

# Structural Disparities in the Polish Economy: Regional Development

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## Abstract

*The purpose of this study is to identify structural imbalances in the regional development of the Polish economy on the basis of the level and specifics of regional development analysis. In order to achieve this goal, the data from the Polish Central Statistics Office describing the labor market, and the demographic and economic situation in Poland have been utilized. The analysis period is 2005–2016. The heterogeneity of regional development generates a number of economic, social and political issues, the solution of which requires the formation of a fundamentally new sustainable development policy concept. Such a concept is supposed to be based on an integrated approach that takes into account the specifics of development each individual region in the country.*

**Keywords:** structural disparities, regional development, polish economy, modern economic system

**JEL:** J21, O18, R58

## Introduction

The modern economic system in Poland, a member of the European Union, is developing in the conditions of the international division of labor and sectoral integration. Coordination of economic processes at the level of the integration association contributes to the sustainable social and economic development of the EU member states. In turn, the sustainable development of each individual country is largely determined by the presence or absence of structural imbalances at its region development level. The purpose of this study is to identify structural imbalances in the regional development of the Polish economy on the basis of the level and specifics of the country's regional development. The analysis results can be a scientific justification of state policy formation for regional development.

Sectoral and social disproportions between particular regions within the country are due to the unequal availability of production factors, historical and economic developmental features, demography and geographical location. This, in turn, affects the fact that measures to stimulate and regulate the economy which are effective for some regions of the country are ineffective or completely inapplicable for others. It means that it is impossible to form a unified development model for all regions that form the national social and economic system. At the national level, a national sustainable development policy ought to be developed, taking into account both external economic factors (such as EU membership) and the internal specifics of the particular state regional development. In turn, each individual region within the country must take into account the requirements of an objective process of economic integration in the formation of its own sustainable development

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strategy. In order to achieve this goal, the data from the Central Statistics Office of Poland describing the labor market, and the demographic and economic situation in Poland, with differentiation in six regions (Central region, Southern region, Eastern region, North-western region, South-western region, Northern region) have been used.<sup>1</sup> The analysis period is 2005–2016.

## 1 Literature Review

A lot of scientific works have been devoted to the study of structural disproportions in the regional development of the Polish economy. The latest studies in this field are the following:

- Głuszczyk (from Wrocław University of Economics) in his study revealed the essence of regional development and identified the main determinants of the regional development concept, taking into account the current social and economic realities (Głuszczyk 2011)
- Kopyściański and Rólczyński (from WSB Universities) highlighted the development of the Polish regions in 2006–2012, analyzed their economic potential and the reasons for regional disparities (Kopyściański and Rólczyński 2013)
- Golejewska (from University of Gdańsk) studied the demographic situation in the regions of Poland in 2005, 2009 and 2013, analyzed the state of the labor market, the economic situation of the inhabitants in the regions and their economic activity level, the activity and financial condition of local government and the social and technical potential of the regions. As a result of the analysis, the author identified structural disproportions in Polish regional development and inconsistency of the social potential level with the economic development level of particular regions in Poland (Golejewska 2016)
- Pietrzak, Balcerzak (from Nicolaus Copernicus University), Gajdos and Arendt (from University of Lodz) investigated the level of social and economic development of the Polish regions in 2010–2014 in order to identify the conditions for running business and entrepreneurial activity at the regional level. As a result of the study, the authors identified significant structural disproportions in the entrepreneurial environment of particular Polish regions (Pietrzak et al. 2017)
- Strzelecka (from Koszalin University of Technology) analyzed the level and structure of household incomes and savings for individual regions in Poland, and estimated the degree of their regional diversification (Strzelecka 2017)
- Malik and Jasińska-Biliczak (from Opole University of Technology) in their article “Innovations and Other Processes as Identifiers of Contemporary Trends in the Sustainable Development of SMEs: The Case of Emerging Regional Economies,” studied the innovation processes which contribute to sustainable growth of Polish enterprises (Malik and Jasinska-Biliczak 2018)

However, to date, ongoing monitoring of the social and economic development level and specifics of the regions in Poland revealing structural imbalances in their development and measures formulation aimed at supporting sustainable regional development processes remains urgent.

## 2 Research Methodology

The author’s methodological approach, based on the evaluation of demographic changes in the regions, the analysis of the labor market and entrepreneurial activity, as well as assessing the level of economic development of the regions, is used to identify structural imbalances in the regional development of the Polish economy.

