sustainability

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Poland on the Path towards Sustainable Development—A Multidimensional Comparative Analysis of the Socio-Economic Development of Polish Regions

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Abstract: The aim of the paper is to conduct research and present the results of a taxonomic analysis assessing the 2019 and 2020 implementations of socio-economic sustainability goals in the Lubuskie Province as compared with other Polish regions. To this end, a multidimensional comparative analysis was performed to determine the level of socio-economic development of the Lubuskie Province and then benchmark it against other regions in the context of sustainable development. The research was based on independent indicators developed with the use of linear ordering methods and accounting for aspects of socio-economic development such as the economic potential, innovation of the economy, sustainable production patterns, demographic changes, job market, and social integration. Synthetic measures were developed with the use of the proposed partial indicators (independent variables), which, according to the authors, best illustrate the socio-economic development and sustainability at the regional level. The regions were then grouped by level of economic development, and the groupings were assessed for their performance. The research shows that in 2020, compared to 2019, the overall level of economic development deteriorated in all Polish regions, but the pandemic has so far had significantly less impact on the social area.

Keywords: multidimensional comparative analysis; sustainable development; socio-economic development; Polish regions

Citation: Barska, A.; Jędrzejczak-Gas, J.; Wyrwa, J. Poland on the Path towards Sustainable Development—A Multidimensional Comparative Analysis of the Socio-Economic Development of Polish Regions. *Sustainability* **2022**, *14*, 10319. https://doi.org/10.3390/su141610319

Academic Editor: Antonio Boggia

Received: 22 July 2022
Accepted: 15 August 2022
Published: 19 August 2022

1. Introduction

The idea of sustainable development emerged from analyzing the rapid and unrestrained pace of population growth, with uncontrolled use of natural resources, increased environmental degradation, and the unrestrained consumption growth. In addition, the deepening disparities between the highly developed and the developing countries have become significant in terms of the quality of their inhabitants' lives [1,2]. Sustainable development of regions is a complex process, which includes changes in both the quantitative and qualitative aspects taking place in the sphere of social, economic, and environmental activities [3–6]. The process of regional development takes place in changing conditions, which include endogenous factors related to the effective use of the internal economic and social potential of the region, as well as exogenous conditions, which undoubtedly include the crisis caused by the COVID-19 pandemic. This crisis has had undesirable consequences, but it has also exposed the weaknesses of regional economies. The vulnerability level in regional economies depends on their resilience to disruptions [7]. The crisis, which revealed the imperfections of regional economies, should therefore be treated as an impulse for changes aimed at building greater resistance to various external impacts that are likely to occur in the future. According to the research, the most vulnerable to crisis are the highly developed regions, but they also have low sensitivity and high ability to react to negative impacts [8] (p. 9). Due to this situation, we are observing a growing problem with socially and territorially sustainable development, one that "develops and effectively uses local resources and potentials of all territories, and in particular supports the development of

areas less resistant to crisis, the ones that cannot fully develop their potential or have lost their socio-economic functions" [9] (p. 38).

In Poland, the regional policy after 2020 will focus on initiating sustainable development in areas with less favorable development conditions, using local resources and potentials of the territories being supported [8] (p. 25). Such wording signals abandoning the previously preferred polarization and diffusion model and focusing development activities on the largest urban agglomerations. It was found that the range of development impulses from voivodeship centers was insufficient, which contributed to the increase in intraregional and interregional differences.

Local government entities act in various conditions that determine the possibilities and barriers to sustainable development stimulation in specific spatial conditions. Spatial diversity is related to natural, social, or economic conditions of individual regions. Thus, the transformation of regions occur with varying intensity. In Poland, the most prone to changes are voivodships associated with large urban agglomerations, with a rich economic structure and a high share of services. For years, Poland was a country with a stable rate of economic growth, faster than the EU average. In 2016–2019, the average annual growth rate in Poland was 4.5%, while in the EU it was 2.1%. The situation changed in 2020, when as a result of the COVID-19 pandemic, Poland experienced the first decline in GDP since the transformation of the economy. Gross domestic product decreased by 2.7% compared to 2019, but it was one of the smallest decreases among EU countries, where the GDP fell on average by 6%. In the 2020 list of countries implementing 17 Sustainable Development Goals (Global SDG Index), Poland took the high 23rd place (out of 166 countries assessed) with a result of 78.1%. However, taking into account its position in the Spillover Index, Poland was only 117th out of 166 countries with a score of 81.81 points. On the other hand, in the European edition of the SDG Index, Poland was awarded a lower result than the Global SDG Index (69.6%), giving Poland the 16th place among 31 European countries included in the list of countries implementing 17 of the Sustainable Development Goals. Importantly, Poland's result in achieving SDGs is below the EU average (70.7%).

