

Regional distance: the concept and empirical evidence from Poland

Jarosław M. Nazarczuk^{CDFMR}

University of Warmia and Mazury in Olsztyn, Faculty of Economic Sciences, Department of Economic and Regional Policy, Oczapowskiego 4/204, 10-719 Olsztyn, Poland; phone: +48 895 234 265, fax: +48 895 233 737, e-mail: jaroslaw.nazarczuk@uwm.edu.pl

How to cite:

Nazarczuk, J.M., 2015: Regional distance: the concept and empirical evidence from Poland, In: Szymańska, D. and Chodkowska-Miszczuk, J. editors, *Bulletin of Geography. Socio-economic Series*, No. 28, Toruń: Nicolaus Copernicus University, pp. 129–141. DOI: <http://dx.doi.org/10.1515/bog-2015-0020>

Abstract. The main aim of this paper is to present the concept of regional distance as a measure of economic diversity at the regional level. Additionally, the paper is devoted to the identification of regional inequalities in Poland, based on the metric presented. Estimates of the regional distance between specific regions (NUTS 2) and the mean level of development of the national economy or Mazowieckie Voivodship (the region with the highest GDP per capita in Poland) were based on calculations conducted using logarithmic equations. Two different distances were calculated: (a) the mean number of years required to achieve the present reference area level of development, (b) the mean number of years necessary to achieve the reference area GDP per capita, taking into consideration the growth rate of the reference area. The empirical example of regional distance application revealed significant inequalities between regions of Poland at NUTS 2 level.

Article details:

Received: 30 January 2014
Revised: 22 December 2014
Accepted: 13 March 2015

Key words:

regional growth,
regional inequality,
economic distance,
Poland,
NUTS 2.

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1. Introduction

The existence of the phenomenon of income inequality is well known to economists and other scholars concerned with problems of economic development and policy making. The issues of welfare differences between countries (see, for example, Barro, 1991) and between the regions of a country (see, for example, Williamson, 1965; Martin, 2005) have been widely discussed in economic literature. For more than a century, academics and researchers have attempted to discern the levels and directions of shifts and the reasons for the emergence of inequalities between countries and regions. Countless theoretical approaches to income distribution have been developed and empirical studies undertaken: in some cases, these studies produced contradictory results (Albu, 2012). The assessment of regional economic growth and convergence has become especially important after the recent enlargement of the EU, with concerns about widening social and economic disparities raised on the basis that the bulk of the European Commission's budget is devoted to the reduction of inequalities (Arbia et al., 2010).

In the 1990s, the disparities identified in the EU at the regional level tended to diminish in 15 countries, whereas regional diversification of its income increased slightly (Martin, 2009). Between 2000 and 2004, the above trends continued for 27 of the countries in the study (Gorzalak, 2009). Moreover, a negative correlation between GDP per capita (in PPS) and its growth rate was observed, suggesting that new member states' regions, which generally had a GDP per capita lower than 75% of the EU average, developed faster on average than other, more advanced, areas. According to official Eurostat data, the dispersion of regional per capita GDP indexes decreased from 32.4% in 1999 to 27.2% in 2009 at NUTS 2 level, calculated for 27 EU countries. At NUTS 3 level, the inequalities identified decreased slightly from 35.7% to 32.8% in the same time period.

Relatively high regional differences in per capita income levels indicate the existence of some kind of a distance between different areas. Essentially, the concept of distance refers to the inverse of the degree of closeness between two regions with regard

to one or multiple dimensions taken into account in the study (Deza, Deza, 2006; Hutzschenreuter et al., 2013). Along with geographical, cultural, administrative and political distance, economic distance represents different per capita incomes as well as the cost and quality of natural, financial and human resources or skills, although wealth is the most important economic attribute that creates distance (Ghemawat, 2001).

Economic distance is conventionally measured using per capita income reporting on economic well-being (Patel, 1964). It is also customary to compute the per capita personal income of a region or province by dividing the estimated total income payments to the residents of that area by the number of residents (Chaudhry, 1971). However, this and similar approaches (in relation to a specific value) have a disadvantage. They rely on one specific unit (e.g. the Dollar or Euro) when absolute distance measurement is involved (Mazurek, 2012) and seem unclear for an average person. Other inequality measurement methods such as the Gini and Theil coefficients would not appear to indicate the real distance between particular areas, but, rather, their diversification. Furthermore, in some cases, the characteristics of the Gini coefficient may mean that it may generate similar results for countries with very different wealth levels.