### 2.1 Analysis and evaluation of demographic changes in the regions

The first index proposed to assess demographic changes in the regions characterizes the change in the level of natural population growth, which allows us to trace the rate of population renewal or the dynamics of its aging. This index is calculated by the following formula:

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1. The data were obtained from Rozkrut (2017) and webpage dedicated to Sustainable Development Indicators, published at <http://wskaznikizrp.stat.gov.pl/>.

$$(1) \quad I_A = \frac{A_i - A_{i-1}}{|A_{i-1}|},$$

where  $A$  is the coefficient of natural population growth per 1000 people, and  $i$  is the period of the study. The formula for calculating the natural growth coefficient includes two components:

$$(2) \quad A_i = B_i - C_i,$$

where  $B_i$  is the fertility rate, and  $C_i$  is the death rate in the  $i$ -th period. Taking into account that in different regions there can be a different range of fertility and mortality in order to more accurately estimate the demographic changes in the region, it is necessary to introduce a correction factor that takes into account the absolute value of fertility and mortality. This correction factor can be derived as follows. Let  $D_i$  be the total range of fertility and mortality rates:

$$(3) \quad D_i = B_i + C_i.$$

From formula (2) and (3) it follows that

$$(4) \quad D_i = 2B_i - A_i,$$

and the correction factor is the ratio of  $A_i$  to  $D_i$ . Thus, the calculation of the index of natural population growth will be made according to the formula

$$(5) \quad I_A = \frac{A_i - A_{i-1}}{|A_{i-1}|} \cdot \frac{A_i}{2B_i - A_i}.$$

The second important quality factor of the regional demographic development is the structural component of its population, which can be estimated on the basis of the following available statistics:  $E$  is the number of the post-working age population per 100 persons of working age;  $F$  is the number of non-working age population per 100 persons of working age;  $G$  is the number of the post-working age population per 100 persons of pre-working age. It allows us to calculate the aggregate index of the population structure in the region. The first component of the aggregate index is the index of the post-working age population change:

$$(6) \quad I_E = \frac{E_i - E_{i-1}}{E_{i-1}}.$$

This index shows the aging rate of the population in the region. The second component is the labor reserve index in the long-term and medium-term perspective, calculated on the basis of data on the number of non-working age population per 100 persons of working age:

$$(7) \quad I_F = \frac{F_i - F_{i-1}}{F_{i-1}}.$$

The third component of the aggregate index is the index of population change in the pre-working age ( $I_H$ ). Due to the fact that in statistics there is no direct indicator for the ratio of the population in the pre-working age to the working age, it is suggested to calculate it based on the  $G$  and  $E$  indicators as follows:

$$(8) \quad I_H = \frac{E_i \times 100 / G_i - E_{i-1} \times 100 / G_{i-1}}{E_{i-1} \times 100 / G_{i-1}} = \frac{G_{i-1} E_i - G_i E_{i-1}}{G_i E_{i-1}}.$$

The index shows the prospects for renewal of the working age population (labor resources reserve in the short term). The aggregate index of population structure change by age group  $I_K$  can be represented as the following:

$$(9) \quad I_K = \frac{I_F + I_H}{2} - I_E.$$

The final index of demographic changes in the region consists of two components: the index characterizing the change in the natural population growth level and the aggregate index of population structure changes by age groups and is calculated by the next formula:

$$(10) \quad I_L = \frac{I_A + I_K}{2}.$$

The positive dynamics of this index indicates the demographic situation improvement in the region.

## 2.2 Analysis of the labor market and entrepreneurial activity in the region

The main indicator characterizing the labor market state is the unemployment rate. Given the agricultural specificity of the Polish economy, it is necessary to estimate the unemployment rate for the region as a whole and separately for rural areas. In this regard, the unemployment index ( $I_P$ ) of the proposed methodology will be calculated as

$$(11) \quad I_P = - \left( \frac{M_i - M_{i-1}}{M_{i-1}} \cdot 0,5 + \frac{N_i - N_{i-1}}{N_{i-1}} \cdot 0,5 \right),$$

where  $M$  is the unemployment rate calculated for the region as a whole, and  $N$  is the unemployment rate in rural areas. It is proposed to calculate the employment index of people with disabilities ( $I_R$ ) in order to take into account the level of the social component development in regional labor markets:

