMENT	Innovation-oriented	INNO_opt
4	DEVELOPMENT	DEVELOPMENT	Infrastructure-oriented	INFR_opt
7	DEVELOPMENT	DEVELOPMENT	Assumed in ROP WM	ROP_opt
21	STATUS QUO	STATUS QUO	Innovation-oriented	INNO_mod
24	STATUS QUO	STATUS QUO	Infrastructure-oriented	INFR_mod
27	STATUS QUO	STATUS QUO	Assumed in ROP WM	ROP_mod
11	CRISIS	CRISIS	Innovation-oriented	INNO_pes
14	CRISIS	CRISIS	Infrastructure-oriented	INFR_pes
17	CRISIS	CRISIS	Assumed in ROP WM	ROP_pes

Legend: green – optimistic scenarios INNO – innovation-oriented scenario
orange – moderate scenarios INFR – infrastructure-oriented scenario
red – pessimistic scenarios ROP – financial scenario included in the draft ROP WM 204-2020
Source: Authors’ own research.

The selected scenarios (Table 4) can be divided into 3 groups that differ from one another in the assumptions concerning the external economic situation; the economic situation in the region (optimistic, moderate and pessimistic scenarios) as well as the economic structure of ROP WM 2014-2020 funds. The GDP and employment rate projections for the selected regional development scenarios for the period 2014-2030 are presented in Figure 4.

Figure 4. GDP in constant 2005 prices and employment rate (aged 15-64) for Warmińsko-Mazurskie for 9 selected regional development scenarios (2004-2013 – historical data; 2014-2030 – projections)



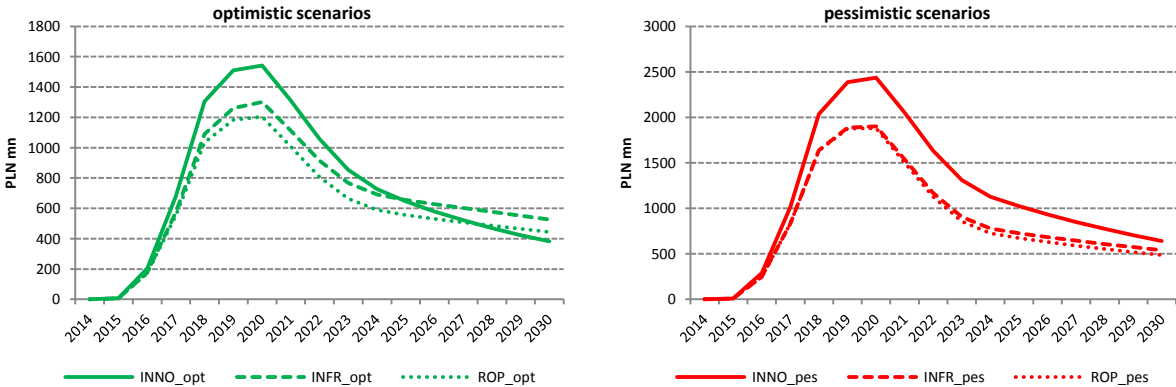
Source: Authors’ own calculations based on GUS (Central Statistical Office) data and on the results of the simulations performed using the HERMIN model for the economy of Warmińsko-Mazurskie.

Analysing the above figure (Fig. 4), one can notice three main paths for the development of Warmińsko-Mazurskie until 2030 (an optimistic path – green colour; a moderate path – orange colour; a pessimistic path – red colour). The further development of the region will be differentiated to a much lesser extent by the structure of funds available under ROP WM 2014-2020 due to a relatively low importance of this funding in relation to the entire regional

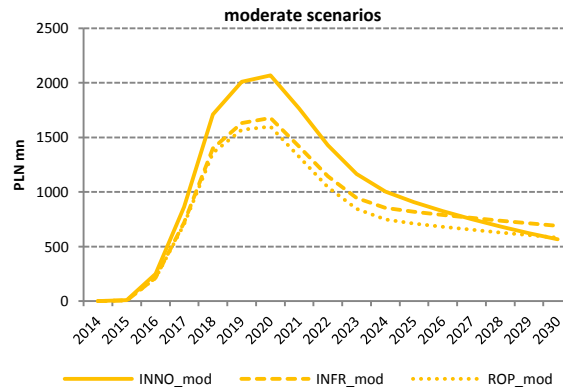
economy (the average yearly transfers in relation to the regional GDP will be at a level of 1.58%¹⁰). The simulation results demonstrate that over the next 17 years the region’s average annual economic growth might range from 0.12% (scenario ROP_pes) to 4.76% (scenario INFR_opt). The employment rate, in turn, could show an increase during the period 2013-2030 ranging from 1.21 percentage points (scenario ROP_pes) to 27.3 percentage points (scenario INFR_opt) ultimately ranging 49.2% - 75.8% in 2030, respectively.