Presenting multifaceted problems of sustainable development of regional entities and their assessment is a very complex issue, especially when overlapped by a pandemic crisis. Therefore, the aim of the article is a multi-faceted assessment of the level of sustainable development of the Lubuskie Voivodeship in terms of socio-economic development compared to other regions of Poland in 2019 and 2020. Multidimensional methods are a helpful tool in assessing the sustainable development of regions. They enable linear ordering of objects in multidimensional diagnostic spaces. Equally important are grouping methods, as they allow us to create groups of similar objects in terms of the analyzed phenomenon. The authors' intention is to define the role of the ongoing COVID-19 pandemic in the implementation of the principles of sustainable development. It should be emphasized, however, that the COVID-19 pandemic is not over and therefore its overall impact on the socio-economic consequences cannot yet be studied. Currently, it is only possible to describe the impact of a pandemic at a given time by making prognostic attempts.

The study covered all 16 voivodeships (regions, province) of Poland, but the authors focus primarily on the Lubuskie region as its publication was possible thanks to the financial support of the Board of the Lubuskie Voivodeship as part of the "Small Donations for Public Universities" grant.

2. The COVID-19 Pandemic and the Sustainable Development Goals

In recent decades, with the increasing prosperity of many societies in the world, the interest in issues related to sustainable development has increased significantly. According to T. Borys [10] (p. 79), in the economic sciences, sustainable development is treated as a paradigm imposed on economics from outside, e.g., by ecological institutions, international organizations, or legal regulations, and not necessarily as paradigm that is itself a "product" of the economy. However, this should not prejudge or depreciate the importance of sustainable development in economics. According to G.W. Kołodko [11] (p. 139), economics

in the light of the new paradigm should be oriented towards co-shaping the economic future of the world on the basis of the principles of moderation and triple sustainable development—economic, social, and ecological. This perfectly illustrates a comprehensive (evolutionary) approach to sustainable development, in which it is treated as the last stage of the specific maturation of the economy to new ways of thinking about development perspectives [12] (p. 349). In this approach, the first phase is to identify development with growth, next to discover the distinctiveness of the economic growth and development categories, and then to take into account the social aspect, and finally to reach the stage of sustainable development [13] (pp. 79–84). Identifying development with growth is characteristic of the industrial economy and the accompanying paradigm of mainstream economics. It is assumed that the improvement of material living conditions translates into development processes, as a high level of income guarantees a high level of consumption and optimal satisfaction of needs, including the non-material ones. The growth in income and the growth in the size of the economy are thus expected by both producers and consumers. The second phase is realizing that growth is only a quantitative change in the economy, and development should be qualitative [14] (p. 77). The structure of the economy should therefore undergo changes that lead to an increase in the share of the services and high technologies sector, as well as to invest in knowledge at the expense of declining industries. There should also be changes in line with the development of productive forces in the ownership structure, state policy, and the shape of the public sector. Therefore, economic growth should translate into improving the condition of the economy and stimulating the dynamics of development processes. The third phase is socio-economic development. Development is seen here as a process of changes that are positively assessed by the citizens who feel more secure, or at least do not believe that the situation has worsened. The final stage of the process outlined in this way is a sustainable development that needs to include the economic, social, and environmental issues as the target phase in the maturation of the economy and of the whole of human civilization to meet a certain development ideal [12] (pp. 350–351).