$$(12) \quad I_R = \frac{R_i - R_{i-1}}{R_{i-1}},$$

where  $R$  is the employment coefficient of people with disabilities. The conditions for easy business running in the regions are suggested to be evaluated on the basis of the entrepreneurial activity growth index ( $I_S$ ):

$$(13) \quad I_S = \frac{S_i - S_{i-1}}{S_{i-1}},$$

where  $S$  is the number of individuals who registered entrepreneurial activity for 100 people of working age. The final index of the labor market and entrepreneurial activity development in the region can be presented as follows:

$$(14) \quad I_{PRS} = \frac{I_P + I_R + I_S}{3}.$$

## 2.3 Assessment of the economic development level of the region

It is proposed to assess the economic efficiency of the region's operation on the basis of the gross regional product volume, adjusted for the number of working age people in the region and the territory of the region. As a result of such an adjustment, regions with a smaller territory and/or fewer human resources have the opportunity to take a more valid place in the ranking, in contrast to the situation when only the gross regional product volume per resident is compared. In accordance, the formula for calculating the economic efficiency index of the region is as follows:

$$(15) \quad I_{EE} = \frac{GRP_i T_i / V_i W_i - GRP_{i-1} T_{i-1} / V_{i-1} W_{i-1}}{GRP_{i-1} T_{i-1} / V_{i-1} W_{i-1}},$$

where:

$GRP$  — is the gross regional product per 1 resident, adjusted for the inflation rate (monetary units),

$T$  — is the total population in the region,

$V$  — is the working population in the region, and

$W$  — is the territory of the region (thousand of km<sup>2</sup>).

To analyze the effectiveness of the region real sector, it is proposed to use five basic indicators adjusted for the inflation rate:

- $S_L$  is the added value of agriculture, forestry, hunting and fishing (monetary units)
- $P_R$  is the added value of industry (monetary units)
- $S_T$  is the added value of the construction industry (monetary units)

- $T_R$  is the value added in the service sector: trade, road transport repair, transport and warehousing, hotel and restaurant business, information and communication (monetary units)
- $O_S$  is the amount of added value of other services (monetary units)

The formulas for calculating the components of the real sector performance index, as well as the weight coefficients assigned to them, are presented in table 1.

The final index of the region's economic development  $I_{ER}$  will be as follows:

$$(16) \quad I_{ER} = \frac{I_{EE} + I_{RS}}{2}.$$

**Tab. 1.** The components of the real sector of a regional economy effectiveness index

Index name	Calculation formula	Weight
$I_{SL}$ Index of agriculture, forestry, hunting and fishing development	$\frac{SL_i - SL_{i-1}}{SL_{i-1}}$	0,2
$I_{PR}$ Industry development index	$\frac{PR_i - PR_{i-1}}{PR_{i-1}}$	0,2
$I_{ST}$ The construction industry development index	$\frac{ST_i - ST_{i-1}}{ST_{i-1}}$	0,2
$I_{TR}$ Index of services sector development: trade, repair of automobile transport, transport and warehousing, hotel and restaurant business, information and communication	$\frac{TR_i - TR_{i-1}}{TR_{i-1}}$	0,2
$I_{OS}$ Index of other service development	$\frac{OS_i - OS_{i-1}}{OS_{i-1}}$	0,2
$I_{RS}$ Aggregated index of the real sector of the region economy development	$0,2I_{SL} + 0,2I_{PR} + 0,2I_{ST} + 0,2I_{TR} + 0,2I_{OS}$	–

*Note:* [In the journal European practice of number notation is followed—for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style).—Ed.]

## 2.4 Consolidated generalizing index of social and economic development of the region

On the basis of the indices proposed in the methodology, it is suggested to compile a consolidated generalizing index for the region development, which provides a compilation of social and economic development ranking for the regions in Poland:

$$(17) \quad I_{\text{netto}} = \frac{I_L + I_{PRS} + I_{ER}}{3},$$

where:

$I_L$  — the final index of demographic changes in the region,

$I_{PRS}$  — the final index of the region labor market and entrepreneurial activity development, and

$I_{ER}$  — the final index of the region's economic development.

We used the correlation analysis in order to analyze structural disproportions of regional development. Here, the minimal statistically significant Pearson correlation value was 0,576 (since the study period was 12 years—i.e., 2005–2016—there were 10 degrees of freedom and  $\alpha$  level was established at 0,05).