The main aim of this paper is to present an approach to regional economic distance that overcomes the problems outlined above. Regional distance can be expressed in a more intuitive form, for instance in time units. In this way, regional distance is defined as the mean number of years required to achieve the level of development of the reference area taken into account in the analysis.

The evaluation of regional economic distance was depicted for Polish regions at NUTS 2 level. Those regional development studies available in Poland indicate increasing polarization of regional growth, as well as significant inequalities in regional levels of development (OECD, 2008; European Commission, 2010; Boselli, 2011; Eurostat, 2012; Nazarczuk, 2013). The above analyses indicate more dynamic growth in economically advanced regions than in less developed ones. This leads to increases in the distance of less wealthy areas in relation to the mean national level of GDP per capita (Fig. 1).

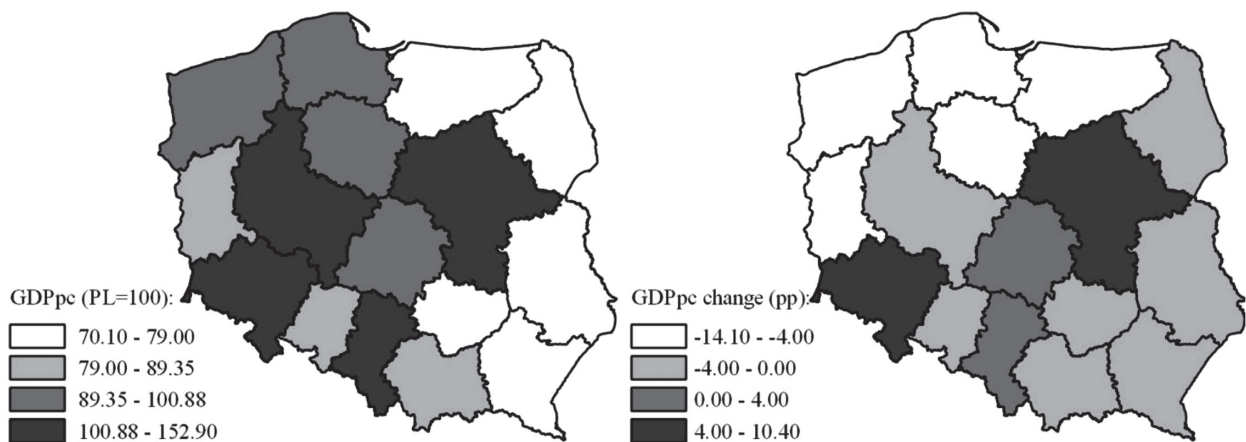


Fig. 1. Spatial distribution of regional GDP per capita in 2000 in relation to the national average (left) and its changes over the period of 2000-2010 (right, in percentage points)

Source: Author's own calculations based on the data from the General Statistical Office of Poland

At present, three types of disparities can be identified in Poland (OECD, 2010): (i) a persistent gap between eastern and western Poland; (ii) a gap between Warsaw and the rest of the country; (iii) intra-regional disparities which are among the highest in OECD counties and are increasing, in particular in the Mazowieckie region (region/voivodship refers to an administrative area of the 1st order), Wielkopolskie and Małopolskie, largely due to increasing inequality between large urban areas and rural ones. According to Bogdański (2012), the regional level of economic development in Poland is mainly affected by its positive relation with the socio-economic potential of cities localized within its borders.

Regional disparities have increased since 1995 due to the concentration of growth in particular locations. The increase in inequalities in Poland is driven mainly by the fact that its leading Mazowieckie region has gained relative to other NUTS 2 regions, as well as by the fact that the country's lagging regions have fallen even further behind. Affected regions include Lubelskie, Podkarpackie, Warmińsko-Mazurskie (Charbit, 2009) and other parts of Eastern Poland such as Podlaskie and Świętokrzyskie. The slow development of eastern regions is primarily linked to historical legacies (e.g. areas annexed by the Soviet Union developed more slowly than others mainly due to the character of the economic policy adopted) (Kukliński, 1982; Zarycki, 2007), the predominance in regional econ-

omies of agricultural activities with low productivity, insufficient resource endowment and the low role of industry in regional economies (Nazarczuk, 2013), the low quality of human as well as social capital, low urbanization and population concentration (Ratazjac, 2012), low FDI inflow (Nazarczuk, Marks-Bielska, 2011), and, finally, their peripheral situation on the border with weakly-developed countries (i.e., the Ukraine and Belarus) (OECD, 2008). In turn, Mazowieckie Voivodship, with the capital city of Warsaw within its borders, is one of the fastest-growing regions with a GDP per capita 1.6 times higher than the average across the Polish economy as a whole.

