ŁUKASZ PIĘTAK[*]

Convergence Across Polish Regions, 2005–2011

Abstract

This article analyses the convergence across Polish regions between 2005–2011. Its theoretical and empirical character determined the choice of research methods. The theoretical part includes an analysis of the literature devoted to the convergence theory, and the empirical part is based on statistical surveys. Statistical data used in the article was taken from the following databases: for the United Kingdom – Office for National Statistics; for Finland – Statistic Finland; for Poland and the rest of the countries – Statistical Yearbook of the Regions – Poland from 2005 to 2013. The studies confirmed that in Poland a strong concentration of economic activity took place in analyzed period. The convergence of per capita GDP did not apply. Rich regions grew faster than poor ones. The convergence of labour productivity did not apply either. The divergence of the K/L relation determined the divergence of labour productivity in the analyzed period. In the last part of the article the author analyzed the convergence across regions in EU countries. In case of countries that gained the accession to the EU on 1 May 2004, convergence did not apply. On the other hand, rich countries of EU like Austria, Belgium or the Netherlands confirmed the phenomenon of convergence at the NUTS level in analyzed period.

Keywords: *regional convergence, per capita income, factors productivity*

[*] Ph.D., University of Lodz, Faculty of Economics and Sociology, Department of World Economy and European Integration

1. Introduction

The concept of absolute convergence implies faster growth in poor countries (regions) than in rich ones. Economies with a lower level of per capita income should achieve a higher rate of growth. Hence, according to absolute convergence there is an inverse relation between the rate of capital growth and its initial level in the economy. In contrast to absolute convergence, conditional convergence does not imply unconditional equalization the level of economic development across countries/regions. The empirical studies carried out have often confirmed the convergence, but only across selected countries, i.e. a "club", characterized by similar values of structural variables [see Galor 1996; Quah 1993; Quah 1996]. In other cases, deepening disparities between countries have very often taken place.

The analysis of the convergence across Polish regions was tested at the regional level. Poland is divided into sixteen voivodships (NUTS 2). The data on Polish regions (voivodships) derives from the *Statistical Yearbook of the Regions – Poland* from the years 2005 to 2013.

Map 1. Polish regions (NUTS 2)
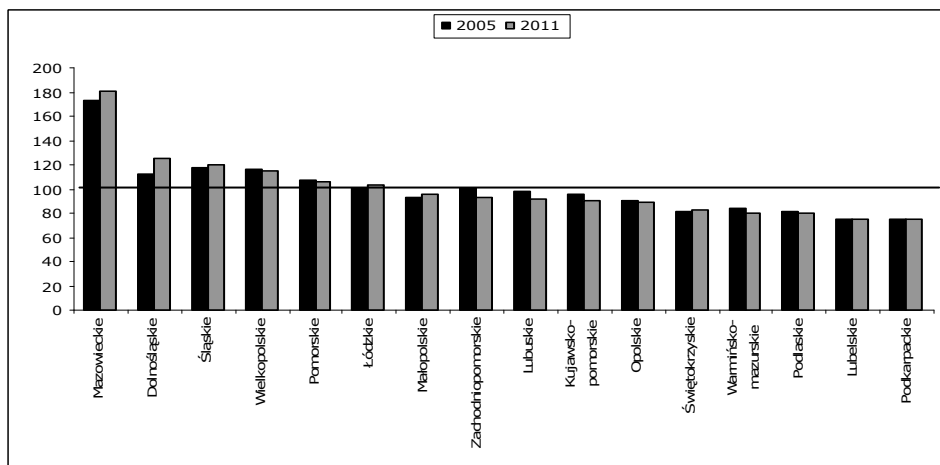

Source: own elaboration.

2. Concentration of economic activity in Polish regions, 2005–2011

The first point of this analysis is to examine the level of per capita GDP, which allows for distinguishing the rich and poor regions. Figure 1 shows the level of per capita GDP in each region in 2005 and 2011, relative to the national average. The regions were ordered by the highest level of per capita GDP in 2011. The richest region was Mazowieckie with per capita GDP of 172.4% in 2005 and 180.3% in 2011 of the national average. The regions which reached per capita GDP above the national average included: Dolnośląskie, Śląskie, Wielkopolskie, Pomorskie and Łódzkie. In the case of the region Zachodniopomorskie, in 2005 the per capita GDP was 101.2% of the national average and decreased in 2011 to 93.4%. In addition, three of the richest regions increased their level of per capita GDP relative to the national average during the six years analyzed: Mazowieckie from 172.41% to 180.37%; Dolnośląskie from 112.69% to 125.40%; and Śląskie from 117.75% to 119.58%. The second group of regions contained the poorest ones: Podkarpackie, Lubelskie, Podlaskie, Warmińsko-mazurskie and Świętokrzyskie. Both in 2005 and 2011 these regions were characterized by per capita GDP below the national average. In addition, the poorest regions in 2005 became poorer in 2011. For example, in the region Podkarpackie per capita GDP in 2005 was at 75.23% of the national average, and six years later that level was reduced to 74.74%. A similar situation took place in regions Podlaskie, Warmińsko-mazurskie and Opolskie. In 2005 the per capita GDP was 80.77%, 83.36% and 90.48% of the national average, respectively. In 2011 per capita GDP was reduced to 79.53%, 79.91% and 88.77% of the national average. Summing up, by comparing the year 2011 with the year 2005 it can be observed that the three Polish regions with the highest per capita GDP became richer. In turn, three of the poorest Polish regions - Podkarpackie, Podlaskie and Warmińsko–mazurskie – became relatively poorer. Only the region Lubelskie, which belonged to the poorer regions, had a different trajectory. In period 2005–2011 it improved its situation of relative per capita GDP from 74.50% to 75.20% of national average.