## 3 Results of the conducted analyses

### 3.1 The final index of demographic changes in the region

The analysis of the level and specifics of regional development in Poland ought to be started with the assessment of the demographic situation in the regions. The final index of demographic changes in the region (the graphical interpretation of the index is shown in figure 1) is to be calculated. Then, based on the calculated index, the dependence between the individual regions (tab. 2) and

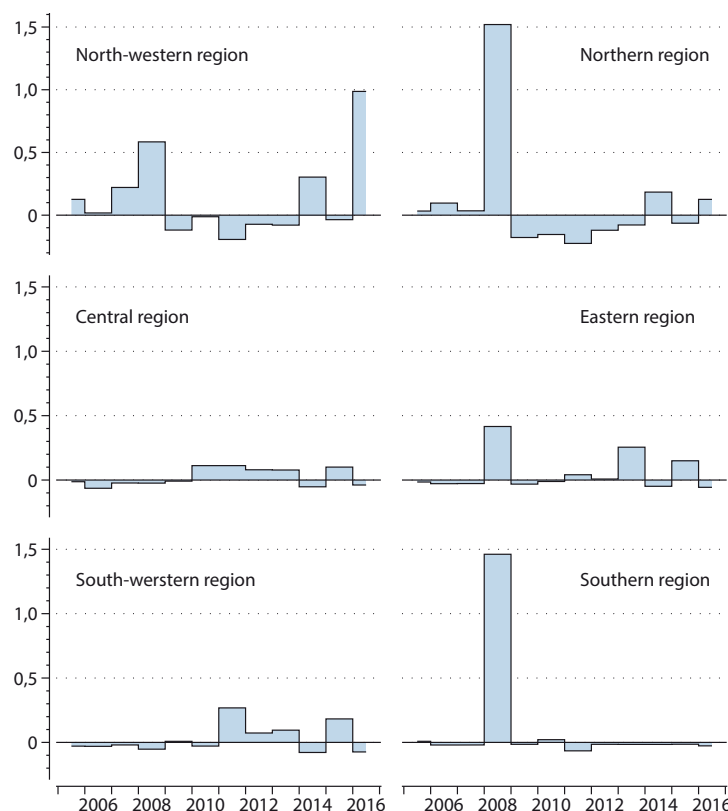


Fig. 1. Dynamics of the demographic changes index for the regions in Poland for 2005–2016

Tab. 2. Correlation coefficients of demographic change indices between the regions in Poland during 2005–2016

	Central	Southern	Eastern	North-western	South-western	Northern
Central	1					
Southern	-0,211	1				
Eastern	0,204	0,775**	1			
North-western	-0,584*	0,405	0,073	1		
South-western	0,767**	-0,256	0,196	-0,622*	1	
Northern	-0,417	0,962***	0,688*	0,568*	-0,405	1

\*  $p < 0,05$ ; \*\*  $p < 0,01$ ; \*\*\*  $p < 0,001$

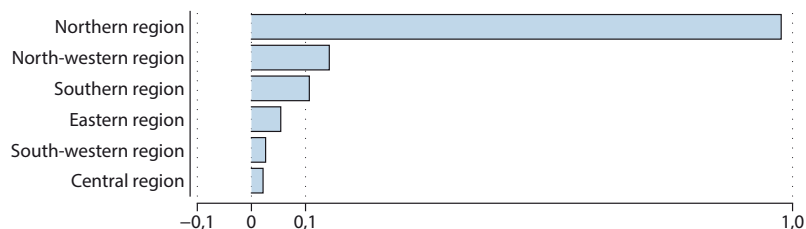


Fig. 2. Ranking of the regions in Poland in the demographic changes index (index average value during 2005–2016)

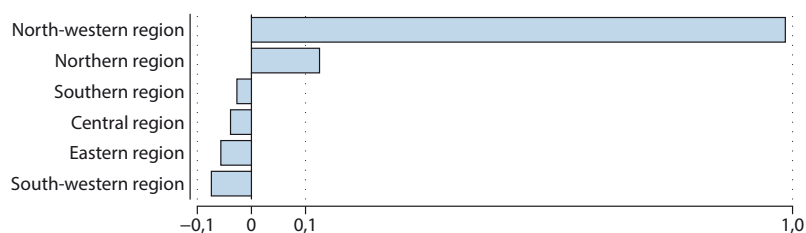


Fig. 3. Ranking of the regions in Poland in the demographic changes index (index value in 2016)

the ranking of the regions (fig. 2 and 3) has to be formed. Analysis of the data presented in figure 1, allows us to draw the conclusion that during the whole study period (2005–2016) the most dynamic demographic changes that gave a positive effect were observed in the Northern regions, North-western region and Eastern region. In the Southern, Central and South-western regions, there were no sharp changes or fluctuations in the demographic situation, either in the direction of improvement or in the direction of deterioration.

