DISPARITIES IN REGIONAL DEVELOPMENT ON THE EXAMPLE OF POLISH PROVINCES BETWEEN 2000 AND 2020

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Purpose: The purpose of this article is to present the disparities of Poland's economic development in 2000-2020 by NUTS-2 units, using selected economic indicators.

Design/methodology/approach: The following methods are used in the article: critical literature analysis and statistical data analysis using selected statistical tools. Based on data obtained from the Local Data Bank of Statistics Poland (GUS), the level of regional characteristics is calculated such as: the output of production (GDP), GDP per capita and the value and share of the industrial sector in the total output. The analysis covered 16 Provinces in the period of 2000-2020.

Findings: The analysis of selected variables in the analyzed years confirmed the regional disparities in Poland between Provinces, and the leading role of the Mazowieckie Province.

Research limitations/implications: The research performed in the article represents only one aspect of the assessment of regional disparities. The complete research picture can be obtained by using other tools of statistical analysis and additional variables of socio-economic and environmental development.

Practical implications: Knowledge of the mechanisms and regularities of regional development is the basis for the formation of policies that would ensure, on the one hand, high and sustainable development dynamics and, on the other, lead to the reduction of regional inequalities.

Social implications: Regional inequalities, manifested through social inequalities, are a natural and – to some extent – acceptable phenomenon. However, excessive economic inequalities lead to conflicts and tensions in societies. Therefore, one of the objectives of economic and social policy of the state should be the reduction of regional inequalities to achieve sustainable development and improvement of the quality of life in the country.

Originality/value: The analysis herein used the most recent statistical data of selected variables and statistical tools. Thus, it can be another element towards recognizing the regularities of regional disparities in the Polish economy at the regional level.

Keywords: regional disparities, regional GDP, changes in industrial sector.

Category of the paper: Research paper.

1. Introduction

The issue of development, including regional development, has been the subject of numerous theoretical analyses and research studies for many years. Globalization processes, as well as the concomitant increased flows of goods, services and production factors, seem to lead to an increasing homogeneity of the world economy. This should be reflected in the increasing uniformity of the level of wealth of countries and the convergence of the values of macroeconomic indicators. However, when reviewing the literature, can be observed the variety of definitions and methods of studying convergence and divergence, and the different results of empirical studies and theoretical considerations. The concept of convergence was introduced to the literature by R. Barro and X. Sala-i-Martin, in the context of economic growth theory (Barro, Sala-i-Martin, 1991). It is most often defined as a process of narrowing the gap in the level of development of different countries, or as a leveling of differences between countries and regions as well. The opposite process to convergence is divergence, which means the persistence or increase of these differences. The literature review indicates that there are many models and theories presenting a variety of concepts and views explaining the causes and mechanisms of development, including regional development (Dyjach, 2013). Initially, a certain division became apparent between theories studying convergence processes and divergence theories. Supporters of convergence, derived from classical theories, interpreted development as a process that aims, through market forces, to achieve a level of equilibrium (Barro, Solow, Swan, Lucas). According to these economists, at the equilibrium point there is an efficient allocation of resources and there is an even distribution of factors of production, which contributes to establishing a similar level of development between regions. On the side of divergence, on the other hand, stands the Keynesian school, which assumes not only the persistence, but also deepening of differentiation between regions (Myrdal, Hirschman, Perroux). However, today, with advanced mathematical methods available, the potential of each theory can be used to create instruments to diagnose the process of regional development (Łaźniewska et al., 2011). Simultaneously, there is an ongoing discussion in the literature addressing the issue of explaining the universal causes and mechanisms of economic growth differentiation and its spread both between and within countries. Long-term research has made it possible to identify direct factors of economic growth, also called first order factors, which include: capital, labor, as well as technical and organizational progress (Zienkowski, 2005). Nevertheless, as the author suggests, for these factors to have an effective impact on the economy, thus contributing to economic development and improving the quality of life of the population, they should be supported by the so-called indirect factors. Such factors may include business conditions, socio-economic policy, innovation or knowledge capital in society. It should be noted that it is very rare that the specified determinants are distributed evenly, both in time and areas. In particular, technological progress, which is considered by many

economists as the main factor of structural change and long-term economic growth, may lead to an increase, rather than decrease in regional inequalities (Barrios, Strobl, 2009). Consequently, as suggested by these authors, it may mean that economic growth will promote divergence rather than convergence or confirm the thesis of the self-reinforcing nature of economic inequality, or the nonlinear development of convergence. Concepts about the nonlinear evolution of regional inequality appeared in the literature as early as the 1950s. One of the economists addressing this issue was S. Kuznets, who, in his analysis of income inequality, suggested the existence of a "long swing" in regional income inequality, i.e., firstly that there is an increase and then there is a decrease in income disparity (Kuznets, 1955). It is caused by the process of industrialization, which means an increase in the share of the industrial sector in the volume of global output (GDP), along with a decrease in the share of the agricultural sector. The concepts of linking economic development with changes in economic structure have their origin in the theory of three sectors, created in the 1930s by A. Fisher and developed by S. Clark and J. Fourastie (Swadźba, 1994). They formulated the thesis that, in the first stage of development (in a backward society, according to C. Clark), the dominant sector is agriculture. As economic development progresses, the proportion of people working in the agricultural sector decreases, in favor of the industrial sector. Then, in the further course of economic development, the importance of the sector of industry decreases, while the service sector increases. Also S. Kuznets (together with Rostow, Chenery, Schumpeter, Hoffman and others) emphasizes the close relationship between economic growth and industrialization of the economy. Most studies, including those by Polish authors (Karpiński, Kempny, Klamut, Lipiński, Swadźba, Lisikiewicz, Ciamaga) point to the occurrence of certain characteristic phenomena in the industrial sector. It is possible to name such processes as industrialization, deindustrialization and reindustrialization. Their distinction is associated with specific changes observed in the share of the industry structure in total global output. Development researchers have transferred this concept to the regional context, suggesting the existence of a bell-shaped curve of spatial development, where inequality should first increase as developed areas benefit from the external economy, better location of decision-makers, mobility of capital and labor (Myrdal, Hirschman, Williamson). A notable study is available by Williamson, who analyzes in quite some detail the driving changes in regional inequality, also depending on the stage of development of the country during industrialization (Williamson, 1965). He finds some evidence of a nonlinear relationship between regional inequality and national development. His conclusions are based on two main empirical facts: first, that regional inequality is higher in less developed countries and lower in more developed countries, and second, that regional disparities increase over time in less developed countries and decrease in more developed countries. Thus, regional income inequality can be regarded, in a sense, as a by-product of the process of development and industrialization, and any attempt to reduce its level may ultimately inhibit this process. Kim and Margo, through their research, present similar findings (Kim and Margo, 2003). They demonstrate that, in the United States, the rise of industrialization in the