The COVID-19 pandemic is a new chapter that has led to the reorganization of the way the economy works and the way development processes are perceived. It resulted in the emergence of many empirical phenomena, as well as research, analyses, and scientific concepts of significant importance to the future of economics as a science [12] (p. 151). The pandemic turned out to be a serious challenge for both economic theory and economic policy, and a test of their efficiency in managing crisis situations. The pandemic is not only a health, social, and humanitarian crisis, but it also constitutes a dramatic economic breakdown. There are opinions in the literature that classify it as the worst peacetime crisis in over 50 years [15–22]. Economists refer to the pandemic in terms of a 'black swan', i.e., a sudden and unforeseeable event. The 'black swan' theory is usually associated with N.N. Taleb [23,24], who attributed three features to the phenomenon, namely: (1) high rarity, (2) extreme influence, and (3) retrospective predictability. The COVID-19 pandemic meets all of the above characteristics. The occurrence of global pandemics in the modern world is an extremely rare phenomenon: cases of this scale were last recorded about 100 years ago during the 'Spanish flu'. The current pandemic is massive, global, and affects every area of human life. The pandemic crisis is of a supply and demand type [25–32]. Contrary to the previous pandemics, which had a single channel of transmission of the shock impact on the economy, the channels of transmission of the COVID-19 crisis to the real economy covered both its supply side (e.g., breaking production chains, shipping difficulties, lack of employees due to the restrictions implemented), as well as demand (decrease in consumption due to social restrictions, increase in uncertainty, decrease in income, and postponement of consumption and investments).

The exact impact of the COVID-19 pandemic on economies will not be known until long after it ends. At the present stage, however, a number of organizations and economists create predictive models in which the impact of the crisis on basic macroeconomic indicators is estimated. Among the many studies of this type, the reports should be listed by the

following bodies: The International Monetary Fund (IMF), the Organization for Economic Co-operation and Development (OECD) and the European Commission (EC). The report of the World Economic Forum entitled 'Global Risk 2021' [33] (p. 7). states that the COVID-19 pandemic is exacerbating existing disparities and social divisions, and its impact on the economy is likely to be seen for the next 3 to 5 years. Additionally, within 5–10 years it may lead to a weakening of geopolitical stability. In addition, the COVID-19 pandemic has also increased the long-term inequalities in health, economy, and digitalization. These disparities can further hamper the global cooperation needed to address long-term challenges such as, for example, environmental degradation.

In the context of the pandemic's impact on the SDGs, four areas can be considered the most important [34] (p. 160).

(1) To eradicate poverty in all its forms worldwide (goal 1);
(2) To eliminate hunger, to achieve food security and better nutrition, and to promote sustainable agriculture (goal 2);
(3) To ensure a healthy life for all people of all ages and promote well-being (goal 3);
(4) To promote stable, sustainable, and inclusive economic growth, as well as full and productive employment and decent jobs for all (goal 8).

The negative effects of the coronavirus pandemic vary territorially. As is the case with sections and branches of the economy, the perceived effects are not uniform across all provinces. The territorial dimension of the crisis depends on at least three factors: (1) the presence of disease outbreaks, (2) the economic structure and its vulnerability to shocks, and (3) the territorial unit's resilience to crises [8] (pp. 45–47). The development of COVID-19 disease occurred mainly in selected outbreaks, spatially aggravating all problems related to the pandemic. In China, where the pandemic began, more than 80% of confirmed cases were in Hubei Province [35]. In Italy, the country most affected at the onset of the pandemic, around 60% of the cases were reported in the three northern provinces: Lombardy, Piedmont, and Emilia-Romagna [36]. In Poland, the largest number of cases was recorded in Silesia, about 40% of all cases [37]. Due to the concentration of disease outbreaks in selected areas, they are disproportionately burdened with the consequences. The distribution of economic problems is also asymmetrical. As indicated earlier, the negative consequences of the global pandemic were felt by enterprises from different sections and sectors of the economy differently. For this reason, its effects were most severely experienced by provinces concentrating a large number of enterprises operating in industries particularly vulnerable to the crisis and disruptions in the product development chain [38]. Another factor differentiating regional economies is resistance to crisis phenomena. The pandemic has put local governments in a completely new situation, demanding efficient crisis management and dealing with current problems. The main task of territorial units was to maintain the functioning of the critical infrastructure, including health, transport, public service, and order, as well as recreational services. The challenge was to adapt the systems to the current national restrictions. The provision of basic services was associated with the need to adapt the labor system, capable of functioning while maintaining social distance, the lack of the possibility to organize direct meetings, and the need to protect employees particularly vulnerable to illness. Providing services in the new reality also meant rapid changes in the digitization of public offices, which were the condition for maintaining the current availability of public services.