The following figures (Figs. 5 and 6) present the results for the impact of ROP WM 2014-2020¹¹ funds on the levels of these two above-mentioned indicators. To maintain clarity, the results are grouped according to the 3 main development scenarios for Warmińsko-Mazurskie. In each group, funds are differentiated by their economic structure (an innovation-oriented structure; an infrastructure-oriented structure; the structure assumed in the ROP WM document).

Figure 5. Results for the impact of ROP WM 2014-2020 on GDP in constant 2005 prices in Warmińsko-Mazurskie broken down into 9 regional development scenarios (in PLN million)



¹⁰ Calculation for the moderate scenario and original ROP WM 2014-2020 funds (for the period 2015-2023).
¹¹ According to the information contained in the ROP WM 2014-2020 document, a total amount of EUR 2031 million is allocated for the implementation of this Programme within the 2014-2020 financial framework, i.e. about 20.1% of GDP in 2011. EU funding accounts for 85% of this amount, while the State budget funding for 15%. The spending of available funds will begin in 2015 and will last until the end of 2023 (in accordance with the n+3 rule of Cohesion Policy, EU funding may be spent for more three years from the end of the respective EU financial framework) An assumption is made that the time profile for funds to be spent will be the same as over the period 2007-2015 (hence, the peak of spending will be during the period 2018-2020).



Source: Authors' own calculations based on GUS data and on the results of the simulations performed using the HERMIN model for the economy of Warmińsko-Mazurskie.

The analysis of the results for the impact of ROP WM 2014-2020 on GDP of Warmińsko-Mazurskie (Fig. 5) reveals that:

- In the case of all 9 scenarios analysed, the highest effects of the Programme implementation can be observed in the period when ROP WM funds will be spent (2015-2023) – during this time, the average annual impact will range from PLN 737 million (scenario ROP_opt) to PLN 1463 million (scenario INNO_pes). After the termination of funding (the period 2024-2030), the effects of previously spent funds should still be visible and remain at a level of PLN 512 million (ROP_opt) to PLN 865 million (INNO_pes) on an average annual basis. It should be taken into account that during the initial period of funding inflows a significant part of this effect is induced through the demand channel. This means that funds injected into the economy stimulate the investment demand, which in turn affects, through the Keynesian investment multiplier, an increase in disposable income and an increase in consumption demand, as a result contributing to an increase in GDP. The supply effects (associated, among others, with the expansion and modernisation of the technical infrastructure, primarily transport and telecommunications infrastructure, an increase in knowledge and skills of the population as well as with the expansion and upgrade of machinery and equipment in enterprises), which are predominantly manifested over the long term, play a relatively smaller role during this period. Their importance is fully revealed after the termination of ROP WM payments;
- The strongest effects of the Programme implementation during the period 2014-2030 should be expected in the event that the pessimistic forecast of the region's development comes true – in such case, the average annual impact will range from PLN 832 million (scenario ROP_pes) to PLN 1131 million (scenario INNO_pes). In

turn, the lowest effects will be observed if the optimistic regional development scenario is fulfilled (the average annual impact will not exceed the level of PLN 719 million). The above primarily results from the fact that in the pessimistic scenarios the value of the Polish currency is expected to depreciate. This –in turn- would significantly augment the size of the EU support when denominated in the Polish currency. What is more, economic slowdown makes the investment multiplier higher through a reduction in imports following the currency depreciation¹². This contributes to an additional increase in economic demand-side effects caused by the ROP WM funds in the case of pessimistic scenarios. With regard to supply-side effects the results are not straightforward. On the one hand, characteristics of the Warmińsko-Mazurskie economy in the optimistic scenarios (e.g. relatively high Hicks-neutral technical progress rate) allow to more efficiently use the EU funding (INFR_pes and ROP_pes). On the other hand, in the case of the pessimistic scenarios, as an effect of the assumed slump in the global economy and deterioration in the situation within the region, physical and human capital stocks will reach much lower levels than during an economic prosperity. With a lower level of stock, in turn, each additional investment is expected to generate greater effects compared to a situation in which the stock and investment saturation are higher (INNO_pes)^{13 14}.