The remainder of this paper is organized as follows: Section 2 is devoted to a review of the literature; section 3 discusses the methodological tools used in the empirical analysis; section 4 describes the empirical results; while section 5 concludes the paper.

2. Theoretical and empirical approaches to regional inequalities

Neoclassical growth economists such as Solow, Swan, Ramsey, Cass and Koopmans have made strong assertions concerning the growth rates of countries over time. Due to diminishing returns of capital and the productivity of other factor in-

puts (Barro, Sala-i-Martin, 2004), these models, starting with Solow (1956) expect absolute convergence among countries, which should lead to higher growth rates in less-developed countries compared to more advanced ones (Barro, 1997). Early endogenous growth models based on Romer (1986) place emphasis on the existence of a persistent gap between rich and poor countries, which can, additionally, increase over time. The formulated “new growth theory” finds the link between capital accumulation and technical changes. More recent endogenous growth models, which stress both the importance of technology in explaining long-term growth and the possibility of the transfer of technology between different countries, predict that countries which are currently lagging behind may catch up with more advanced areas (Di Liberto, 2007).

Williamson’s study (1965), in which he adapted Kuznets’ curve of personal income disparities (Kuznets, 1955, 1963) for regional wealth inequalities, describes regional diversity on the basis of its relation to national levels of development. Similarly to its original version, which investigates personal income inequalities among households in relation to national income, Williamson claims that national development creates increasing regional inequalities in the early stages of development (at low income levels) while, later on, development (at higher income levels) leads to regional convergence (Szörfi, 2007). This results in an inverted U-shaped curve, which describes the relationship of these categories.

Williamson’s argumentation is based on the assumption that, in lagging countries, the number of growth pole regions is limited, with a skilled workforce and capital concentrated in a limited number of areas. Due to the more rapid increase in the productivity of growth pole regions, regional disparities tend to rise, as the growth rate of such regions is higher than that of lagging areas. When diseconomies of scale (or higher costs of factor inputs) emerge in growth pole regions, the capital is likely to move to other areas with lower productivity. Additionally, the spillover effect of knowledge may enhance the coinciding process of spatial convergence due to the reallocation of factor inputs. More recent findings suggest that, after the completion of the inverted U-shaped pattern, regional income diversity tends to increase, rather than stabilize (Amos, 1988; Lessmann, 2014).

Additionally, the expected inequalities tend to rise as a country transforms from a primarily agrarian and preindustrial state to the industrial stage (Chaudhry, 1971). The progression of inequalities derives from the systematic concentration of activities in a country. At the initial stage, variations in soil fertility, the availability of raw materials and climatic conditions are the main differentiating factors between regions and also affect their productivity. At this point of development, the inequalities observed are expected to be narrow, determined as they are by the distribution of suitable land.

Due to economies of scale, the process of industrialization results in the concentration of activities in regions which have the required resources and infrastructure, access to a skilled workforce and, usually, are situated in close proximity to large markets (thereby ensuring low transportation costs). Geographically-concentrated firms in the same industry benefit from externalities associated with the concept of “agglomerative economies” such as access to skilled labour, existing channels of distribution and knowledge spillovers (Ganesan et al., 2005). This is why manufacturers’ production will be concentrated in certain areas (i.e., those with large markets). Due to “circular causation” (Myrdal, 1957), the markets will be large where industrial production is concentrated, leading to increasing inequalities between regions. Regions which obtain an initial competitive advantage in the production of goods with a high income elasticity of demand will sustain that advantage through the process of increasing returns and thanks to the difficulties other regions experience in establishing similar activities (Dixon, Thirlwall, 1975). Higher wages lead workers to relocate towards more industrialized regions, thus intensifying agglomeration (Puga, 1999). A greater degree of economic homogeneity arises when industrialization spreads to other parts of a country and capital, as well as labour, becomes mobile.