The 2019 UN report [39] indicated that, if the current trends in 2030 are maintained, the share of people living in extreme poverty will be 6% of the global population. In the case of the second goal—the number of malnourished people increased from 784 million in 2015 to 821 million in 2017. Considering the 8th goal, it was assumed that the economic growth in the Least Developed Countries (LDCs) should be 7% per year, but in 2010–1017 it reached 4.8%. In 2019, it was forecast that in the year 2020 "growth in LDCs is expected to climb to 5.7 percent in 2020 owing to favorable external economic conditions along with stable commodity prices that encourage financial flows and investment in natural resource projects and infrastructure" [39] (p. 38). These conditions were not met. The research

confirmed the negative impact of the pandemic on the implementation of the Sustainable Development Goals [40–46]. For most of the 17 strategic goals, the impact of the pandemic on their implementation is negative; only in three cases is it positive, and in a few others it is mixed and ambiguous [47]. The pandemic has been identified as a threat to the achievement of the SDGs, especially with regard to poverty. It also indicates that the pandemic has put 420 million people below the poverty threshold [41] (pp. 159–160). Moreover, the pandemic has caused, apart from crises in education, health, and the economy, a number of psycho-social problems in various countries. The level of uncertainty triggered by the pandemic has led to a decline in employment and an unemployment increase. The Human Development Index declined after 30 years of growth, indicating increasing inequalities in health, education, and employment.

3. Materials and Methods

The territorial scope of the research concerns Poland, a country located in Central Europe (see Figure 1). The administrative area of Poland is 312,696 km^2, which gives it 69th place in the world and 9th in Europe. In 2021 inhabited by 38,179,800 people, it ranks 38th in the world in terms of population and 5th in the European Union. Poland is divided into 16 province/voivodeship. Lubuskie Voivodeship (Province) is located in western Poland, established in 1999, and is the smallest region of Poland with an area of 13,988 km^2. In 2020, it was inhabited by 1,010,177 people. The capital city of Poland is Warsaw and it's the largest city. Poland has been a member of the EU since 1 May 2004 (Figure 1). The sectors of the Polish economy in 2020 were wholesale and retail trade, transport, accommodation, catering services (24.9%), industry (24.2%), and activities related to public administration, defense, education, health care, and social assistance (15.3%). Trade with other EU countries accounts for 74% of Polish exports (29% to Germany, 6% to the Czech Republic, and 5% to France). Exports to Great Britain are 6%, and to Russia and the United States are 3% each. Regarding imports, 67% come from EU Member States (27% from Germany, 6% from The Netherlands, and 5% from Italy). Import from China is 10% and from Russia 4%.

Figure 1. Location of Poland on the map of the European Union. Source: own study.

The aim of the research is to assess the impact of the COVID-19 pandemic on the socio-economic development of Polish regions in the context of the implementation of the concept of sustainable development. In order to achieve the research objective, synthetic indicators were calculated for all regions of Poland before the pandemic (2019) and in the first year of the pandemic (2020), then:

- The differences between the values of these indicators in individual regions in 2019 and 2020 were compared and analyzed.
- On the basis of synthetic indicators, rankings of Polish regions in 2019 and 2020 were prepared and compared.

- Grouping of Polish regions was carried out due to the similar level of socio-economic development in 2019 and 2020.

The synthetic indicators were constructed on the basis of two methods of multidimensional analysis, i.e., the Hellwig method [48] and the TOPSIS method [49]. Both of them belong to the group of reference methods, but they use different principles of constructing the synthetic index. The use of two different reference methods will make it possible to compare the obtained results and it will be the so-called "confirmatory analysis". The 5 stages of the construction of synthetic measures using the Hellwig method and the TOPSIS method are presented below:

As a result of the substantive and formal analysis of variables, 31 indicators classified into six thematic groups were initially proposed (see Appendix A).