second half of the 19th century increased regional income differences between regions. More recent studies of the European economy can also be considered quite significant in terms of the extent, to which regional inequality dynamics depend on national catch-up processes (in particular, the poorest member states of the European Union). In this context, D. Quah notes that Spain and Portugal, which achieved the highest economic growth rates in the 1980s, are also the countries that experienced the most striking increase in regional imbalances (Quah, 1996). Petrakos and Saratsis also find similar findings for Greece, finding that during the same 1980s, the most developed regions of that country experienced great difficulties due to intensified foreign competition (Petrakos and Saratsis, 2000). Other studies (Davies and Hallet, Petrakos et al.) also provide evidence of rising regional income inequalities in the poorest EU countries. It is also confirmed by the 2004 European Commission's report, which indicates that the then newly admitted countries, such as the Czechia, Hungary, Poland and the Slovak Republic, where the need to quickly catch up with the highly developed countries resulted in an upward trend of regional inequalities (European Commission, 2004). The authors of the report also indicate that regional inequalities tend to increase as the relative level of national GDP per capita increases, and then they start to have a decreasing tendency, after reaching a certain relative level of national GDP per capita. The issue of convergence is also taken up by Polish economists (Malaga, Łaźniewska et al.; Smętkowski, Gorzelak, Malina). The authors publish literature studies and empirical analyses to explain the processes of convergence and divergence, both at the international and regional level, using various statistical tools. The conclusions of those studies, which with their time span stop, at the latest, in the first decade of the 21st century, also confirm the existing thesis in the foreign literature about the existence of processes of regional divergence rather than convergence. Thus, the question arises whether the contemporary years of the 21st century are an illustration of economic convergence, or further divergence, leading to increase in disparities in the level of regional development in Poland. Therefore, this article attempts to analyze the issue of changes in regional disparities based on data on the Polish economy in the first twenty years of the 21st century. It can be argued that the Polish economy is a rather interesting case study in this time frame, during Poland's accession to the European Union, the financial crisis and the beginning of the COVID-19 pandemic. Structural and economic changes that Poland has faced in the last two decades may have had a significant impact on the dynamics of regional inequality. This issue is important because the knowledge of mechanisms and regularities of regional development is the basis for shaping a regional and national policies, that would ensure high and sustainable economic growth rate on the one hand, and on the other, would lead to a reduction in regional inequalities. This issue is also aligned with Article 174 and 178 of the Treaty on the Functioning of the European Union, which formulates the pursuit of regional policy to "reduce disparities between levels of development in the various regions" (Treaty on the Functioning of the European Union, 2012).

2. Methods

The research in this article is based on annual indicators of the level and growth rate of gross domestic product (GDP) and GDP per capita. These are the main indicators used to measure economic growth and development, despite their criticism and imperfections (Łaźniewska, et al, 2011). The statistical data, presented according to NUTS-2 classification, comes from 16 Polish Provinces (also called regions): Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Lubuskie, Łódzkie, Małopolskie, Mazowieckie, Opolskie, Podkarpackie, Podlaskie, Pomorskie, Śląskie, Świętokrzyskie, Warmińsko-Mazurskie, Wielkopolskie and Zachodniopomorskie. The main source of data is the Local Data Bank of Statistics Poland (GUS-Local Data Bank). Moreover, the values of shares of the industrial sector in provinces are compared. To analyze changes in the selected indicators, statistical data are collected for over twenty years, from 2000 to 2020. Only statistics for industry sector cover only the 2000-2019 period, due to the lack of homogeneity of their calculations in Statistics Poland. The different authors propose various statistical tools that describe and measure differences between variables. In this study, the selected element of descriptive statistics and the classical coefficient of variation (cv) has been chosen. This coefficient is calculated as the quotient of the standard deviation and the mean value for variables, in each province during the analyzed period. If the value of this coefficient exceeds 40%, it means high diversity. And accordingly, the more the values are below 40%, the smaller the variation of the variables is. These elements are used for presentation and interpretation of changes in selected indicators, in the context of regional disparities and convergence or divergence processes. A histogram will also be used as one of the graphical means of visualizing the distribution of variables under study. It is used to present the frequency of occurrence of a given analyzed variable in selected period. All own calculation results are presented in the Appendix in Tables.