At the post-industrial stage, when a country undergoes a transition from the production of goods to provision of services, new factors such as the quality of human capital, information, technology, innovation, creativity and knowledge become crucial to stimulating growth across a region. Due to the specific features of these forms of capital, they tend to be concentrated in close proximity to growth pole areas. Regional and national spillover effects are

tremendously important to understanding regional inequalities (Quah, 1996). Thanks to Marshall's contribution (1920), it is known that spatial proximity enhances information sharing and interaction between firms which, in turn, facilitates the diffusion of knowledge. New communication technologies and the dematerialization of economy, innovation and economic activity are highly localized in spatial terms and tend to agglomerate (Deza, Deza, 2009). Diversification in the adoption of new technologies causes production polarization between regions and the formation of clusters (Giovannetti, 2000; Alderighi, Percoco, 2009).

3. Research methodology

The concept of distance refers to the inverse of the degree of closeness between two regions with regard to one or multiple dimensions taken into account in the study (Deza, Deza, 2006; Hutzschenreuter et al., 2013). The notion of economic distance is derived from the analyses of income diversity between countries. It is sometimes defined as a *perceived difference between two countries* (Håkanson, Ambos, 2010, p. 2) or *the level of economic development of the host country relative to that of the home country* (Tsang, Yip, 2007: 1156). More often, economic distance refers to absolute differences in per capita incomes (Martínez-Zarzoso, Nowak-Lehmann, 2004).

Along with various regional GDP growth rates, unequal regional growth potential indicates the level of economic development. The simultaneous analysis of these two categories permits identification of the potential time gap between the specific region and the reference area. Unlike most regional disparity analyses, regional distance can also be expressed in time units. In this way, regional distance is defined as the mean number of years required to achieve the level of development of the reference area. This concept is based on the ap-

proach proposed by Timofiejuk (2006) and estimates the distances between countries according to selected economic indicators. The main advantage of this approach is the intuitiveness of the results: higher numbers indicate regions with a greater distance. However, in some cases (e.g., when the GDP per capita of the specific region is higher than the reference area), there will be a few regions without any distance.

Usually, the analysis can refer to a whole country (in the case of one-country interregional analysis), a specific region (e.g., that which has the highest GDP per capita) or a group of countries (e.g., the EU). The use of GDP per capita in constant prices, rather than in market prices, would seem to be more appropriate. However, when comparing regions from different countries (and using different currencies), it is more convenient to use GDP per capita, expressed as a Purchase Parity Standard, or other units which utilize purchase power parity.

In this paper, I discuss different approaches to regional distance. First, I present an approach based on the number of years a region will require to achieve the contemporary level of development of the reference area. Essentially, present regional distance (PRD) indicates how many years (on average) will pass before the specific region attains the GDP per capita of the reference area in the year of the analysis. Secondly, I extend regional distance to incorporate the growth rate of the reference area as well (RRD). Finally, I present the mean growth rates needed to attain the GDP per capita of the reference area by a specific year.

Definition 1. Let A (reference area) and B (specific region) be two areas of interest, let x be the GDP per capita in constant prices, let i be the number of years, let r_B be the mean GDP per capita growth rate of the specific region, let x_{A0} be the initial GDP per capita of the reference area, let x_{B0} be the initial GDP per capita of the specific region, where $x_{A0} > x_{B0}$. Then the growth rate between two areas A and B can be expressed by the following equation:

$$x_{B0}(1+r_B)^i = x_{A0} \quad (a)$$

After appropriate transformations of the above equation, we arrive at the following expressions:

$$\log x_{B0} + i \log(1+r_B) = \log x_{A0} \quad (b)$$

$$i \log(1+r_B) = \log x_{A0} - \log x_{B0} \quad (c)$$

Definition 1a. Retaining the assumptions in definition 1, the present regional distance (PRD) between area A and B is given as:

$$PRD = \frac{\log x_{A0} - \log x_{B0}}{\log(1+r_B)} \tag{d}$$

Definition 2. Let A (reference area) and B (specific region) be two areas of interest, let x be the GDP per capita in constant prices, let i be the number of years, let r_A be the mean growth rate of the reference area, let r_B be the mean GDP per capita growth rate of the specific region, let x_{A0} be the initial GDP per capita of the reference area, let x_{B0} be the initial GDP per capita of the specific region. Assuming that $x_{A0} > x_{B0}$ and $r_A < r_B$, relative regional distance between area A and B can be expressed as follows:

$$x_{B0}(1+r_B)^i = x_{A0}(1+r_A)^i \tag{e}$$

After appropriate transformations of the above equation, we arrive at the following expressions:

$$\log x_{B0} + i \log(1+r_B) = \log x_{A0} + i \log(1+r_A) \tag{f}$$

$$i \log(1+r_B) - i \log(1+r_A) = \log x_{A0} - \log x_{B0} \tag{g}$$

$$i[\log(1+r_B) - \log(1+r_A)] = \log x_{A0} - \log x_{B0} \tag{h}$$

Definition 2a. Retaining the assumptions in definition 2, the relative regional distance (RRD) between area A and B is given as:

$$RRD = \frac{\log x_{A0} - \log x_{B0}}{\log(1+r_B) - \log(1+r_A)} \tag{i}$$

Finally, the identification of the mean growth rate required in a specific region, if it is to achieve the GDP per capita of the reference area by a specific year in the future, can be achieved by solving equation (e) in the following way:

$$\log x_{B0} + i \log(1+r_B) = \log x_{A0} + i \log(1+r_A) \tag{j}$$

$$i \log(1+r_B) = \log x_{A0} - \log x_{B0} + i \log(1+r_A) \tag{k}$$

$$\log(1+r_B) = \frac{\log x_{A0} - \log x_{B0} + i \log(1+r_A)}{i} \tag{l}$$

$$1+r_B = 10^{\left(\frac{\log x_{A0} - \log x_{B0} + i \log(1+r_A)}{i}\right)} \tag{m}$$

Definition 2b. Retaining the assumptions in definition 2, the mean growth rate of area B (r_B) required for it to achieve the GDP per capita of area A in i years is given as:

$$r_B = 10^{\left(\frac{\log x_{A0} - \log x_{B0} + i \log(1+r_A)}{i}\right)} - 1 \tag{n}$$

One should, however, bear in mind that the results of the study obtained with the expression (n) are based on a strong assumption about the future growth rates of the areas A and B: namely that, in the future, the dynamics of GDP per capita will be similar to those at the time of the study. It is important to utilize as long a time series as possible (and available) when calculating mean growth rates and setting the initial year of the analysis. One or two business cycles should be enough to reduce the risk of significant failures in the study and the impact on mean values of the inappropriate selection of time series.

This approach can be also utilized to estimate changes in distances between specific regions and the reference area. It could be useful in verifying whether regions converge or diverge (in terms of absolute convergence) with the mean level of development of the national economy within two selected time series. It is also possible to estimate approximately how much time it would take for less

developed regions to catch up with, for instance, the mean national GDP per capita.

4. Results

In order to illustrate the evaluation of present and relative distances, NUTS 2 regions (voivodships) of Poland were chosen. Due to the availability of data, turbulent changes during the Polish economy's first decade of transformation in the 1990s and austerity in exterior markets after 2008, the analysis was conducted in two time series, namely years (a) 2000-2008 and (b) 2000-2010. The purpose of such time series selection was to evaluate regional distances in Poland and their changes after two years of austerity in Europe and economic slowdown in Poland. Additionally, the growth rates required to achieve the mean national level of economic development by 2030 and 2050 were calculated and compared with historical regional dynamics.

Table 1. Regional distances between GDP per capita of the Polish economy and Mazowieckie Voivodship

Voivodships	A		B			
	C		C			
	2000-2008	2000-2010	2000-2008	2000-2010		
Mazowieckie	0.0	0.0	0.0	0.0	0.0	0.0
Dolnośląskie	0.0	0.0	8.2	7.8	0.0	0.0
Śląskie	0.0	0.0	8.5	10.4	0.0	0.0
Wielkopolskie	0.0	0.0	9.7	11.3	0.0	0.0
Łódzkie	1.6	2.0	11.5	13.6	17.1	31.5
Pomorskie	1.5	1.2	14.2	15.0	b	b
Małopolskie	3.5	4.3	14.3	17.1	371.5 ^a	b
Kujawsko-Pomorskie	3.6	4.9	14.7	18.5	b	b
Lubuskie	4.1	5.0	16.4	19.3	b	b
Opolskie	3.6	6.3	13.7	19.6	43.5	b
Świętokrzyskie	4.8	7.1	14.5	19.7	42.3	b
Podlaskie	7.6	8.2	18.5	20.8	b	b
Zachodniopomorskie	3.0	5.1	17.2	22.7	b	b
Warmińsko-Mazurskie	8.0	8.9	20.2	23.0	b	b
Lubelskie	9.1	11.0	20.4	24.6	b	b
Podkarpackie	9.7	11.7	21.6	26.0	b	b
Mean of all regions	3.8	4.7	14.0	16.8		
GDP weighted average	2.9	3.6	11.7	13.8		