Map 2 consists of two maps. On the left hand map the five richest regions, which could be called the "poles" of the Polish economy, were selected: Mazowieckie, Dolnośląskie, Śląskie, Wielkopolskie and Pomorskie. On the right hand map regions with the lowest level of per capita GDP in 2011 were selected: Podkarpackie, Lubelskie, Podlaskie, Warmińsko-mazurskie and Świętokrzyskie. They often are called the "poor eastern wall". In 2005 the five richest regions produced 57.6% of the national GDP. In addition, in these regions were inhabited by 48.0% of the Polish population and comprised 50.5% of the total national employment. With respect to both GDP and population, the richest regions increased their combined relative share in 2011 to 58.9% and 48.2%, respectively. Only their relative share of

employed persons decreased very slightly, from 50.5% to 50.4%. It should be emphasized that the five richest regions in 2011 produced almost 60% of Polish GDP and comprised above 50% of total employment in the country. The poorest regions were in a totally different situation. In 2005 their share in GDP, population and employment in Poland was, respectively 15.4%, 18.4% and 20.6%. In 2011 their share in GDP decreased to 13.4% of the national GDP. In the case of population their share remained the same at 18.4%, while the share of employment in the poorest regions achieved a slight upward trend from 20.6% in 2005 to 20.8% in 2011.

Figure 1. Per capita GDP in Polish regions 2005–2011, (2004 = 100)

Source: own elaboration.

Map 2. Rich regions versus poor regions in Poland, 2005–2011

Source: own elaboration.

Table 1 shows the share of each region in GDP, population and employment in period 2005–2011. Regions which increased their shares in the national GDP were Dolnośląskie, Małopolskie and Mazowieckie (Dolnośląskie from 7.82% to 8.58%; Małopolskie from 7.30 to 7.46%; and Mazowieckie from 21.38 to 22.36%). In case of employment four regions improved their share in national employment: Dolnośląskie, Małopolskie, Podkarpackie and Pomorskie (Dolnośląskie from 7.05 to 7.27%; Małopolskie from 8.13 to 8.92%; Podkarpackie from 5.08 to 5.71%; and Pomorskie: from 5.30 to 5.35%). Regions which increased their share in the national population were Kujawsko–pomorskie, Małopolskie, Mazowieckie, Pomorskie, Warmińsko-mazurskie, Wielkopolskie and Zachodniopomorskie (Kujawsko-pomorskie from 5.42 to 5.44%; Małopolskie from 8.56 to 8.68%; Mazowieckie from 13.52 to 13.72%; Pomorskie from 5.76 to 5.93%; Warmińsko-mazurskie from 3.74% to 3.77%; Wielkopolskie from 8.8 to 8.9%; and Zachodniopomorskie from 4.44 to 4.47%).

Table 1. Share of regions in GDP, population and employment in Poland, 2005–2011

	GDP		Population		Employment	
Regions	**2005**	**2011**	**2005**	**2011**	**2005**	**2011**
Dolnośląskie	7.82	8.58	7.57	7.57	7.05	7.27
Kujawsko-pomorskie	4.73	4.48	5.42	5.44	5.15	4.91
Lubelskie	3.90	3.83	5.71	5.64	5.80	5.78
Lubuskie	2.39	2.20	2.64	2.65	2.32	2.33
Łódzkie	6.21	6.10	6.75	6.57	7.15	6.71
Małopolskie	7.30	7.46	8.56	8.68	8.13	8.92
Mazowieckie	21.38	22.36	13.52	13.72	16.43	16.26
Opolskie	2.28	2.11	2.74	2.63	2.34	2.26
Podkarpackie	3.80	3.73	5.50	5.52	5.08	5.71
Podlaskie	2.33	2.24	3.14	3.12	3.08	2.90
Pomorskie	5.65	5.64	5.76	5.93	5.30	5.35
Śląskie	13.27	12.98	12.28	12.00	11.97	11.85
Świętokrzyskie	2.52	2.48	3.37	3.32	3.46	3.33
Warmińsko-mazurskie	2.86	2.72	3.74	3.77	3.16	3.04
Wielkopolskie	9.44	9.32	8.84	8.97	9.73	9.71
Zachodniopomorskie	4.12	3.78	4.44	4.47	3.85	3.68
Poland	100	100	100	100	100	100

Source: own elaboration.

In order to estimate the level of GDP, population and employment concentration in Polish regions, the dispersion formula was used. Figure 2 presents the dispersion of GDP, population and employment across Polish regions in 2005–2011. All analyzed indicators show an increasing value of the dispersion that stands for the strongest concentration of economic activity. In the case of GDP and employment, the increase in concentration started in 2008. On the other hand, the concentration of population showed an upward trend during the six years analyzed.

Figure 2. Dispersion of GDP, population and employment across Polish regions, 2005–2011
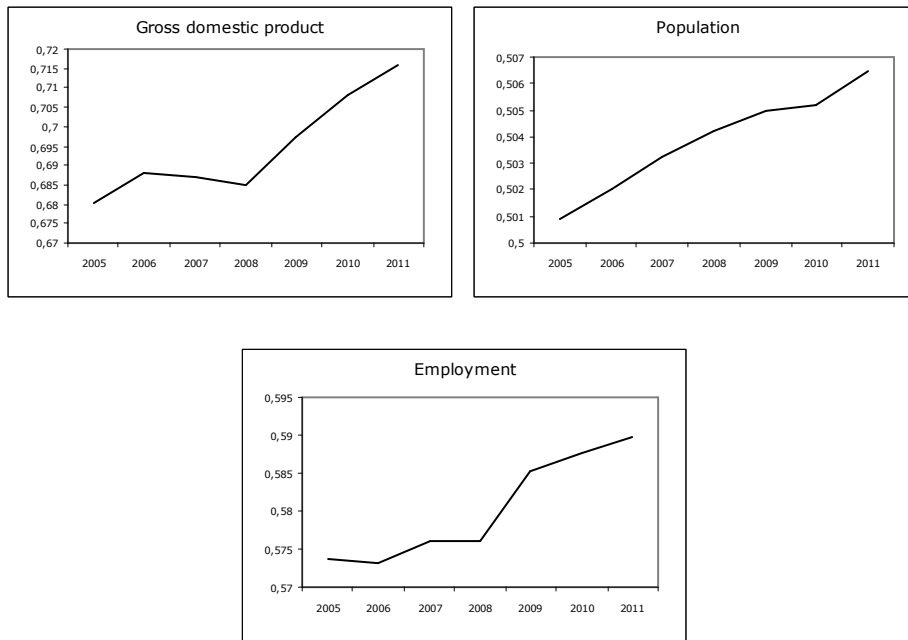
Source: own elaboration.