Demographic changes: D1—birth rate (per 1000 of population), D2—fertility rate, D3—foreign migration rate of working age people, D4—demographic dependency rates, D5—live births per 1000 of population, and D6—total deaths per 100,000 people.

Labor market: L1—unemployment rate (%); L2—employment rate for people aged 18–59/64; L3—professional activity rate, L4—people in households without working persons, people living in households with very low work intensity (population aged 0 to 59 years), and percentage of total population aged less than 60; L5—average monthly gross salaries in relation to the national average (%, Poland = 100).

Social integration: Y1—risk of poverty or social exclusion (%), and persons at risk of poverty or social exclusion; Y2—impact of social transfers (excluding pensions) on poverty reduction (percentage); Y3—extent of using community social assistance according to the income criterion; Y4—inequality of income distribution S80/S20; Y5—average monthly income per 1 person (PLN); and Y6—average monthly expenses per 1 person (PLN).

Economic potential: G1—dynamics of gross domestic product per capita (%), G2—investment outlays per capita (PLN), G3—gross value of fixed assets in enterprises per capita (%, Poland = 100), G4—the share of electricity consumption in the industrial sector in total consumption (%), G5—the share of electricity consumption in the transportation sector in total consumption (%), and G6—industry share in total water consumption (%).

Innovation: I1—share of innovative enterprises in the total number of enterprises (%), I2—patents granted by the PPO for 100,000 inhabitants, I3—share of people employed in R&D in the economically active population (%), and I4—share of enterprises that incurred expenditure on innovative activities in the total number of enterprises (%).

Sustainable production patterns: P1—outlays on fixed assets for environmental protection and water management per capita (PLN), P2—certified organic farms' share of agricultural land in total agricultural land (%), P3—renewable energy share in total electricity production (%), and P4—industrial sewage treated per 100 km^2 (dm^3).

The discriminant ability of the variables and their capacity (the degree of correlation with other variables) were examined. From the set of 31 potential variables, those where the value of the coefficient of variation was less than 10% (D2, D4, D6, L2, L3, L5, Y4, and Y5) were eliminated. Then, for each thematic area, an analysis of the Pearson correlation matrix was performed (The thematic areas reflect the goals and priorities of sustainable development. Each area is described by different indicators that have been selected using merit criteria. On the other hand, statistical criteria were used to select indicators within each thematic area). From each thematic area, one of the variables for which the correlation coefficient exceeded the threshold value of $r^* = 0.7$ (D5, G3) was eliminated (if the correlation coefficient takes a value from 0.7 to 0.9, then the relationship between the studied variables is significant, while if it is above 0.9, then the relationship is very strong [4]). Two highly correlated variables (correlation coefficient ≥ 0.7) convey similar information (in this case, the correlation is equivalent to carrying the same information about the studied regions); therefore, one of them was eliminated.

The nature of the variables was determined due to the way they affect the economic development. Therefore, a set of variables was designated as stimulants (D1, Y2, Y6, G1,

G2, G5, I1, I2, I3, I4, P1, P2, P3, and P4) and destimulants (D3, L1, L4, Y1, Y3, G4, and G6). None of the variables was nominative. The destimulants were transformed into stimulants.

The variables were normalized. In the Hellwig method, standardization was used for the normalization of variables ($z_{ij} = \frac{x_{ij} - \overline{x}_j}{S_j}$, x_{ij}—is the value of the j-th variable in the i-th thematic group, $\overline{x}_j$—is the variable average value, and S_j—is the standard deviation). With the TOPSIS method, the so-called zero unitarization was used ($z_{ij} = \frac{x_{ij} - \min\limits_i x_{ij}}{\max\limits_i x_{ij} - \min\limits_i x_{ij}}$).