The constructed correlation dependencies (tab. 2) indicate a low tightness of the links between demographic changes in different regions of the country, with the exception of the Central region and South-western region, the Southern region and Eastern region, the Southern region and Northern region, (here the correlation coefficients are greater than 0,700). Thus, it can be concluded that the country's demography is not affected by internal (interregional) migration processes, and positive changes in the demographic processes of the regions are due to the social and economic factor improvement within the region and the inflow of the working population from abroad.

The ranking of the regions in the demographic changes index shows that the best situation in terms of positive demographic changes during 2005–2016 was observed in the Northern region and North-western region (the demographic changes index in these regions was 0,98 and 0,14). In 2016, demographic trends underwent changes: positive changes in the demographic structure were observed in the North-western region and Northern region, and in the remaining regions of Poland there was a slowdown in demographic transformations (fig. 3). Thus, the conducted researches allow us to draw a conclusion about the presence of structural disproportions in the processes of demographic changes in some regions in Poland. At the same time, in recent years there has been a tendency to level out these disproportions and equalize the demographic situation in the country.

### **3.2 The final index of the labor market and entrepreneurial activity development**

The next important indicator characterizing regional development is the level of the labor market and entrepreneurial activity development. This indicator is directly related to the regional demography and the trends of its change. Figure 4 (on the next page) shows the dynamics of the region labor market and the entrepreneurial activity development index in Poland during 2005–2016. An analysis of the index dynamics allows us to conclude that the labor market is stable in some regions of Poland (tab. 3).

The most dynamically developing labor market, according to the ranking performed in 2005–2016, is in the South-western region and the North-western region (the labor market and entrepreneurial activity development indices are 0,052 and 0,043 respectively). The third place in the ranking is taken by the Northern region (the index is 0,038) (fig. 5). In 2016, the situation is somewhat different: although the South-western region still takes the first place in the ranking, the Southern region is close to it (indices for both regions are 0,110), the north-western region is moving to the third place (index 0,070), then the Central region, Eastern region and Northern region (fig. 6).

### **3.3 The final index of regional economic development**

The next index, which must be calculated according to the proposed methodology for identifying structural disparities in the regional development of the Polish economy, is the final index of regional economic development. Analysis of the economic development index of the Polish regions during 2006–2015 shows that a fairly intensive development is observed in all regions in Poland, although by years the values of the individual regional economic development index may have gaps (fig. 7 on page 77). In this case, there is a close correlation between all regions in Poland, calculated in this index (tab. 4). Thus, the conducted research allows us to draw a conclusion about uneven economic development of the Polish regions.

### **3.4 Consolidated generalizing index of regional social and economic development**

The final stage of the structural disproportion analysis in Poland's regional development is the calculation and analysis of the dynamics of the consolidated generalizing index of regional social and economic development. The dynamics of this index, shown in figure 10 (on page 78), indicate