3. Convergence of per capita GDP across Polish regions, 2005–2011

The economic literature includes many concepts of convergence. This paper focuses on two kinds of convergence: $\sigma-$convergence and $\beta-$ convergence (Barro, Sala-i-Martin, 2004; Sala-i-Martin, 2000). The $\sigma-$convergence implies that the dispersion of per capita GDP between countries decreases over time. On the other hand, $\beta-$ convergence implies faster growth in poorer countries/regions than in rich ones. The formula used to test the $\sigma-$convergence is as follows:

$$\sigma_t = \sqrt{\sum_{t=1}^{n} (\ln Y_{it} - \ln Y_t)^2 / n} \quad ,$$ (1)

where:

$\ln Y_{it}$ − per capita GDP of the region i in period t,

$\ln Y_t$ − average of per capita GDP in the group of analyzed countries (regions) in period t.

     The decreasing value of dispersion signifies a reduction of dispersion around the average value.

The formula used to test the β − convergence is as follows:

$$\log(y_{it}) - \log(y_{i,t-1}) = a + b \log(y_{i,t-1}) + u_{it},$$ (2)

where:

$i = 1,..., N$ − number of countries (regions) included in the analysis,

$\log(y_{it})$ − logarithmic value of the income of country i in period t,

$\log(y_{i,t-1})$ − logarithmic value of the income of country i in period $t-1$,

b − parameter of regression, $0 < b < 1$,

u_{it} − effect of the error term,

A negative value of the b parameter indicates that the convergence process took place.

     Figure 3 presents the dispersion of per capita GDP, employment rate, productivity of labour and productivity of capital across Polish regions in 2005–2011. In the case of per capita GDP, the dispersion began to increase in 2005 and from that time the σ − convergence did not apply. The divergence of the employment rate and productivity of labour started in 2008. As to the productivity of capital, from 2007 to 2009 convergence took place, but the situation changed in 2009 and the dispersion of productivity of capital began to increase.

Figure 3. Dispersion of per capita GDP, employment rate, productivity of labour and productivity of capital across Polish regions, 2005–2011
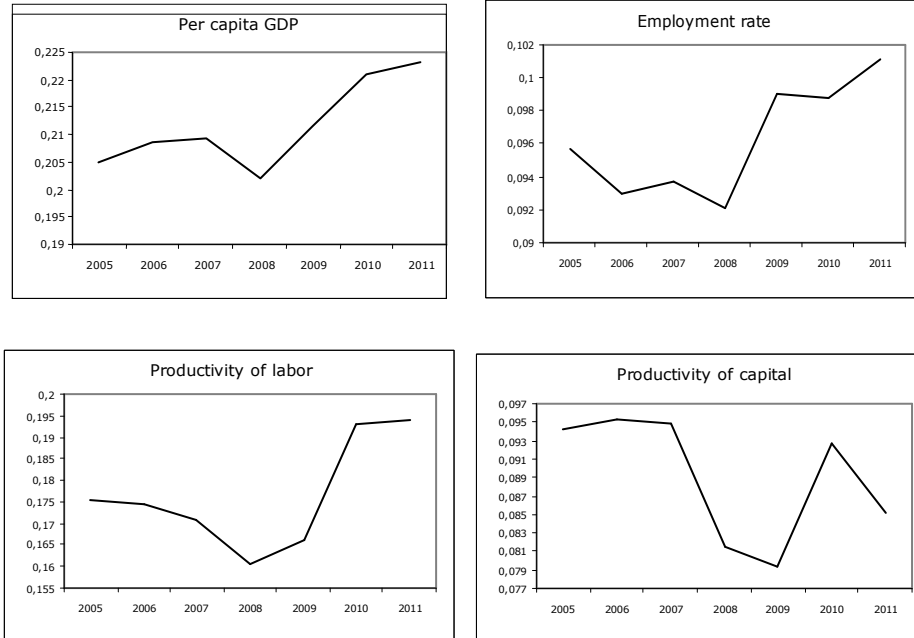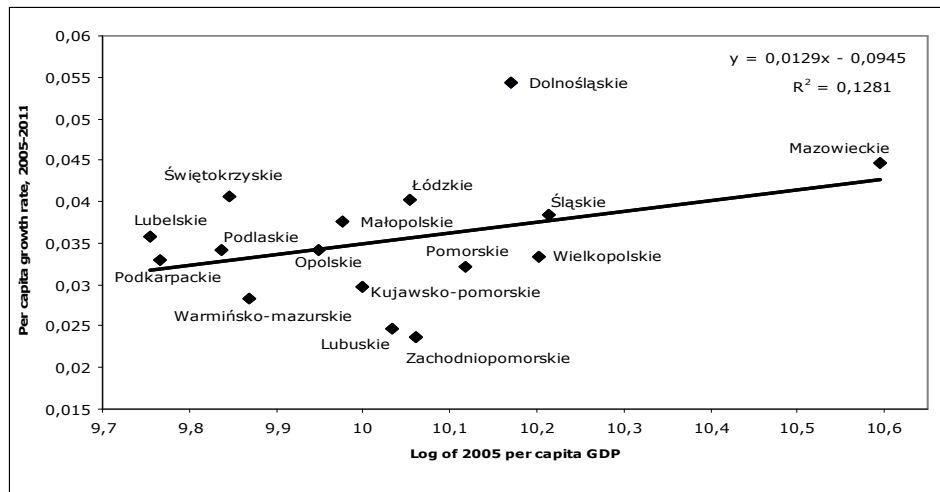

Source: own elaboration.