Explanation: A - present regional distance from; B - relative regional distance from; C - national economy, D - Mazowieckie Voivodship; a - in this case, the large distance is caused by very similar growth rates between the country as a whole and Małopolskie Voivodship; b - regions with smaller mean growth rates than the Polish economy. Poland's mean growth rate of GDP per capita over the period of 2000-2008 and 2000-2010 was respectively: 4.3% and 4.0%

Source: Author's own calculations based on data from the General Statistical Office of Poland

The results of the analysis conducted proved that Poland indeed has significant regional diversification (see Table 1). In 2010, the highest regional distances from the national economy were observed in Podkarpackie (11.7 years), Lubelskie (11 years), Warmińsko-Mazurskie (8.9 years) and Podlaskie (8.2 years) (see Fig. 2). This means that these regions will achieve the present GDP per capita of the Polish economy approximately between 2019 and 2022. These are less developed areas of eastern Poland with historical difficulties in catching up with other, more advanced, territories. Their present and historical position is determined by inferior access to raw materials and labour (especially highly-skilled labour), which resulted in a relatively low concentration of factories, enterprises, capital, etc. These regions are largely rural and relatively specialized in agricultural manufacturing. Other characteristics include

significant labour market difficulties, low personal incomes and productivity, and relatively high net emigration.

In contrast, the Mazowieckie, Dolnośląskie, Śląskie and Wielkopolskie regions had a higher average GDP per capita than the Polish economy as a whole. These were the most economically advanced regions: each is home to one of the biggest Polish cities or agglomerations of cities with highly developed manufacturing and service sectors and relatively high contributions to Polish GDP. The lowest (positive) distances were observed in Łódzkie, Pomorskie, Małopolskie and Kujawsko-Pomorskie Voivodship. In 2010, these regions required from 1.2 to 4.9 years to achieve the mean level of development of the Polish economy (according to its 2010 value). This therefore meant that they would achieve the national GDP per capita in 2012 or, in some cases, even in 2015.

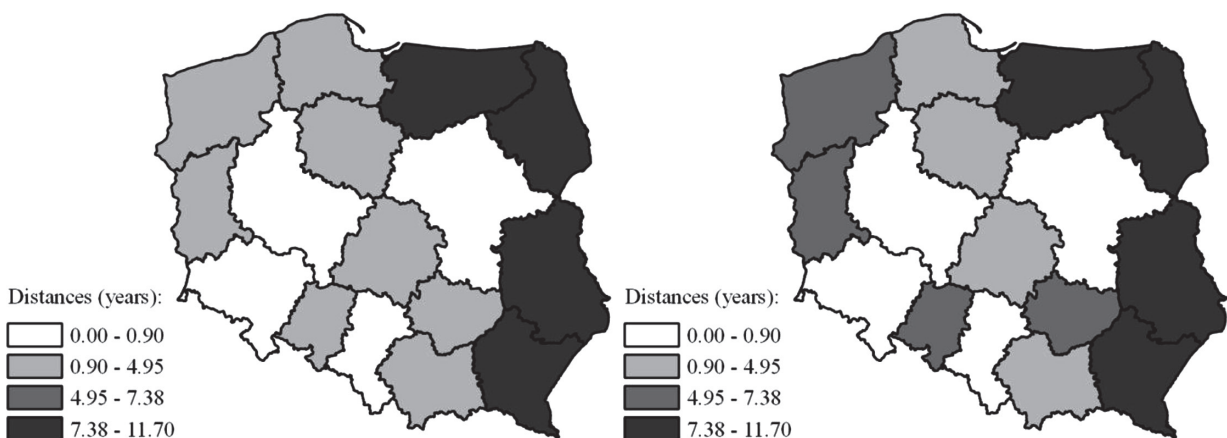


Fig. 2. Spatial distribution of present regional distances with national economy in 2008 (left) and 2010 (right)

Source: Author's own calculations

The distances from Mazowieckie showed an even higher polarization of the level of development of Polish regions (see Fig. 3). In 2010, distance estimates ranged from 7.8 years (in the case of Dolnośląskie) and 26 years (Podkarpackie). These results proved the major role of Mazowieckie region, home to the capital city of Warsaw, which is the wealthiest and one of the fastest-growing regions in Poland.