- For a major part of the period in question, the strongest economic effects are observed in the case of the innovation-oriented scenarios, i.e. INNO_opt, INNO_mod and INNO_pes¹⁵. This is in line with the expectations that the R&D expenditure allows the region to increase its non-cost competitiveness and value added generated within its area. In the case of funds allocated to transport infrastructure, the impact on the region's economic development is largely lower compared to the innovation-oriented

¹² In the HERMIN-based simulations marginal propensity to consume was not differentiated across scenarios. Further analyses might take into account impacts of economic downturns on the marginal propensity to consume. It would be also interesting to carry out comparisons for various types of consumption functions (e.g. liquidity-constrained Keynesian ones versus Friedman- or Modigliani-type ones).

¹³ Large deficits in R&D system (R&D facilities, openness of businesses and institutions to innovative activities, cooperation capabilities, etc.) in Polish regions assumed in the pessimistic scenario (INNO_pes) result in the higher impacts of the EU funds than under the optimistic assumptions (INNO_opt). In the case of INFR_pes and ROP_pes deficits in transportation and telecommunication infrastructure and human capital stocks are relatively lower. Thus, additional investment generates not so strong effects as in the case of INNO_pes. What is more, the prosperous economy in the optimistic scenario allows to more efficiently use the infrastructure and human capital.

¹⁴ In order to derive the impacts of the EU funds that are not associated with differences in exchange rate the authors assumed the same value of the Polish currency in both pessimistic and optimistic scenarios. Due to the volume limitation of the paper the tables with the separate demand- and supply-side impacts under the same assumptions on exchange rates might be provided by request at the e-mail address: zmg@warr.pl.

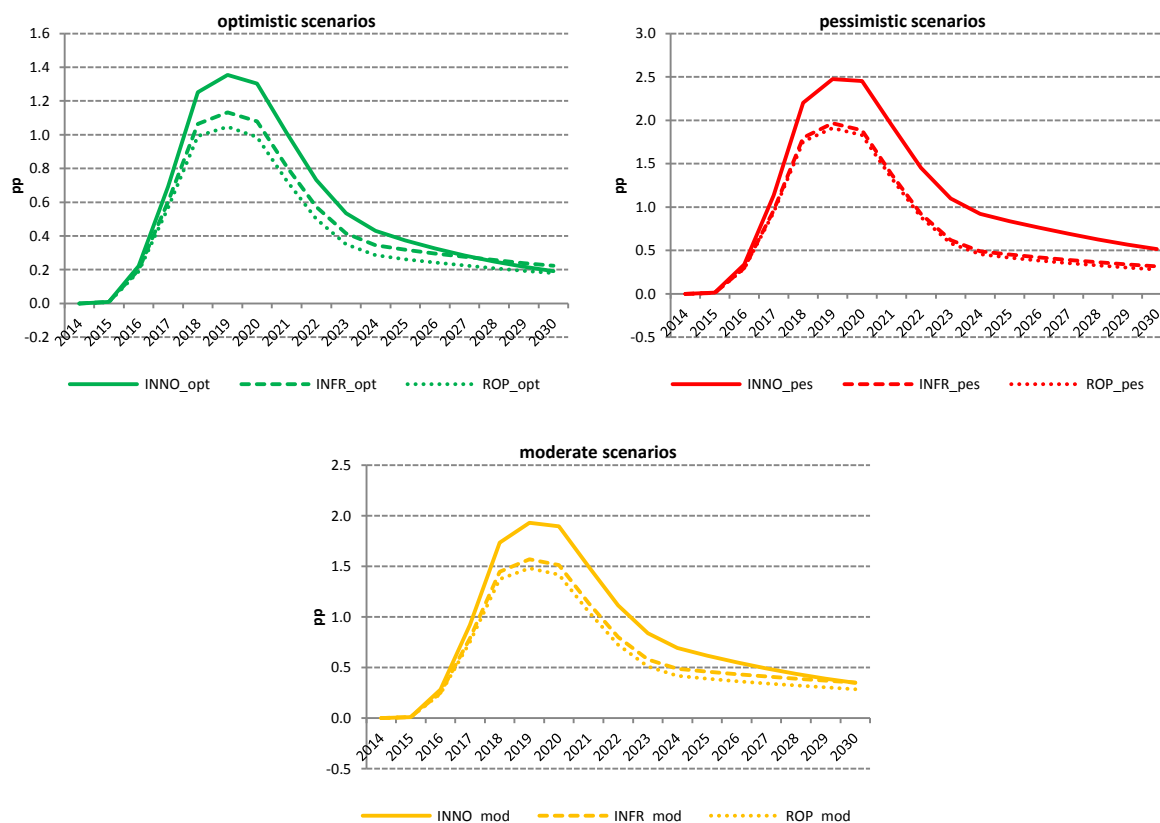
¹⁵ An exception is the scenario INNO_pes where its dominance over INFR_pes and ROP_pes lasts until the end of the investigated period (looking at the trajectory in the graph, one may, however, expect that this situation will change after 2030).