Figure 4 presents $\beta-$ convergence of per capita GDP. On the horizontal axis is the logarithmic value of the initial level of per capita GDP. On the vertical axis is the annual growth rate of per capita GDP in 2005–2011. The relation between per capita GDP growth and its initial value was positive. Hence, $\beta-$ convergence did not apply. Also, Figure 4 allows for distinguishing between the regions that had a positive and negative impact on divergence. The regions like Mazowieckie, Dolnośląskie or Łódzkie, in spite of the high level of per capita GDP in 2005, achieved high growth rates during the six years analyzed. In their case the divergence had a positive aspect. On the other hand, the opposite group of regions included Warmińsko-mazurskie, Lubelskie and Zachodnio-pomorskie. These regions represented a low level of per capita GDP in 2005 and during the six years analyzed they could not reach a rate of economic growth that would have allowed them to catch up with the richest regions. The regions of Śląskie, Opolskie and Podkarpackie confirmed the existence of $\beta-$ convergence in 2005–2011.

The per capita GDP is a ratio of GDP and population. Hence, the per capita GDP growth rate can be expressed as the difference between two components: GDP and population growth rates. Figure 5 presents the results of the decomposition of

per capita GDP for GDP and population growth rates. Regions are ordered from highest to lowest in terms of per capita GDP growth rate. In all regions the decisive factor of per capita GDP growth rate was an increase in GDP, while the population growth had little significance. Moreover, in three regions - Łódzkie, Śląskie and Opolskie–the growth of per capita GDP was conditioned by the loss of population.

Figure 4. $\beta-$ **convergence of per capita GDP across Polish regions, 2005–2011**
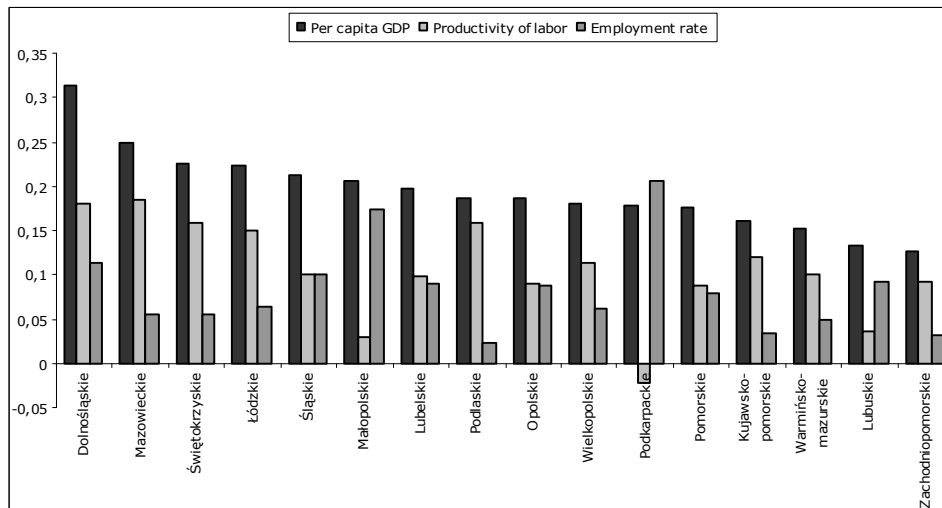

Source: own elaboration.

Figure 5. Decomposition of per capita GDP growth rate for GDP and population growth rates
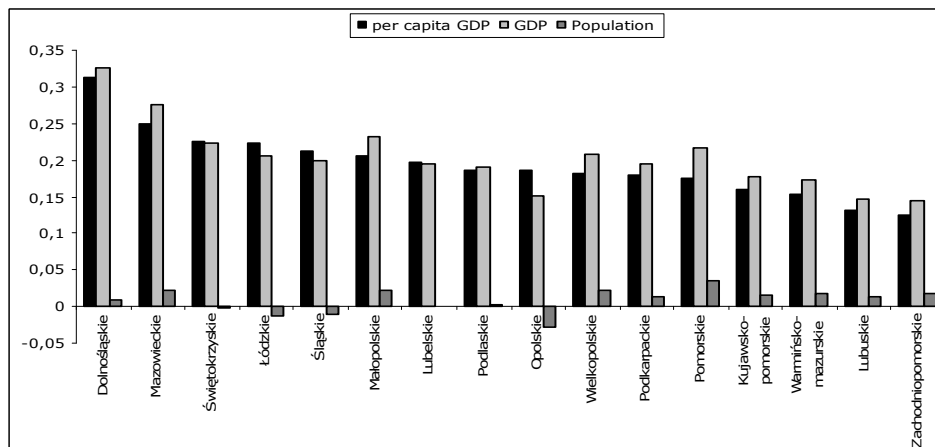
Source: own elaboration.

Another way to decompose the per capita GDP growth rate is its representation as a product of labour productivity and employment growth rates (see Dębniewski, Gryciuk, 2002; Woźniak, 2008). In regions with the highest per capita GDP growth rate - Dolnośląskie, Mazowieckie and Świętokrzyskie– its growth rate was mainly based on labour productivity growth. In turn, in the regions like Podkarpackie, Małopolskie and Lubuskie the labour productivity growth rate had a low share in the per capita GDP growth. The deciding role was played by the employment growth rate. In the case of the Podkarpackie region, the labour productivity growth rate was negative, and the growth of per capita GDP was reached by the increasing level of the employment rate.