3. Results and discussion

Analyzing the 2000-2020 GDP values, it could be noticed a regular growth of production in all provinces. Figure 1 shows the GDP in subsequent years (vertically) in each province. In the analyzed period, Mazowieckie, Śląskie and Wielkopolskie provinces are the ones with the highest GDP level. 20 years later, they are still the leaders.
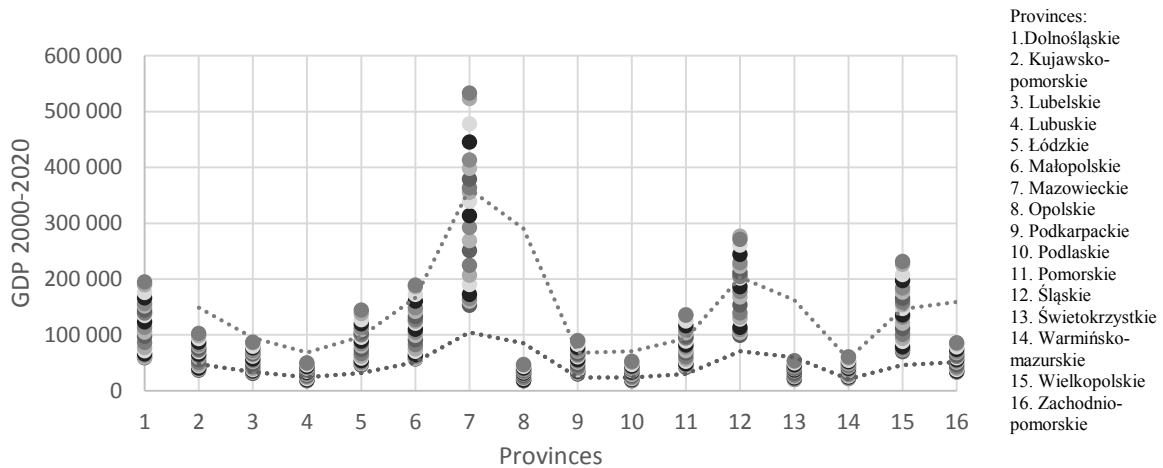
Figure 1. GDP in 2000-2020 by province. Own analysis based on data from Statistics Poland.

As seen in Table 1 and Table 2 (Appendix) some of the provinces that multiplied the GDP level the most in 2022, compared to 2000, are Mazowieckie (248%), Małopolskie (235%) and Dolnośląskie (231%). At the end of analyzed time period (at the beginning of pandemic), the Śląskie Province has the largest decrease while the Łódzkie Province has the highest increase. Yet all provinces record a decline, but not the same for all of them in GDP growth rate at the end of the period. The presented statistical data indicates that there are disparities in the GDP level in the analyzed provinces. In the discussed period the distance between the Mazowieckie Province and the other provinces is increasing. This province has not only the highest growth since 2000, but also the highest average annual GDP growth (over 6% on average). The lowest growth increase (below 5% on average per year) is characteristic for Zachodniopomorskie Province. The biggest gap compared to the Mazowieckie Province is recorded for the Opolskie Province, both at the beginning and at the end of the analyzed period. The highest variability of the value and of the GDP growth in the analyzed 20 years period is observed in the Opolskie (about 85%), Świętokrzyskie (67%) and Śląskie (66%) provinces. The lowest coefficient of variation is found for the Łódzkie Province (37%). However, such high coefficients of variation for almost all the regions may indicate a lack of tendency to balance the level of GDP.
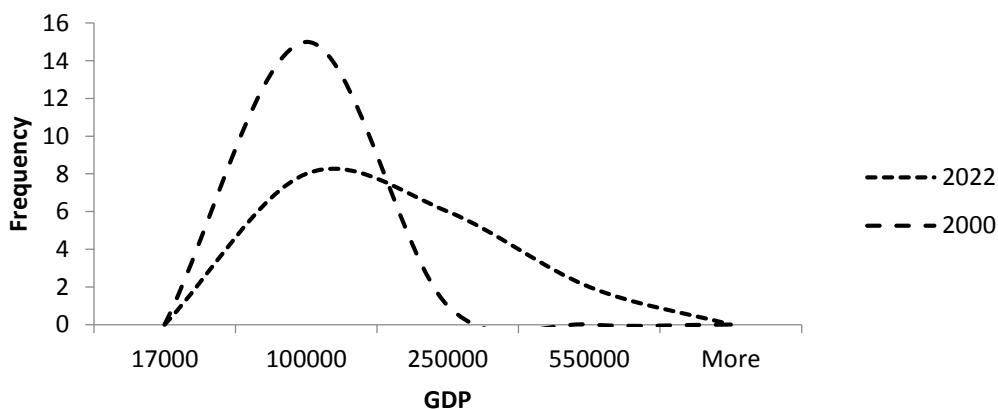

Figure 2. GDP histogram for 2000 and 2020. Own analysis on data from Statistics Poland.

The plotted lines on Figure 1 graphically indicate greater diversity of the analyzed variable in 2020 compared to 2000. While grouping provinces by GDP levels, it can be assumed the division into three groups (Table 7, Appendix). The first group, with the highest GDP level (over or almost 200 billion PLN), includes the following provinces: Mazowieckie, Dolnośląskie, Śląskie and Wielkopolskie. The second group comprises Małopolskie, Łódzkie and Pomorskie Provinces. The remaining provinces, with GDP below 100 billion PLN, are classified in the third group. The graph presented in Figure 2 shows a flattening and a slight shift to the right of the 2020 graph compared to 2000. This indicates an improving situation, in which more regions have a higher level of GDP. However, along with the increase in the level and of GDP growth, there is an increase in the diversification of this indicator between regions.