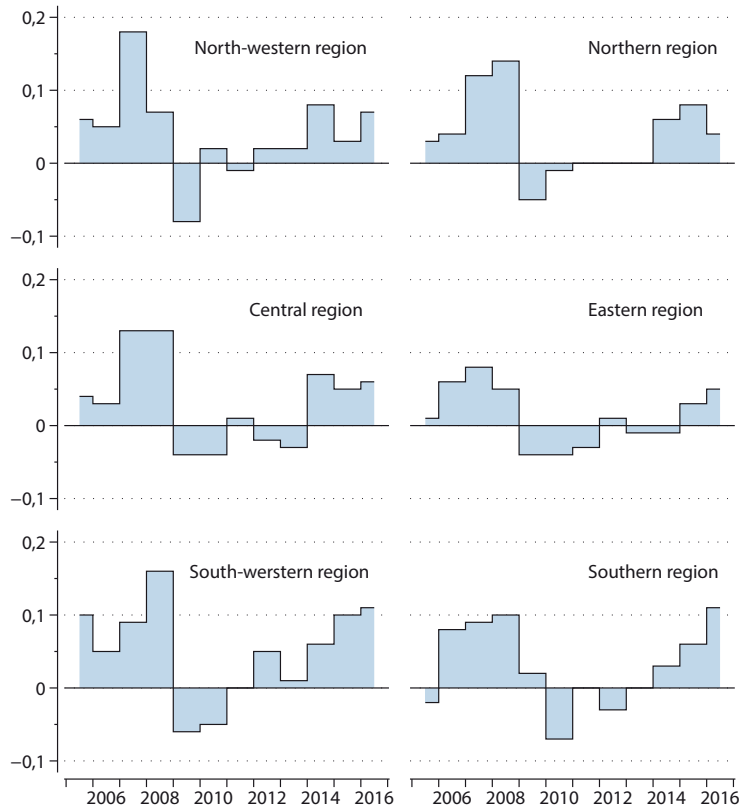


Fig. 4. Dynamics of the regional labor market and entrepreneurial activity dev. index in Poland during 2005–2016

Tab. 3. Correlation coefficients of the labor market and entrepreneurial activity development indices between the regions in Poland during 2005–2016

	Central	Southern	Eastern	North-western	South-western	Northern
Central	1					
Southern	0,757**	1				
Eastern	0,773**	0,799**	1			
North-western	0,802**	0,478	0,762**	1		
South-western	0,842***	0,659*	0,793**	0,668*	1	
Northern	0,949***	0,691*	0,784**	0,796**	0,850***	1

\*  $p < 0,05$ ; \*\*  $p < 0,01$ ; \*\*\*  $p < 0,001$

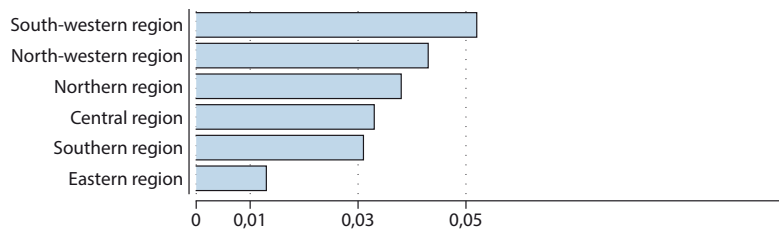


Fig. 5. Ranking of the regions in Poland as for the labor market and entrepreneurial activity development index (the average value of the index during 2005–2016)

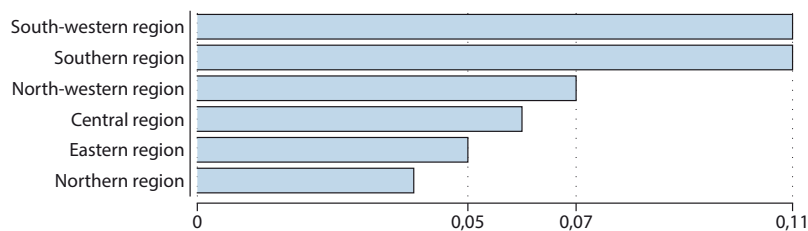


Fig. 6. Ranking of the regions in Poland as for the labor market and entrepreneurial activity development index (the value of the index in 2016)