Figure 6. Decomposition of per capita GDP growth rate for labour productivity and employment growth rates, 2005–2011

Source: own elaboration.

Previous analysis showed that the GDP growth rate had a decisive role in per capita GDP growth, while the population growth rate had little significance. The application of formula [3] allowed for determining the contribution of each sector in obtained Gross value added:

$$\frac{Y_t}{Y_0} = \sum_{i=1}^{n} S_{j0} \cdot \frac{Y_{jt}}{Y_{j0}},\tag{3}$$

where j and S_{j0} are the succeeding sector and share of j sector in Gross value added, respectively.

Table 2. Share of each sector in Gross value added in 2005–2011

		Agriculture	Industry	Services
Dolnośląskie	Share 2005–2011	1.9	43.0	55.2
	Gross value added (%)	2.6	35.4	62.0
Kujawsko-pomorskie	Share 2005–2011	5.5	33.8	60.7
	Gross value added (%)	6.8	29.5	63.8
Lubelskie	Share 2005–2011	7.4	26.7	66.0
	Gross value added (%)	7.4	24.4	68.3
Lubuskie	Share 2005–2011	4.3	37.5	58.2
	Gross value added (%)	4.6	33.3	62.0
Łódzkie	Share 2005–2011	4.8	35.6	59.6
	Gross value added (%)	5.9	31.6	62.5
Małopolskie	Share 2005–2011	2.0	32.7	65.3
	Gross value added (%)	2.9	29.1	67.9
Mazowieckie	Share 2005–2011	3.3	22.0	74.7
	Gross value added (%)	3.7	21.2	75.1
Opolskie	Share 2005–2011	5.0	37.4	57.7
	Gross value added (%)	5.5	35.0	59.5
Podkarpackie	Share 2005–2011	2.3	35.3	62.4
	Gross value added (%)	3.3	33.1	63.6
Podlaskie	Share 2005–2011	10.4	27.3	62.3
	Gross value added (%)	11.8	23.8	64.4
Pomorskie	Share 2005–2011	2.9	33.2	63.9
	Gross value added (%)	2.8	28.9	68.4
Śląskie	Share 2005–2011	0.9	41.7	57.4
	Gross value added (%)	1.3	39.1	59.6
Świętokrzyskie	Share 2005–2011	5.1	35.8	59.1
	Gross value added (%)	6.3	29.2	64.4
Warmińsko-mazurskie	Share 2005–2011	8.2	32.0	59.8
	Gross value added (%)	8.5	27.3	64.2
Wielkopolskie	Share 2005–2011	5.5	35.7	58.8
	Gross value added (%)	7.8	32.6	59.6
Zachodniopomorskie	Share 2005–2011	4.1	28.1	67.9
	Gross value added (%)	4.5	24.2	71.3
Poland	Share 2005–2011	3.7	32.7	63.6
	Gross value added (%)	4.5	29.5	66.0

Source: own elaboration.

Table 2 contains data concerning the share of each sector in Gross value added in Polish regions in 2005–2011. Each region is assigned two rows. The first row called "share 2005–2011" indicates the share of each sector in obtained

Gross value added in 2005–2011. The second row "Gross value added (%)" indicates the contribution of each sector in Gross value added in 2005. For example, in Poland the share of agriculture, industry and services in Gross value added during the six years analyzed was 3.7%, 32.7% and 63.6%, respectively. The regions with a low level of per capita GDP - Lubelskie, Podlaskie or Warmińsko-mazurskie - were characterized by a high share of agriculture in the Gross value added, equal to 7.4%, 10.4% and 8.2%, respectively. On the other hand, in case of the regions with high level of per capita GDP the rule was a low share of agriculture in the Gross value added. For example, in regions like Dolnoślaskie and Mazowieckie the share of agriculture in Gross value added was 1.9% and 3.3%, respectively. Also, in the Śląskie region this share was even less than one per cent, more precisely 0.9%. The example of the richest region (Mazowieckie) should also be noted. In its case, 74.7% of Gross value added was obtained in services sector.

Another tool used to examine the development of Polish regions was the "shift–share" analysis. This formula is based on the assumption that an increase of the variable at the regional level can be explained by the combined effect of the three variables: national share, industry mix and regional shift (Houston 1967; Stevens, Moore 1980; Blair 1995). The formula of shift share is as follows:

$$SS = NS + IM + RS \, , \tag{4}$$

where:

SS − Shift-Share,

NS − National Share,

IM − Industry Mix,

RG − Regional Mix.

The equations describing the successive components of SS are as follows:

$NS = regional_i^{t-1} \cdot national^t / national^{t-1}$.

$IM = (region_i^{t-1} \cdot national_i^t / national_i^{t-1}) - NS$.

$RG = regional_i^{t-1} \cdot (regional_i^t / regional_i^{t-1} - national_i^t / national_i^t)$,

where:

$regional_i^{t-1}$ − region's income in the sector i in the period $t-1$,

$regional_i^t$ − region's income in the sector i in the period t,

$national^{t-1}$ − national income in the period $t-1$,

$national_i^{t-1}$ − national income in the sector i in the period $t-1$,

$national_i^t$ − national income in the sector i in the period t .

In the shift–share analysis the National Share implies that the increase of regional income is a result of growth at the national level. Hence, if the national economy increases by 5%, that should correspond to a 5% increase in regions. In turn, according to assumption of Industry Mix an income increase in a given sector at the national level should be reflected in the growth of this sector at the regional level. But the most important component of "shift–share" analysis is the Regional Mix, which describes the competitiveness of each sector. If the growth rate of the sector in the region is higher than the national growth rate, the sector is considered to be competitive. Otherwise, the sector belongs to the declining sectors.