When analyzing the GDP per capita, also as in the case of GDP, an upward trend can be observed in all provinces (Figure 3) and (Table 3 and 4, Appendix). Only at the end of the analyzed period, at the turn of 2019-2020, several provinces (Śląskie, Podkarpackie and Pomorskie) record a decrease in this variable. The highest level at the beginning of the analyzed period is shown in the following provinces: Mazowieckie, Śląskie and Wielkopolskie. The lowest level is evidenced in Lubelskie, Podkarpackie and Podlaskie provinces. At the end of the analyzed period, there is a change in the leading position, where Dolnośląskie Province took the second place after Mazowieckie. Wielkopolskie and Śląskie provinces still showed high GDP per capita values.
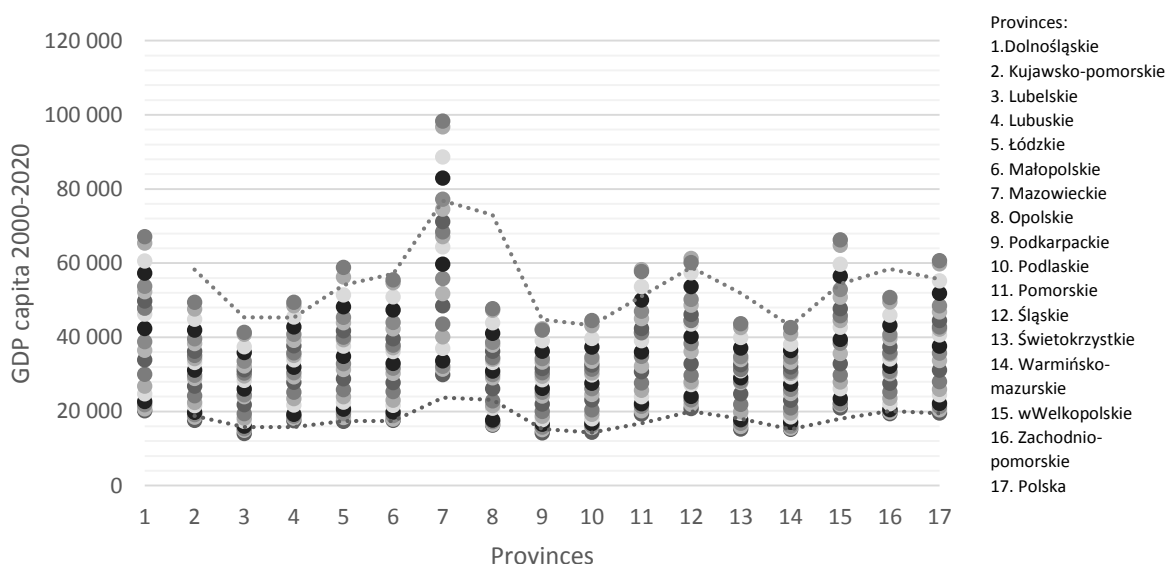

Figure 3. GDP per capital in 2000-2020 by province and in Poland. Own analysis based on data from Statistics Poland.

The lowest values are observed in the following provinces: Lubelskie, Podkarpackie and Warmińsko-Mazurskie. On the other hand, the Wielkopolskie Province recorded a fairly large increase in GDP per capita, the highest of all analyzed regions. The unquestionable,

independent leader in terms of GDP per capita throughout the studied period is still the Mazowieckie Province. An interesting situation can be observed where only three provinces at the beginning of the analyzed period have a higher GDP per capita than the size of this indicator for the whole country: Dolnośląskie, Mazowieckie and Śląskie, but at the end of this period only two provinces, i.e. Dolnośląskie and Mazowieckie. Compared to the Mazowieckie Province, the Lubelskie Province was the farthest behind. If categorize provinces into groups by this indicator, it can be divided into four groups, assigning the Mazowieckie Province to the first group (Table 7, Appendix). The second group includes provinces with GDP per capita above 60 thousand PLN, i.e.: Dolnośląskie, Śląskie and Wielkopolskie. These are also the regions with higher or equal to Polish GDP per capita. The provinces with GDP per capita between 50 and 60 thousand PLN are: Małopolskie, Łódzkie, Pomorskie and Zachodniopomorskie, which can be assigned to the third group. In the group of regions with the lowest level (below 50 thousand PLN) of GDP per capita are the Kujawskie, Lubuskie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie and Warmińsko-Mazurskie. Coefficient of variation of this parameter for all provinces are less than 40%, which can be interpreted as an average level of variation. The highest average growth can be observed in Dolnośląskie and Mazowieckie provinces. However, the greatest coefficient in the growth of GDp per capita occurs in the Opolskie Province. Differences in changes in GDP per capita growth are also another argument for the existence of disparities between provinces and a deepening of this disparity at the end of the analyzed period. This is also confirmed by the graphic lines (upper for 2020, lower for 2000) on Figure 3.

Comparing both indicators GDP and GDP per capita, the differences between the provinces are smaller for the latter variable, compared to the corresponding period of change in total GDP. Thus, it could be concluded that the distribution of GDP per capita across regions is less skewed.
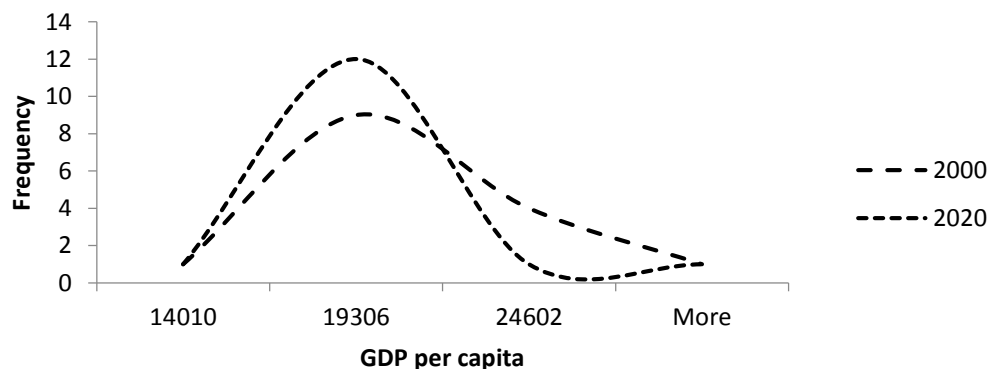
Figure 4. GDP per capita histogram for 2000 and 2020. Own analysis based on data from Statistics Poland.