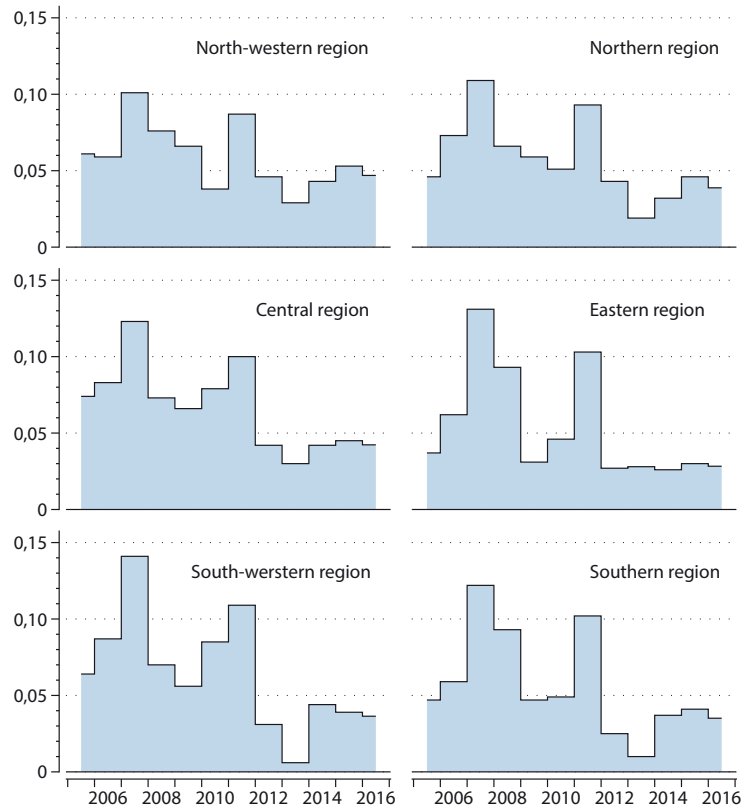


Fig. 7. Dynamics of the economic development index for the regions in Poland during 2005–2016

Tab. 4. Coefficients of correlation of economic development indices between the regions in Poland during 2005–2016

	Central	Southern	Eastern	North-western	South-western	Northern
Central	1					
Southern	0,901***	1				
Eastern	0,870***	0,963***	1			
North-western	0,842***	0,935***	0,873***	1		
South-western	0,985***	0,906***	0,864***	0,817***	1	
Northern	0,939***	0,937***	0,907***	0,924***	0,936***	1

\*  $p < 0,05$ ; \*\*  $p < 0,01$ ; \*\*\*  $p < 0,001$

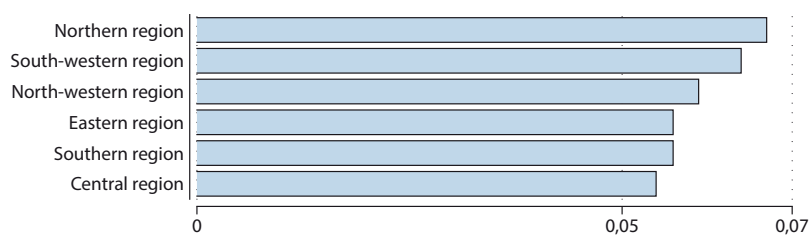


Fig. 8. Ranking of regions in the economic development index (average value of the index during 2005–2016)

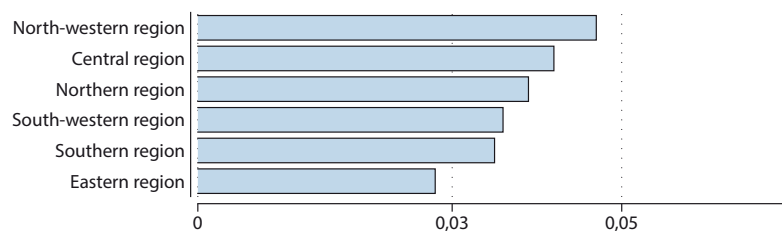


Fig. 9. Ranking of regions in the economic development index (value of index in 2016)

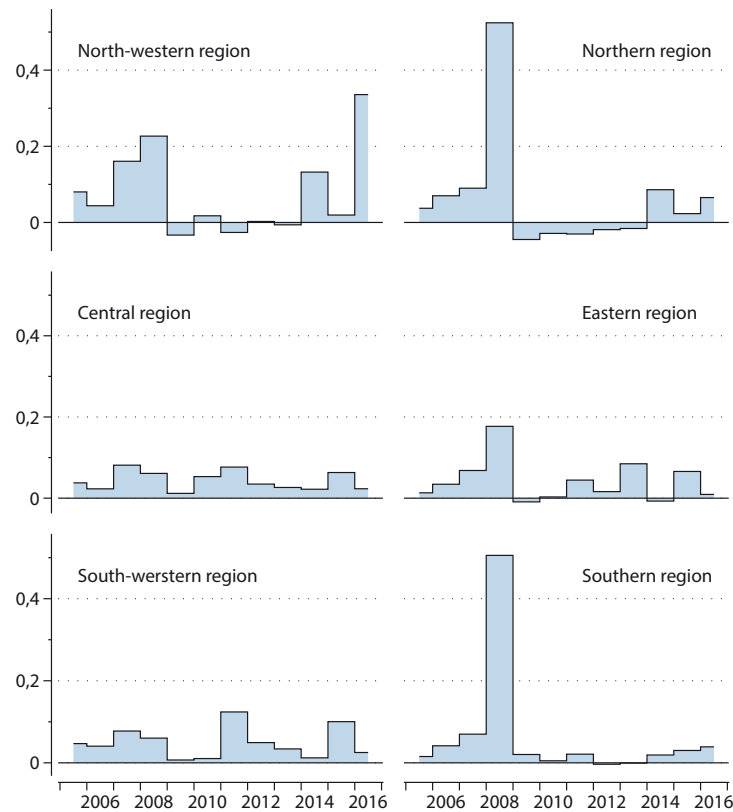


Fig. 10. Dynamics of the consolidated general index of regional social and economic development during 2005–2016