scenarios. The interpretation of these results may be as follows: the expansion and modernisation of infrastructure allow existing resources to be exploited more effectively, but they do not generate – or generate to a limited extent – effects that enable the structure of regional development to be changed. This kind of significant structural changes is dependent on innovation and technological progress to a great extent.

- Relatively lower impacts for the scenario with higher fraction of human capital-oriented investment (included originally in ROP WM) may be explained by the comparatively smaller scale of this type of expenditure in relation to human capital stock in Warmińsko-Mazurskie than in the case of infrastructure and R&D. In other words, increasingly greater number of graduates imply that the human capital stock rises at a higher pace than infrastructure and R&D facilities do. Thus, the EU financial injections play a limited role in this field;
- Over the longer time horizon, the effects generated in the infrastructure-oriented scenarios, i.e. INFR_opt, INFR_mod, and INFR_pes, start to dominate in the case of each group of regional development alternatives. As far as the optimistic and moderate scenarios are concerned, INFR_opt and INFR_mod become dominant after 2025 and 2027, respectively, whereas in the case of the pessimistic scenario (INFR_pes) this dominance will manifest itself after 2030. A relatively rapid decrease in the effects in the innovation-oriented scenarios, which predominated throughout the major part of the period in question, is caused by the lower durability of innovation investments compared to infrastructural and human capital ones. As a matter of fact, a product or a process can be innovative only for a certain period of their economic lifecycle and they may generate strong supply-side effects only at that time. After the end of such period, they lose their innovative character if there is no further investment. It is different in the case of infrastructural and human capital undertakings whose economic functionality does not change dramatically with time and can still produce significant economic effects in the long run.

The analysis of the results for the impact of ROP WM 2014-2020 on the employment rate in Warmińsko-Mazurskie provides similar conclusions (Fig. 6). It is worth mentioning here that in the case of this indicator the average annual effect over the period 2014-2030 will range from 0.41 percentage points (scenario ROP_opt) to 1.06 percentage points (scenario INNO_pes).

Figure 6. Results for the impact of ROP WM 2014-2020 on the employment rate (aged 15-64) in Warmińsko-Mazurskie broken down into 9 regional development scenarios (in percentage points (pp))



Source: Authors' own calculations based on GUS data and on the results of the simulations performed using the HERMIN model for the economy of Warmińsko-Mazurskie.

Conclusions

The main aim of this study was to present a methodology to evaluate the regional efficiency of the EU Cohesion Policy in the context of the volatility of development conditions. The methodology was based on the foresight analysis and macroeconomic HERMIN model. Its application was shown on the example of Warmińsko-Mazurskie Voivodeship. The research process consisted of 3 stages:

- Construction of 3 groups of assumptions concerning: external environment, internal tendencies and the EU Cohesion Policy (ROP WM 2014-2020);
- HERMIN-based simulations of alternative development scenarios for Warmińsko-Mazurskie Voivodeship over the period 2014-2030 using the assumptions adopted;
- Running HERMIN- based simulations of the impact of EU funds to be spent under ROP WM 2014-2020 on GDP and employment rate.

In effect, 27 alternative development scenarios for Warmińsko-Mazurskie were constructed. Due to the volume limitation of this paper, 9 scenarios were selected and analysed – 3 extreme optimistic scenarios, 3 extreme pessimistic ones, and 3 moderate ones. The analysis allows us to formulate the following main conclusions:

- The implementation of ROP WM will produce the strongest effects¹⁶ if the pessimistic development scenarios for Warmińsko-Mazurskie come true. The average annual impact on GDP will reach PLN 1131 million over the period 2014-2030, while in the case of the employment rate – up to 1.06 percentage points. In turn, the relatively lower effects will be observed if the optimistic regional development scenarios are fulfilled. The average annual impact will not exceed the level of PLN 719 million in the case of GDP and 0.54 percentage points in the case of the employment rate. It results largely from the fact that in the pessimistic scenarios the value of the Polish currency is expected to depreciate. This –in turn- would significantly augment the size of the EU support when denominated in the Polish currency. The impact of currency depreciation is complemented by two additional effects of demand- and supply-side nature. Firstly, in the case of the optimistic scenarios the values of the Keynesian investment multiplier are lower due to greater import leakages. Secondly, economic prosperity usually contributes to the higher efficiency of the Cohesion Policy impacts on production and productivity. However, it might not be the case when the EU funding accounts for a considerable support of physical or human capital in the pessimistic scenario.
- With regard to the economic structure of the EU funding the strongest effects are observed in the case of the innovation-oriented scenarios. This type of expenditure allows the region to increase its non-cost competitiveness and value added generated within its area. However, due to a relatively short life cycle of innovative products and processes, their impact on the regional development is lower in the long term than in the case of the infrastructure-oriented scenarios and those based on the strong development of human resources. This is especially visible in the case of the optimistic and moderate regional development scenarios characterised by relatively high saturation of the economy with R&D. Investments in transport infrastructure and human capital are more durable and – assuming their full effectiveness – might

¹⁶ In all the scenarios it was assumed that all the EU projects under the ROP WM are fully effective and efficient. In future analyses this assumption might be relaxed in order to show the Cohesion Policy effects at various levels of effectiveness and efficiency of the EU operational programmes.

generate effects with longer economic duration. Given the above, a permanent source of innovation-oriented financing must be ensured to guarantee a long-term sustainable improvement in the region's competitiveness and its economic development.

- Relatively lower impacts for the scenario with higher fraction of human capital-oriented investment (included originally in ROP WM) may be explained by the comparatively lower scale of this type of expenditure in relation to human capital stock in Warmińsko-Mazurskie than in the case of infrastructure and R&D. In other words, increasingly greater number of graduates imply that the human capital stock rises at a higher pace than infrastructure and R&D facilities do. Thus, the EU financial injections play here not such a strong role.
- Warmińsko-Mazurskie struggles with both infrastructure and R&D deficiencies. Transportation and telecommunication infrastructure is a sine qua non condition for regional development. There is no possibility to take full advantage of territorial potentials when the external and internal accessibility is limited. However, the infrastructure expenditure gives hardly any stimulus for structural changes as pro-innovative projects do. Even though the results indicate that effective and regular R&D investments might have a significantly greater impact on an economy than infrastructure-oriented expenditure recommendations for the development policy are not straightforward. One should bear in mind that HERMIN-based simulations do not take into account the benefits from upgraded infrastructure which are associated with the diversified territory. An effective infrastructure might improve territorial cohesion by intensifying economic interrelations between different parts of a region (higher complementarity) and by greater accessibility to the diversified territorial assets (higher standard of living). Hence, it is necessary to undertake investment in the transportation and telecommunication system until it does not pose an obstacle for improving quality of living in a region.
- Bearing in mind one of the recommendations of Barca's report (2009), the limited EU resources ought to be thematically concentrated in order to produce significant effects. There are two main areas of intervention. On the one hand, there are projects that are expected to develop supply-side of the regional economy – with a special role of pro-innovative undertakings characterised by relatively high uncertainty and risks and – at the same time- by considerable potential socio-economic effects. On the other hand, there are initiatives aimed at building stocks of social capital, social and environmental infrastructure, local roads etc. They are likely to improve qualitative aspects of

development at the cost of spectacular quantitative macroeconomic effects. The choice is determined by development priorities of the regional society represented by its authorities as well as by the EU restrictions in the form of *ring fencing*.

- The final decision on the structure for the distribution of funding available under ROP WM 2014-2020 should be based on macro- and microeconomic analysis. This paper fits into the former of the above-mentioned approaches. The microeconomic level should take into consideration the following: 1) long-term economic efficiency of particular projects as well as their opportunity costs; 2) an analysis of cost intensity of the particular types of projects and costs of maintenance of their potential results; and 3) the determination of the level of investment saturation relative to the individual investment priorities included in ROP WM 2014-2020. This will allow us to find to what extent it is possible to achieve the set goals and whether there is a risk of overinvestment in a particular area entailing the cost of maintenance of unnecessary investments. The allocations may not exceed the absorption barriers. Otherwise, a part of available funding may be spent ineffectively and may not produce the intended effect.

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http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/en/main/
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