The interpretation of the GDP per capita histogram is, in fact, the same as for GDP (Figure 4). The flattening and slight rightward shift of the 2020 graph compared to 2000 indicates an improvement, more regions having a higher level of GDP per capita. Thus, it can be concluded that, with the increase in the level and growth of GDP per capita, there is a slight increase in variation and disparities of this indicator among provinces.

Another parameter compared is the share of the industrial sector in GDP (Figure 5) and (Table 5 and 6, Appendix). The highest share of the total value added of industrial production at the beginning of the analyzed period is notable for the Śląskie Province (17.37%), and a slightly lower share for the Mazowieckie Province (15.05%). However, at the end of the analyzed period both provinces' values are at almost the same level. However, in the case of the Mazowieckie Province, a decrease in this share in 2000-2011 is noticeable, followed by an increase. In the Śląskie Province, however, an increase in the share of the industrial sector until 2004 is noticeable, and then after Poland's accession to the European Union, its systematic decline. The following provinces are also in the lead in terms of the value added of industrial production throughout the analyzed period (apart from Mazowieckie and Śląskie): Dolnośląskie and Wielkopolskie. Comparing the coefficient of variation, it can be stated that the greatest variation in changes occurs in Lubuskie and Dolnośląskie, and the smallest in Podlaskie. This fact is graphically confirmed by the curves on Figure 5.

Provinces:
1. Dolnośląskie
2. Kujawsko-Pomorskie
3. Lubelskie
4. Lubuskie
5. Łódzkie
6. Małopolskie
7. Mazowieckie
8. Opolskie
9. Podkarpackie
10. Podlaskie
11. Pomorskie
12. Śląskie
13. Świętokrzyskie
14. Warmińsko-Mazurskie
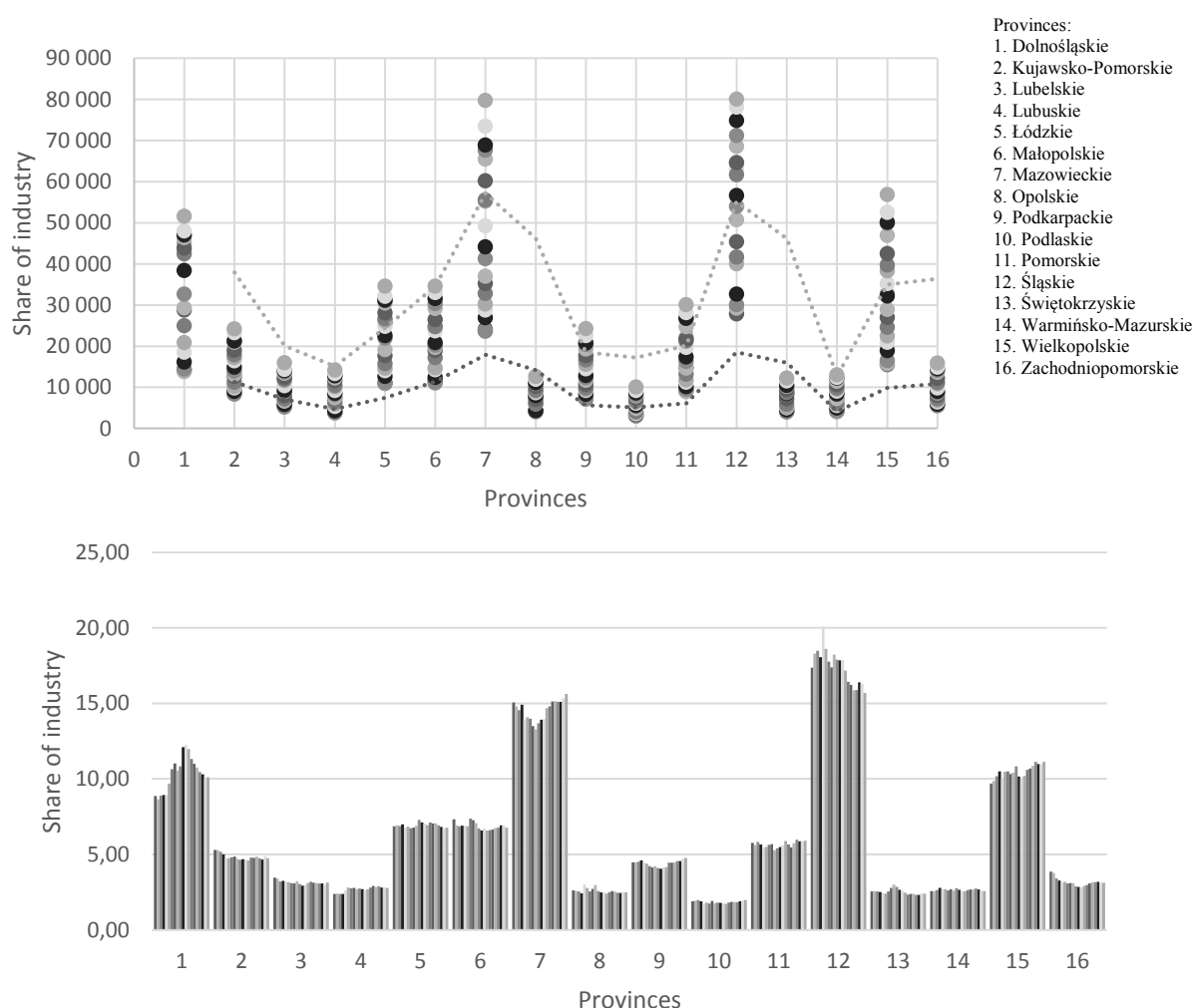15. Wielkopolskie
16. Zachodniopomorskie

Figure 5. Value added and share of industry sector in GDP in 2000-2019 by province. Own analysis based on data from Statistics Poland.