The second version of regional distance (RRD), providing for the mean growth rate of the national economy, suggested that all Polish regions would have significant difficulties in catching up with the mean level of GDP per capita in the future, with the

exception of Mazowieckie, Dolnośląskie, Śląskie and Wielkopolskie (see Tab. 1), which had higher levels of development on average than the national economy. However, in 2010, most of the regions were characterized by a lower GDP per capita growth rate than the economy as a whole, with the result that this will probably result in greater polarization of future growth between Polish regions. Only in the case of Łódzkie was the identified distance positive (estimated at 31.5 years). Based on these calculations, it can be assumed that, after approximately that period of time, Łódzkie will potentially have a GDP per capita close to that of the national economy.

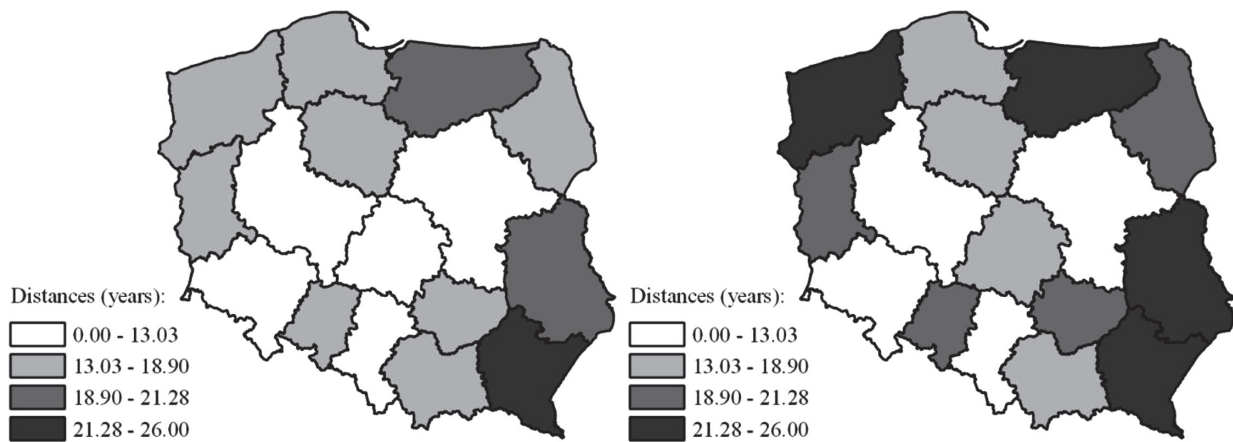


Fig. 3. Spatial distribution of present regional distances with Mazowieckie Voivodship in 2008 (left) and 2010 (right)

Source: Author's own calculations

Furthermore, regional diversification has intensified following austerity in global markets. In 2010, the mean regional distance between Polish NUTS 2 regions and the national economy was estimated to be 6.3 years, whereas, two years earlier, it was only 5.0 years. The increase in this time gap was mainly due to the insufficient growth rates observed in less developed regions compared with more advanced territories. In the case of 11 regions, the distances identified have grown while the only case of a reduction in the calculated time gap from the national economy was that of Pomorskie, at approximately 0.3 years. Pomorskie was one of the regions which, during the economic slowdown in Poland,

had a relatively high rate of economic growth (4.0% in 2009 and 3.7% in 2010 at constant prices), mainly due to the following: low sensitivity and absorption of negative economic shock (Zaucha et al., 2014), dynamic growth of the Tricity agglomeration (Gdańsk, Gdynia, Sopot) and the Gdańsk area (Nazarczuk, 2013b), the relatively high share of services in the regional economy, high inflow of FDI, numerous infrastructure investment projects, high inflow of tourists, the relatively high volume of exports due to significant diversification of external markets with a relatively low share of exports to Germany and other EU 15 countries (Gawlikowska-Hueckel, Umiński, 2014).