Table 3 contains the components of the Shift Share, while Table 4 shows the decomposition of the Regional Mix for three sectors: agriculture and forestry, industry and services. In rich regions like Dolnośląskie, Mazowieckie, Wielkopolskie or Łódzkie, the competitive sector was services. On the other hand, in poor regions like Lubelskie, Warmińsko-mazurskie or Podlaskie, competitive sector was agriculture. In the case of the richest region (Mazowieckie), the development of the services sector was accompanied by the development of the agriculture sector.

Table 3. Shift-Share analysis in Polish regions, 2005–2011

Regions	NS	IM	RS
Dolnośląskie	84235.1	926.5	6119.7
Kujawsko-pomorskie	50872.8	–162.7	–1787.7
Lubelskie	42026.8	–478.9	–480.6
Lubuskie	25676.8	133.8	–1733.0
Łódzkie	66901.0	61.9	–1028.4
Małopolskie	78546.5	116.2	436.6
Mazowieckie	230141.1	–2528.2	12389.7
Opolskie	24528.7	157.6	–1600.0
Podkarpackie	40855.1	276.8	–1226.7
Podlaskie	25080.4	–459.9	–233.9
Pomorskie	60870.7	80.5	–478.4
Śląskie	142803.2	2585.8	–5534.8
Świętokrzyskie	27144.3	–82.0	51.6
Warmińsko-mazurskie	30821.2	–270.6	–1012.1
Wielkopolskie	101610.2	–14.2	–1373.4
Zachodniopomorskie	44375.3	–342.2	–2505.9

Source: own elaboration.

Table 4. Decomposition of the Regional Shift in Polish regions, 2005–2011

| Regions	Agriculture	Industry	Services
Dolnośląskie	–101.8	6193.5	27.9
Kujawsko-pomorskie	–149.9	–70.2	–1567.6
Lubelskie	465.3	–390.9	–555.0
Lubuskie	50.4	–455.6	–1327.8
Łódzkie	–97.9	95.3	–1025.8
Małopolskie	–298.3	478.7	256.2
Mazowieckie	888.6	–1179.9	12681.0
Opolskie	33.1	–884.5	–748.5
Podkarpackie	–200.5	–904.4	–121.9
Podlaskie	88.2	43.5	–365.7
Pomorskie	353.9	633.5	–1465.8
Śląskie	–242.1	–3510.7	–1782.0
Świętokrzyskie	–42.4	933.9	–839.9
Warmińsko-mazurskie	249.2	130.3	–1391.6
Wielkopolskie	–1036.7	–866.4	529.7
Zachodniopomorskie	40.8	–244.3	–2302.4

Source: own elaboration.

4. The convergence of labour productivity

In order to examine the convergence of labour productivity across Polish regions the formula of sigma and beta convergence was used. Figure 7 shows the beta convergence of labour productivity. In the analyzed period divergence took place. Regions like Mazowieckie and Dolnośląskie, despite a high level of labour productivity in 2005, achieved high growth rates during the six years analyzed. On the other hand, the regions like Świętokrzyskie, Podlaskie and Łódzkie confirmed the phenomenon of convergence in labour productivity. The low level of labour productivity in 2005 corresponded to its growth rate above the national average. A negative aspect of divergence was reflected in the situation of the regions like Podkarpackie, Małopolskie, Lubuskie, and Opolskie. The low level of labour productivity in 2005 corresponded to its low growth rate in the analyzed period.

Figure 8 presents the decomposition of labour productivity growth rate for two components: GDP growth rate and employment growth rate. The regions are ordered from the largest to the smallest labour productivity growth rate. According

to the Figure 8, the regions with highest growth rate of labour productivity were characterized by a lower employment growth rate. In addition, there was a negative correlation (–0.70) between the growth rate of labour productivity and the employment growth rate.

Figure 7. Beta convergence of labour productivity across Polish regions, 2005–2011
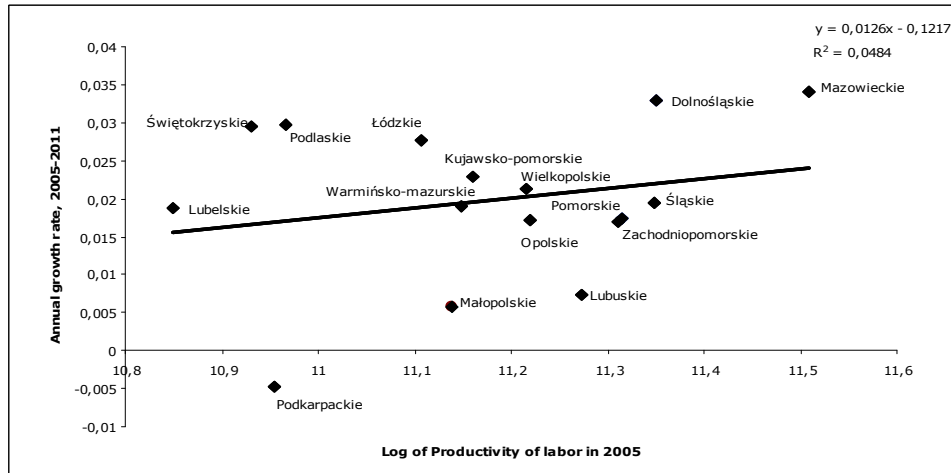
Source: own elaboration.