On the other hand, the highest increase in the share of the industry sector in the analyzed period can be observed in Lubuskie Province (16.7% in 2019 compared to 2000), and the highest decrease in Zachodniopomorskie Province (-19%). A characteristic phenomenon for this parameter is also a rather large irregularity of values in the analyzed period in all provinces and a lack of clear trend. In most regions, the decline in the share of industry took place mostly in 2009-2011. The opposite trend is characteristic, as already mentioned, for Śląskie Province, as well as for Dolnośląskie Province. Thus, it can be concluded that some provinces experienced reindustrialization (Mazowieckie), while others were deindustrialized (Kujawsko-Pomorskie, Lubelskie, Łódzkie, Opolskie, Śląskie, Świętokrzyskie and Zachodniopomorskie). Coefficients of variation for this variable were in the range of 30-40%. The highest value was found for the following provinces: Dolnośląskie, Lubuskie, Mazowieckie and Wielkopolskie. When analyzing this variable, it can be also created certain groups (Table 7, Appendix). The first group includes the leading provinces with the highest share of the industrial sector (over 10%): Śląskie, Mazowieckie, Wielkopolskie and Dolnośląskie. The second group (with the share of this sector in the range of 5%-10%): Łódzkie, Małopolskie and Pomorskie. The third group, with the lowest shares of industrial manufacturing, comprises the following provinces: Kujawsko-Pomorskie, Lubelskie, Lubuskie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie, Zachodniopomorskie and Warmińsko-Mazurskie. Interpretation of the histogram of industrial sector share in GDP differs slightly from that for previous variables (Figure 6). The graph is shifted strongly to the right, while, at the same time, it is flattened. This indicates that more of the analyzed regions were characterized by a higher share of the industrial sector in 2019 than in 2000. Some provinces experienced reindustrialization (Mazowieckie), while others were deindustrialized (Kujawsko-Pomorskie, Lubelskie, Łódzkie, Opolskie, Śląskie, Świętokrzyskie and Zachodniopomorskie).
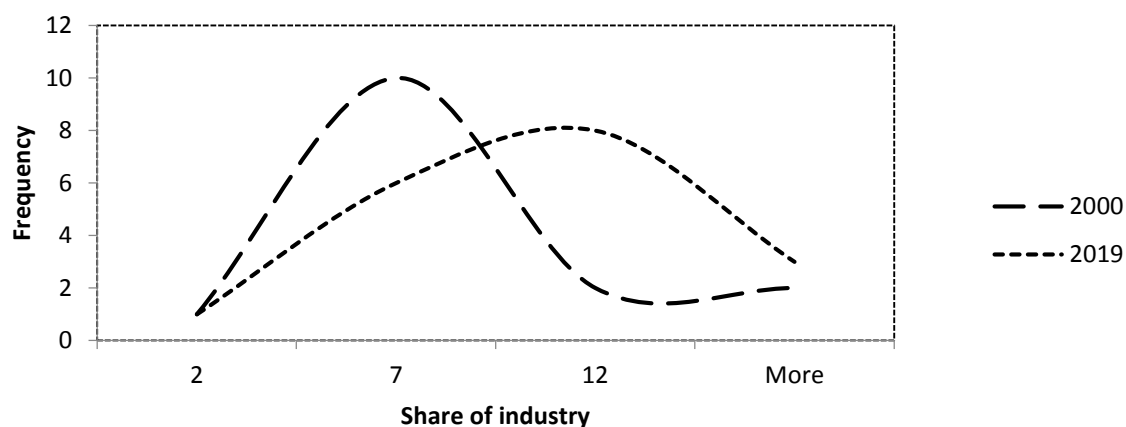

Figure 6. Industrial sector share histogram for 2000 and 2019. Own analysis based on data from Statistics Poland.

4. Summary

The paper attempts to analyze the changes in regional disparities and variation between the levels and growth rates of GDP, GDP per capita and the share of the industrial sector in total output, at the level of NUTS-2 classification. The collected data from the first two decades of the 21st century allow to formulate several conclusions. As can be seen from the presented results, at the regional level of the Polish economy can be observed a process of divergence rather than convergence. The analysis allows to conclude that there are disproportions between the size and growth rates of both GDP and GDP per capita, despite their increase during the entire period under analysis. Coefficients of variation calculated for consecutive years indicate that the rate of divergence after 2004 decreases slightly, which may indicate the spread of economic development throughout the country. Smaller disproportions occur in the values of GDP per capita than GDP, which is not surprising. The highest values of all analyzed indicators can be found in Mazowieckie Province. The distance between this province to other regions in the values of analyzed variables is greater at the end of the analyzed period. This conclusion is consistent with the previously mentioned research (e.g., Smętkowski, Malina). The share of the industrial sector in GDP, in all analyzed provinces increases. However, that changes in the share of the industrial sector in total value are not so ambiguous. Some provinces experience reindustrialization, while others are deindustrialized. The study of selected variables also does not indicate that the occurrence of characteristic events in the Polish economy (accession to the European Union, the financial crisis, the beginning of COVID-19) caused the same effects in individual regions. The comparison of the value of the share of industrial sector in GDP and the change in GDP per capita growth rates, gives rise to the following conclusions. The greater the share of the industrial sector in GDP, the higher the values of GDP and GDP per capita occur in a region, while contributing, according to the thesis indicated in the literature, to the further increase in their divergence of these parameters.