Table 2. Calculated and historical growth rates of Polish regions

Voivodships	A	B	
		2030	2050
Zachodniopomorskie	2.8	4.7	4.3
Podkarpackie	3.5	6.1	5.0
Lubuskie	3.5	4.9	4.4
Warmińsko-Mazurskie	3.5	5.6	4.8
Pomorskie	3.6	4.2	4.1
Lubelskie	3.6	6.0	5.0
Kujawsko-Pomorskie	3.7	4.9	4.4
Opolskie	3.7	5.2	4.6
Małopolskie	3.9	4.8	4.4
Podlaskie	3.9	5.7	4.8
Świętokrzyskie	4.0	5.4	4.7
Wielkopolskie	4.0	3.8*	3.9*
Śląskie	4.1	3.6*	3.8*
Łódzkie	4.3	4.4	4.2*
Mazowieckie	4.6	1.5*	2.7*
Dolnośląskie	4.9	3.4*	3.7*

Explanation: A - mean historical growth rates between 2000 and 2010; B - calculated growth rates in order to achieve national GDP per capita by 2030 and 2050. * in this case, the mean historical growth rate is higher than the calculated one. Poland's mean growth rate of GDP per capita over the period of 2000-2010 was 4.0%

Source: Author's own calculations, based on data from the General Statistical Office of Poland

The analysis of historical regional growth rates compared with calculated ones affirmed the significant difficulties experienced by 11 regions in catching up with the mean national GDP per capita before 2030 (see Table 2). Most of the regions would have to boost their GDP per capita growth rates by 0.1 percentage points annually (in the case of Łódzkie) or 0.6 percentage points (for Pomorskie) to 2.6 percentage points (for Podkarpackie).

The calculated mean annual growth rates required in order to attain national GDP per capita by 2050 were higher than historical ones by 0.5 percentage points, in the case of Pomorskie, to 1.5 percentage points in the case of Podkarpackie. In the context of this time horizon, Łódzkie had a higher past growth rate than was calculated for it to attain the mean national GDP.

5. Conclusion

Regions, like countries, cities and other administrative units have characteristics which determine their ability to generate and sustain economic growth. Unequal growth potential implies diversification at regional level. Nowadays, geographic distance seems to have less impact on regions than in the past thanks to advances in transportation and communication as well as the processes of globalization and regionalization. Along with geographic distance, there is also an economic distance between regions. This distance is dependent on indicators used in the study. In most of the diversification analyses, GDP per capita is used. However, there is also the possibility of expressing distance in a different way. In this paper, regional distance is described as the number of years required to achieve a particular GDP per capita or a level of development equivalent to that of a reference area.

The concept of regional distance presented would seem to be an intriguing alternative to other indices used in regional diversification studies. It is conceptually related to β -convergence. Due to its simplicity and the intuitiveness of the results it produced, it can be used more frequently in regional studies. Its main advantage is its simultaneous incorporation of present GDP per capita with region-

al GDP growth rates. This enables the estimation of the time gap between a specific region and the reference area. Most analyses take into account only one of the above indexes at any one time. The approach presented in this paper is also fairly elastic in terms of the economic indexes used in the study. For this reason, it can be broadened to include other economic variables which have similar productive characteristics.

The empirical example of regional distance application revealed significant inequalities between regions of Poland at NUTS 2 level. The present regional distance (PRD), i.e., the time required to reach the 2010 national level of GDP per capita, ranged from 1.2 years for Pomorskie to 11.7 years in Podkarpackie. The relative regional distance showed that most of the Polish regions would have significant difficulties in catching up with national GDP per capita in the future, primarily due to the insufficient growth rates of their economies. It also suggests a forthcoming intensification of regional inequalities between well-developed regions and less advanced ones, which is consistent with Williamson's theory. According to a quite recent study (Szörfi, 2007), Poland is located on the ascending side of the inverted U-shaped curve, implying an increase in regional inequalities in the future. Another acknowledgement of the increasing inequalities thesis is the comparison of historical and calculated growth rates required to attain reference area level of development by 2030 and 2050. In most cases (excluding areas with no distance), regions would have to boost their mean annual growth rate from 0.2 to 2.6 percentage points (by 2030) or from 0.5 to 1.6 percentage points (by 2050). At present, it seems that a majority of these regions will find it almost impossible to accelerate at the pace required to achieve these annual growth rates.

The regional policy programmes and availability of cohesion funds (2014-2020) can have a significant impact on regional development in Poland in forthcoming years, although it is difficult to believe at this time that in the medium term regional inequalities will significantly diminish. According to the inverted U-shaped curve theory, it is possible once the Polish economy becomes significantly wealthier in terms of GDP per capita (ca. 22,800 PPS per capita).

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