Synthetic measures were calculated, and rankings of regions were prepared. In the Hellwig method, the coordinates of the pattern and the distances of individual regions from the pattern were determined (for the stimulant variables: pattern coordinates: $z_{0j} = \max_i\{z_{ij}\}$, distances of regions from the pattern $d_{i0} = \sqrt{\frac{1}{n}\sum_{i=1}^{m}(z_{ij} - z_{0j})^2}$). Then the values of the synthetic variable were determined ($s_i = 1 - \frac{d_{i0}}{d_0}$, $s_i \in [0;1]$, $\max_i\{s_i\}$—best region, $\min_i\{s_i\}$—worst region, $d_0 = \overline{d}_0 + 2S_d$, $\overline{d} = \frac{1}{n}\sum_{i=1}^{n} d_{i0}$, $S_d = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(d_{i0} - \overline{d}_0\right)^2}$. In the TOPSIS method, the coordinates of the pattern and the anti-pattern, as well as the distances of the regions from the pattern and anti-pattern were determined (for the variables stimulant: pattern $z_{0j}^{+} = \max_i\{z_{ij}\}$, anti-pattern $z_{0j}^{-} = \min_i\{z_{ij}\}$, distance of regions from the pattern: $d_{i0}^{+} = \sqrt{\sum_{j=1}^{m}\left(z_{ij} - z_{0j}^{+}\right)^2}$, distance of regions from anti-pattern: $d_{i0}^{-} = \sqrt{\sum_{j=1}^{m}\left(z_{ij} - z_{0j}^{-}\right)^2}$. Then the values of the synthetic variable were determined ($s_i = \frac{d_{i0}^{-}}{d_{i0}^{+} + d_{i0}^{-}}$, $s_i \in [0;1]$, $\max_i\{s_i\}$—best object, $\min_i\{s_i\}$—worst object).

Moreover, the value of Spearman's rank correlation coefficients between synthetic measures was calculated. The measures were determined with the Hellwig method and the TOPSIS method to test the convergence of the results. Regions were also grouped due to the similar level of socio-economic development in the context of sustainable development. By using the so-called threshold method [50] four groups of regions were determined: (1) regions with a very high level of development ($s_i \geq \overline{s_i} + S_{s_i}$), (2) regions with a high level of development ($\overline{s_i} + S_{s_i} > s_i \geq \overline{s_i}$), (3) regions with an average level of development ($\overline{s_i} > s_i \geq \overline{s_i} - S_{s_i}$), and (4) regions with a low level of development ($s_i < \overline{s_i} - S_{s_i}$, s_i—synthetic variable, $\overline{s_i}$—arithmetic mean, S_{s_i}—standard deviation).

4. Results and Discussion

The conducted research shows that the impact of the pandemic on the level of socio-economic development of Polish regions in the context of the implementation of sustainable development is not clear. Based on the Hellwig method, this level decreased in nine regions, while it increased in seven, but using the TOPSIS method, the results were inverse—it decreased in seven regions and increased in nine regions. The ambiguous impact of the pandemic is also indicated by the fact that, in the case of the Hellwig method, both the minimum and maximum value of the synthetic indicator increased, which should be assessed positively, but the average value decreased, which in turn is a negative phenomenon. In turn, in the TOPSIS method, the minimum and average value increased, while the maximum value decreased (Table 1).

Table 1. A synthetic measure of the socio-economic development of regions in the context of sustainable development.

Region	Metoda Hellwiga		Metoda Topsis	
	2019	2020	2019	2020
Dolnośląskie	0.3493	0.3253	0.5397	0.5437
Kujawsko-pomorskie	0.0607	0.1147	0.3042	0.3692

Table 1. *Cont.*

Region	Metoda Hellwiga		Metoda Topsis	
	2019	**2020**	**2019**	**2020**
Lubelskie	0.0643	0.1153	0.3479	0.3837
Lubuskie	**0.1529**	**0.0825**	**0.4344**	**0.4022**
Łódzkie	0.2796	0.2573	0.5074	0.5118
Małopolskie	0.3297	0.3561	0.5236	0.5585
Mazowieckie	0.3476	0.3081	0.5824	0.5578
Opolskie	0.2422	0.1792	0.4558	0.4347
Podkarpackie	0.1717	0.0994	0.3876	0.3741
Podlaskie	0.2370	0.1623	0.4684	0.4491
Pomorskie	0.3714	0.3724	0.5555	0.5817
Śląskie	0.3186	0.2744	0.5241	0.5181
Świętokrzyskie	0.0532	0.0686	0.2742	0.3617
Warmińsko-mazurskie	0.0642	0.0722	0.3830	0.4111
Wielkopolskie	0.3184	0.2784	0.5245	0.4995
Zachodniopomorskie	0.2173	0.2610	0.4613	0.4863
MIN	0.0532	0.0686	0.2742	0.3617
MAX	0.3714	0.3724	0.5824	0.5817
Average	0.2236	0.2080	0.4546	0.4652
Standard Deviation	0.1155	0.1074	0.0923	0.0760

Source: own study.