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Appendix

Table 1.
Descriptive Statistics of GDP for Polish Provinces in the period 2000-2020

PROVINCE	DESCRIPTIVE STATISTICS					
	Mean	Standard Deviation	Kurtosis	Skewness	Coefficient of variation	Confidence level (95%)
POLSKA	1448423.90	505012.43	-1.10	0.20	43.45	229878.90
DOLNOŚLĄSKIE	119726.57	44211.57	-1.24	0.09	51.74	20124.86
KUJAWSKO-POMORSKIE	65383.62	20618.41	-1.06	0.20	40.79	9385.39
LUBELSKIE	56659.05	18060.90	-1.22	0.12	52.36	8221.22
LUBUSKIE	32472.38	10354.84	-1.13	0.10	50.71	4713.47
ŁÓDZKIE	88666.86	30150.12	-1.01	0.20	37.08	13724.17
MAŁOPOLSKIE	113187.14	42505.27	-1.00	0.31	42.34	19348.17
MAZOWIECKIE	315526.10	121477.15	-1.04	0.28	42.00	55295.73
OPOLSKIE	31073.71	9463.24	-1.09	0.04	85.78	4307.61
PODKARPACKIE	56762.76	19223.96	-1.12	0.22	45.23	8750.64
PODLASKIE	32890.90	10786.43	-1.04	0.21	48.36	4909.92
POMORSKIE	83323.43	30219.53	-1.05	0.27	49.18	13755.76
ŚLĄSKIE	182791.90	56813.94	-1.18	0.07	66.29	25861.40
ŚWIĘTOKRZYSKIE	35921.52	10578.24	-1.08	-0.02	67.88	4815.16
WARMIŃSKO-MAZURSKIE	39116.24	12346.32	-1.19	0.09	41.17	5619.98
WIELKOPOLSKIE	139342.00	51695.55	-1.06	0.28	43.49	23531.53
ZACHODNIO POMORSKIE	55579.81	17020.15	-1.07	0.23	51.24	7747.48

Table 2.

GDP characteristics for Polish Provinces in the period 2000-2020

PROVINCE	CHARACTERISTICS				
	Minimum	Maximum	Growth 2000-2020	Average growth	Change in relation to Mazowieckie 2000-2020
	[mln PLN]	[mln PLN]	[%]	[%]	
POLSKA	748483.00	2326656.00	210.85	5.87	
DOLNOŚLĄSKIE	58630.00	194631.00	231.96	6.23	1.87
KUJAWSKO-POMORSKIE	36272.00	102302.00	182.04	5.34	4.55
LUBELSKIE	30925.00	86899.00	181.00	5.34	3.94
LUBUSKIE	17641.00	49897.00	182.85	5.37	2.19
ŁÓDZKIE	45657.00	144082.00	215.57	5.94	2.86
MAŁOPOLSKIE	56433.00	189295.00	235.43	6.27	1.43
MAZOWIECKIE	152817.00	533233.00	248.94	6.48	0.00
OPOLSKIE	17476.00	46805.00	167.82	5.14	2.66
PODKARPACKIE	29882.00	89832.00	198.35	5.65	2.83
PODLASKIE	17431.00	52383.00	200.52	5.69	1.58
POMORSKIE	41914.00	136063.00	222.88	6.08	2.05
ŚLĄSKIE	99189.00	277029.00	173.11	5.21	14.11
ŚWIĘTOKRZYSKIE	19891.00	53686.00	169.90	5.15	2.95
WARMIŃSKO-MAZURSKIE	21620.00	60465.00	179.67	5.30	2.81
WIELKOPOLSKIE	69838.00	231752.00	231.84	6.22	2.24
ZACHODNIOPOMORSKIE	32867.00	85846.00	161.19	4.95	5.41

Table 3.

Descriptive Statistics of GDP per capita for Polish Provinces in the period 2000-2020

PROVINCE	DESCRIPTIVE STATISTICS					
	Mean	Standard Deviation	Kurtosis	Skewness	Coeffcient of variation	Confidence level (95%)
POLAND	36602.40	12302.54	-1.05	0.20	33.61	5757.76
DOLNOŚLĄSKIE	39946.15	14372.72	-1.25	0.08	35.98	6726.64
KUJAWSKO-POMORSKIE	30521.15	9197.10	-1.03	0.20	30.13	4304.38
LUBELSKIE	25537.30	8226.87	-1.14	0.17	32.22	3850.29
LUBUSKIE	31109.35	9566.60	-1.06	0.12	30.75	4477.31
ŁÓDZKIE	33963.70	11730.58	-1.03	0.19	34.54	5490.08
MAŁOPOLSKIE	32816.85	11375.91	-0.93	0.30	34.66	5324.09
MAZOWIECKIE	57719.20	20487.12	-1.04	0.23	35.49	9588.27
OPOLSKIE	29774.10	9570.89	-1.08	0.08	32.15	4479.31
PODKARPACKIE	26028.85	8450.49	-1.01	0.25	32.47	3954.95
PODLASKIE	26705.35	8609.32	-1.02	0.20	32.24	4029.29
POMORSKIE	35583.10	11715.60	-0.95	0.25	32.92	5483.07
ŚLĄSKIE	38596.90	12344.88	-1.07	0.14	31.98	5777.58
ŚWIĘTOKRZYSKIE	27570.40	8253.64	-1.03	0.03	29.94	3862.82
WARMIŃSKO-MAZURSKIE	26468.00	8050.35	-1.17	0.10	30.42	3767.68
WIELKOPOLSKIE	39181.40	13507.35	-1.02	0.26	34.47	6321.64
ZACHODNIOPOMORSKIE	31664.80	9281.39	-0.98	0.26	29.31	4343.82

Table 4.