Figure 8. Decomposition of labour productivity growth rate for GDP and employment growth rates
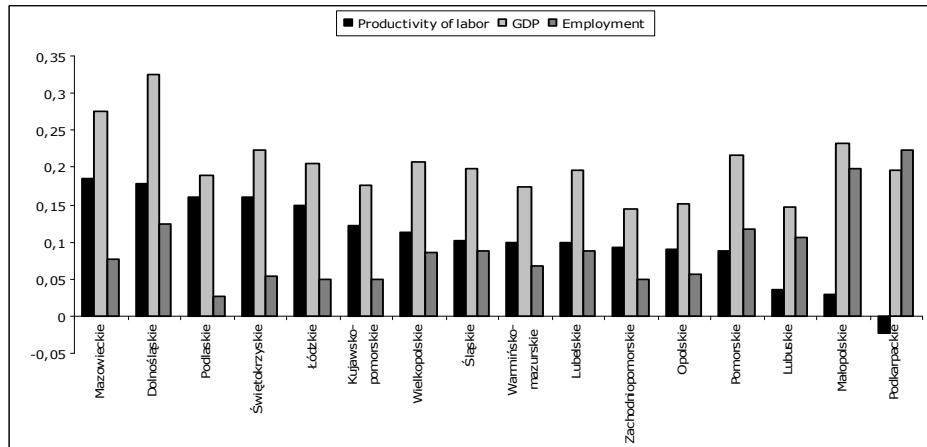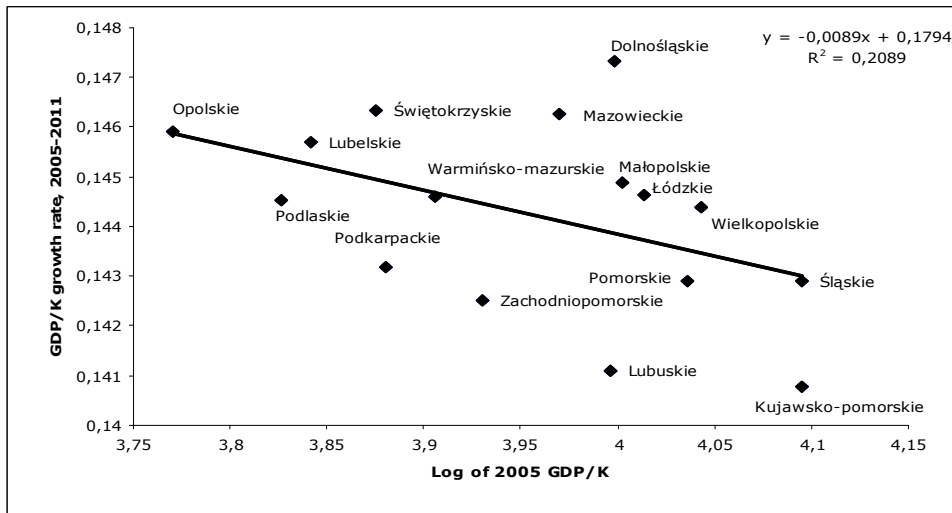

Source: own elaboration.

Another way to explain the existing differences in labour productivity is an application of the formula:

$$\frac{GDP}{L} = \frac{GDP}{K} \cdot \frac{K}{L} , \tag{5}$$

where K is the stock of capital, L employment, GDP/K capital productivity and K/L the level of employment capitalization. Figures 9 and 10 present the beta convergence of following elements of formula [5]. The relation of GDP/K confirmed a convergence. On the other hand, in case of the ratio K/L divergence took place. The convergence of labour productivity did not apply. The divergence of relation K/L determined the divergence of labour productivity in analyzed period.

Figure 9. Beta convergence of GDP/K and K/L

Source: own elaboration.

Figure 10. Beta convergence of K/L
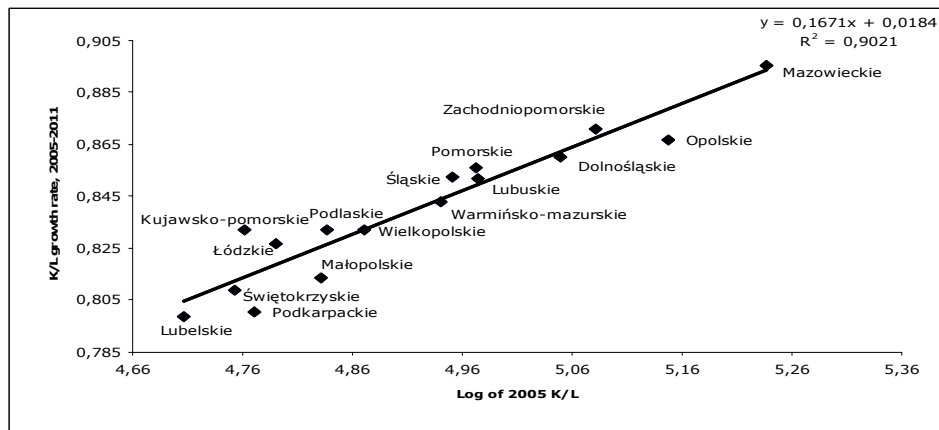
Source: own elaboration.

5. Convergence across regions in EU countries

Another component of our research was devoted to the analysis of convergence in the EU countries at NUTS level (Nomenclature of Territorial Units for Statistic). The data used in the analysis came from the following databases: for the United Kingdom – Office for National Statistics; for Finland – Statistic Finland; for Poland and the rest of the countries – Statistical Yearbook of the Regions – Poland from 2005 to 2013. Table 5 contains regression results for the growth rate of per capita GDP in regions of the selected group of countries. The first column answers the question whether the convergence process took place in the period analyzed. The second column contains the estimate of *b* parameter of regression and the standard error of this estimate (in parentheses). The third column contains the value of the speed of convergence β (%), which was calculated as: $\beta = -\ln(1+b)/T$. The fourth column contains R^2 of the regression and the standard error of the equation (in brackets). The selected countries can be divided in two groups. The first group includes countries like: Spain, Romania, Slovakia Hungary, Italy etc. Their cases did not confirm the phenomenon of convergence. The rich regions have grown more rapidly than the poor ones. Poland belonged to this group too. In all the analyzed countries that acceded to the EU on 1 May 2004, divergence took place. The second group includes both rich countries like Belgium and the Netherlands and poorer countries like Greece and Portugal, strongly affected by the crisis 2008–2013.