Tab. 5. Coefficients of correlation between regions in the consolidated generalizing index of regional social and economic development during 2005–2016

	Central	Southern	Eastern	North-western	South-western	Northern
Central	1					
Southern	0,293	1				
Eastern	0,494	0,822**	1			
North-western	0,016	0,473	0,244	1		
South-western	0,792**	0,138	0,444	-0,140	1	
Northern	0,236	0,970***	0,779**	0,598*	0,085	1

\*  $p < 0,05$ ; \*\*  $p < 0,01$ ; \*\*\*  $p < 0,001$

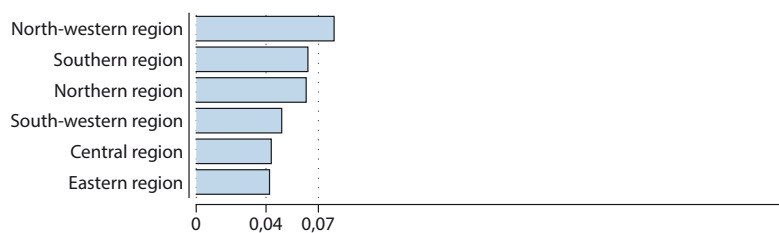


Fig. 11. Ranking of regions in the consolidated generalizing index of regional social and economic development (average value of the index during 2005–2016)

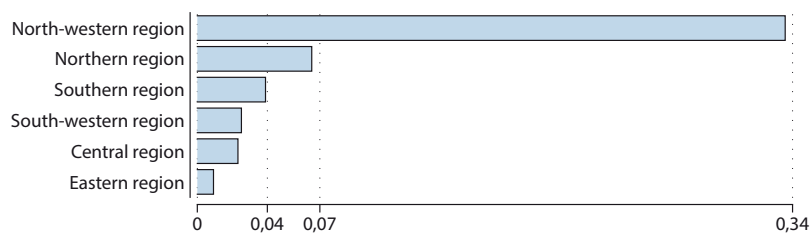


Fig. 12. Ranking of regions in a consolidated generalizing index of regional social and economic development (the value of the index in 2016)

the existence of significant structural disproportions in the regional social and economic development in Poland. These conclusions are also confirmed by the correlation between regions (tab. 5).

The ranking of the regions in Poland based on the consolidated generalizing index of regional social and economic development (average value of the index during 2005–2016) shows that there is a twofold gap between the first (North-western region) and the second (Southern region) regions in the ranking, between the first and the sixth (Eastern region) the gap is 1,88 times (fig. 11). The ranking of the regions for the consolidated generalizing index in 2016 shows a larger gap in the level and dynamics of the socioeconomic development of the Polish regions (fig. 12).

## Conclusions

The conducted research allows us to conclude that the regions in Poland have a certain specificity of social and economic development, which causes an economic gap in the national economy due to regional development, and also raises problems of stimulating economic growth and ensuring sustainable development. The solution of these problems ought to be based on regional coordination with the definition of fundamentally new mechanisms for state regulation of national economy social and economic development. Taking into account the fact that the economies of individual regions in Poland are interrelated, the economic issues of one region can become issues in all other regions after a certain period of time. Therefore, the transformation of regional development processes should be aimed at achieving social and economic homogeneity of the Polish regions on the basis of the “equalization criteria” definition.

The fact that uneven regional social and economic development is not an objective obstacle to achieving sustainable development of the national economy as a whole should be taken into account. Uneven development stimulates economic activity, facilitates the movement and interpenetration of financial and economic activities of individual regions. Regional interaction accelerates the restructuring of economic structures, strengthens competition, synchronizes cycles of economic activity of regional social and economic systems, and creates for the latter additional opportunities and forces decision makers to make additional efforts in accordance with the objectives of national economic policy. However, the heterogeneity of regional development generates a number of economic, social and political issues, the solution of which requires the formation of a fundamentally new state sustainable development policy concept. Such a concept ought to be based on an integrated approach that takes into account the sectoral and social specifics of each individual region’s development.

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