GDP per capita characteristics for Polish Provinces in the period 2000-2020

PROVINCE	CHARACTERISTICS				
	Minimum	Maximum	Growth 2000-2020	Average growth	Change in relation to Mazowieckie 2000-2020
	[PLN]	[PLN]	in %	in %	
POLAND	19565.00	59741.00	210.06	5.90	
DOLNOŚLĄSKIE	20116.00	65392.00	233.80	6.34	-1.07
KUJAWSKO-POMORSKIE	17530.00	47558.00	182.03	5.41	8.31
LUBELSKIE	14010.00	40771.00	194.90	5.65	4.80
LUBUSKIE	17495.00	48499.00	182.33	5.42	8.24
ŁÓDZKIE	17345.00	56209.00	239.23	6.34	-1.88
MAŁOPOLSKIE	17552.00	54678.00	215.91	6.00	2.26
MAZOWIECKIE	29898.00	96725.00	228.57	6.18	0.00
OPOLSKIE	16294.00	47272.00	192.89	5.54	5.92
PODKARPACKIE	14225.00	42225.00	194.81	5.65	4.89
PODLASKIE	14387.00	43128.00	209.46	5.91	2.80
POMORSKIE	19328.00	58202.00	198.37	5.74	5.94
ŚLĄSKIE	20769.00	61234.00	189.33	5.51	8.30
ŚWIĘTOKRZYSKIE	15260.00	42608.00	186.02	5.51	6.61
WARMIŃSKO-MAZURSKIE	15167.00	40883.00	180.65	5.41	7.40
WIELKOPOLSKIE	20897.00	64763.00	216.83	6.01	2.50
ZACHODNIOPOMORSKIE	19361.00	49496.00	161.87	5.05	13.15

Table 5.

Descriptive Statistics of share of industry sector in GDP for Polish Provinces in the period 2000-2019

PROVINCE	DESCRIPTIVE STATISTICS					
	Mean	Standard Deviation	Kurtosis	Skew-ness	Coefficient of variation	Confidence Level (95%)
POLSKA	295610.00	103504.31	-1.38	0.14	35.01	51471.48
DOLNOŚLĄSKIE	31523.67	12880.40	-1.70	-0.15	40.86	6405.27
KUJAWSKO-POMORSKIE	14141.06	4665.98	-1.37	0.26	33.00	2320.34
LUBELSKIE	9223.78	3071.58	-1.38	0.24	33.30	1527.46
LUBUSKIE	8046.89	3166.91	-1.26	0.14	39.36	1574.87
ŁÓDZKIE	20574.33	7328.55	-1.52	0.09	35.62	3644.40
MAŁOPOLSKIE	20201.50	6776.33	-1.18	0.17	33.54	3369.79
MAZOWIECKIE	42814.56	16011.83	-1.33	0.38	37.40	7962.50
OPOLSKIE	7582.56	2462.42	-1.24	-0.05	32.47	1224.53
PODKARPACKIE	12859.11	4647.30	-1.13	0.43	36.14	2311.05
PODLASKIE	5386.00	1876.97	-1.23	0.31	34.85	933.40
POMORSKIE	16711.56	6123.34	-1.24	0.32	36.64	3045.06
ŚLĄSKIE	51049.28	15467.16	-1.36	-0.11	30.30	7691.64
ŚWIĘTOKRZYSKIE	7414.56	2382.30	-1.59	-0.26	32.13	1184.69
WARMIŃSKO-MAZURSKIE	7852.39	2778.48	-1.23	0.19	35.38	1381.70
WIELKOPOLSKIE	31047.61	11690.91	-1.16	0.26	37.65	5813.75
ZACHODNIO POMORSKIE	9181.00	2989.36	-0.96	0.56	32.56	1486.57

Table 6.
Share of industry sector in GDP characteristics for Polish Provinces in the period 2000-2019

PROVINCE	CHARACTERISTICS				
	Minimum	Maximum	Growth 2000-2019	Average industry share	Change in share 2000-2019
	[mln PLN]	[mln PLN]	[%]	[%]	
POLSKA	159812	456771	218.54		
DOLNOŚLĄSKIE	13802	47113	263.13	10.36	14.00
KUJAWSKO-POMORSKIE	8415	21302	186.02	4.83	-10.21
LUBELSKIE	5201	14084	188.64	3.14	-9.39
LUBUSKIE	3822	12934	271.77	2.69	16.71
ŁÓDZKIE	10983	31185	215.34	6.92	-1.00
MAŁOPOLSKIE	11055	31595	195.00	6.87	-7.39
MAZOWIECKIE	23651	68939	230.61	14.53	3.79
OPOLSKIE	4092	11150	202.81	2.58	-4.94
PODKARPACKIE	7129	20826	238.30	4.39	6.20
PODLASKIE	3022	8616	234.75	1.84	5.09
POMORSKIE	8980	26824	226.25	5.66	2.42
ŚLĄSKIE	27848	74882	187.67	17.39	-9.69
ŚWIĘTOKRZYSKIE	4079	10538	200.51	2.52	-5.66
WARMIŃSKO-MAZURSKIE	4113	12266	217.63	2.65	-0.28
WIELKOPOLSKIE	15524	50128	266.27	10.48	14.98
ZACHODNIOPOMORSKIE	5547	14507	157.84	3.15	-19.06

Table 7.
Groups of provinces by indicators

INDICATOR	PROVINCES			
	Group 1	Group 2	Group 3	
GDP	Mazowieckie	Śląskie, Wielkopolskie, Dolnośląskie	Małopolskie, Łódzkie, Pomorskie	Kujawsko-pomorskie, Lubelskie Lubuskie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie, Warmińsko-mazurskie Zachodnio-pomorskie
GDP PER CAPITA	Mazowieckie	Śląskie, Wielkopolskie, Dolnośląskie	Małopolskie Łódzkie, Pomorskie Zachodnio-pomorskie	Kujawsko-pomorskie, Lubelskie, Lubuskie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie, Warmińsko-mazurskie
SHARE OF INDUSTRY IN GDP	Mazowieckie	Śląskie, Wielkopolskie, Dolnośląskie	Małopolskie Łódzkie, Pomorskie	Kujawsko-pomorskie, Lubelskie, Lubuskie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie, Warmińsko-mazurskie, Zachodnio-pomorskie