Table 5. Convergence across regions in selected countries of EU, 2005–2011

	Convergence	b	Speed of convergence β (%)	R^2
Austria	Yes	–0.0541	0.93	0.0796
		(0.0696)		[0.0401]
Belgium	Yes	–0.0715	1.24	0.5531
		(0.0214)		[0.0217]
Denmark	No	0.0240	–0.39	0.0524
		(0.0588)		[0.0225]
Finland	Yes	–0.2406	4.59	0.3274
		(0.0813)		[0.0646]
France	Yes	–0.1087	1.92	0.1388
		(0.0553)		[0.0601]
Greece	Yes	–0.2449	4.68	0.1786
		(0.1584)		[0.1177]
Spain	No	0.0379	–0.62	0.0151
		(0.0744)		[0.0572]
Netherlands	Yes	–0.0052	–0.01	0.0001
		(0.1725)		[0.0965]
Germany	Yes	–0.0686	1.19	0.1505
		(0.0272)		[0.0361]
Portugal	Yes	–0.0187	0.31	0.0147
		(0.0684)		[0.0359]
Czech Republic	No	0.0075	–0.13	0.0063
		(0.0388)		[0.0330]
Romania	No	0.2486	–3.70	0.7482
		(0.0589)		[0.0536]
Slovakia	No	0.0200	–0.33	0.1535
		(0.0333)		[0.0328]
Sweden	Yes	–0.0246	0.42	0.0104
		(0.0983)		[0.0419]
Hungary	No	0.0543	–0.88	0.1746
		(0.0528)		[0.0442]
United Kingdom	No	(0.0686)	–1.11	0.1130
		0.0325		[0.0498]
Italy	No	(0.0392)	–0.64	0.0642
		0.0343		[0.0400]

Source: own elaboration.

6. Conclusions

1. In the first part of this article the author studied the concentration of economic activity in Polish regions from 2005 to 2011. The results of the analysis indicate an increasing value of dispersion of GDP, population and employment. Hence, in Poland there was a strong concentration of economic activity in the analyzed period.

2. In the second part of the article the author tested the convergence of per capita GDP across Polish regions. Since the value of parameters σ – convergence and β – convergence are positive, absolute convergence did not apply. Rich regions grew faster than poor ones.

3. In the third part of the article the author analyzed the convergence of labour productivity. As in a case of per capita GDP, the convergence of labour productivity did not apply. The divergence of relation K/L determined the divergence of labour productivity in the analyzed period.

4. In the fourth part of the article the author analyzed the convergence across regions in EU countries. In case of countries that gained the accession to the EU on 1 May 2004, convergence did not apply. On the other hand, rich countries like Austria, Belgium or the Netherlands confirmed the phenomenon of convergence at the NUTS level in analyzed period.

References

Barro R.J., Sala-i-Martin X. (2004), *Economic Growth. Second Edition*, The MIT Press, Cambridge, Massachusetts.

Blair J.P. (1995), *Local Economic Development: Analysis and Practice*, Thousand Oaks, CA: Sage Publications.

Dębniewski G., Gryciuk R. (2002), *Makroekonomia. Wybrane problemy*, Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego, Olsztyn.

Galor O. (1996), *Convergence? Inferences from Theoretical Models*, 'Economic Journal', vol. 106., no. 437.

Houston D. B. (1967), *The shift and share analysis of regional growth: a critique*, 'Southern Economic Journal', vol. 33, no. 4.

Office for National Statistic – www.ons.gov.uk

Quah D. (1993), *Empirical Cross-section Dynamics in Economic Growth*, 'European Economic Review', vol. 37, no. 2–3.

Quah D. (1996), *Empirics for Economics Growth and Convergence*, 'European Economic Review', vol. 40, no. 6.

Sala-i-Martin X. (2000), *Apuntes de crecimiento económico. Segunda edición*, Antoni Bosch, Barcelona.

Statistic Finland – www. stat.fi

Statistical Yearbook of the Regions – Poland from 2005 to 2012, CENTRAL STATISTICAL OFFICE, Warsaw.

Stevens B.H., Moore C.L. (1980), *A critical review of the literature on shift-share as a forecasting technique*, 'Journal of Regional Science', vol. 20, no. 4.

Woźniak M.G. (2008), *Wzrost gospodarczy. Podstawy teoretyczne*, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków.

Streszczenie

KONWERGENCJA POMIĘDZY REGIONAMI POLSKI, 2005–2011

Celem artykułu jest zbadanie zjawiska konwergencji pomiędzy regionami Polski w latach 2005–2011. Teoretyczno-empiryczny charakter artykułu zdeterminował wybór metod badawczych Część teoretyczna obejmuje analizę literatury poświęconej zagadnieniom konwergencji regionalnej. Z kolei, część empiryczna artykułu bazuje na badaniach statystycznych. Materiał statystyczny wykorzystany w artykule został zaczerpnięty z Roczników Statystycznych Województw Polski od 2005 r. do 2013 r. oraz baz danych urzędów statystycznych Wielkiej Brytanii i Finlandii. Przeprowadzone badania zmierzają do następujących przypuszczeń: W Polsce w latach 2005–2011 miał miejsce wzrost koncentracji aktywności ekonomicznej. Ponadto pomiędzy województwami nie zachodził proces konwergencji. Regiony bogate rozwijał się szybciej niż regiony biedne. Dywergencja miała miejsce także przypadku produktywności pracy. Dywergencja relacji K/L zdecydowała o dywergencji produktywności pracy w analizowanym okresie. W przypadku krajów UE, to przeprowadzone badania dowiodły, że kraje które uzyskały akcesję z UE w dniu 1 maja 2014, podobnie jak Polska, doświadczyły dywergencji regionalnej. Z kolei, państwa zamożne jak Austria, Belgia czy Holandia potwierdzały konwergencję regionalną na poziomie NUTS 2.

Słowa kluczowe*: konwergencja regionalna, dochód per capita, produktywność czynników produkcji.*