Both methods indicate a reduction in differentiation between regions in their level of socio-economic development. Based on the Hellwig method, in 2019, the value of the synthetic measure for the regions with the highest values was almost 7 times higher than for the regions with the lowest values, while in 2020 this indicator decreased to approx. 5.4. On the other hand, the TOPSIS method shows a reduction of the highest to the lowest ratio relation from 2.1 to 1.6. It can therefore be concluded that the pandemic could have contributed to the reduction of disproportions between regions in the level of socio-economic development in the context of sustainable development (Table 1).

Unfortunately, the research results indicate that the pandemic could have had a negative impact on the level of socio-economic development of the Lubuskie Voivodeship. Both methods indicate a decrease in the value of the synthetic measure in the Lubuskie Voivodeship—in the Hellwig method by over 46% and in the TOPSIS method by over 7%. Moreover, in the analyzed period, the difference between the value of the indicator for the Lubuskie Voivodeship and the average value for the regions increased—in the case of the Hellwig method from approx. 32% to over 60%, and in the TOPSIS method from 5% to 14% (Table 1).

With the use of the synthetic measures' values, rankings of Polish regions were created based on the level of socio-economic development in the context of sustainable development. In the case of both methods, the highest position, both in 2019 and 2020, was recorded in the regions of Pomorskie, Mazowieckie, Dolnośląskie, and Małopolskie, which for many years have been characterized by the highest level of socio-economic development in the context of sustainable development. On the other hand, the lowest positions in the ranking of regions were taken by: Świętokrzyskie, Kujawsko-Pomorskie, Warmińsko-Mazurskie, Podkarpackie, and Lubelskie. The group of provinces with low positions in the ranking also includes the Lubuskie Voivodeship, which in 2019, depending on the method, was in the 11th/12th position, while in 2020, this position moved to 14th (Hellwig method). Thus, the Lubuskie Voivodeship was included in the group of seven regions that recorded a decline in their position in the socio-economic development in the context of sustainable development (Table 2).

Table 2. Ranking of regions according to the level of socio-economic development in the context of sustainable development.

Region	Metoda Hellwiga			Metoda TOPSIS		
	2019	2020	Rank Change	2019	2020	Rank Change
Dolnośląskie	2	3	−1	3	4	−1
Kujawsko-pomorskie	15	12	+3	15	15	0
Lubelskie	13	11	+2	14	13	+1
Lubuskie	**12**	**14**	**−2**	**11**	**12**	**−1**
Łódzkie	7	8	−1	7	6	+1
Małopolskie	4	2	+2	6	2	+4
Mazowieckie	3	4	−1	1	3	−2
Opolskie	8	9	−1	10	10	0
Podkarpackie	11	13	−2	12	14	−2
Podlaskie	9	10	−1	8	9	−1
Pomorskie	1	1	0	2	1	+1
Śląskie	5	6	−1	5	5	0
Świętokrzyskie	16	16	0	16	16	0
Warmińsko-mazurSkie	14	15	−1	13	11	+2
Wielkopolskie	6	5	+1	4	7	−3
Zachodniopomorskie	10	7	+3	9	8	+1

Source: own study.

Both in 2019 and 2020, no significant differences were observed between the positions of individual regions in the rankings obtained based on the methods used. The vast majority of regions took a similar position in both methods.

Another analyzed issue was the grouping of regions based on a similar level of socio-economic development in the context of the implementation of sustainable development concepts. Due to the high compatibility of the results of linear ordering obtained with both methods, the grouping was performed based on the results from the TOPSIS method. Basing on the threshold method, the regions were divided into four groups: (1) regions with a very high level of development, (2) regions with a high level of development, (3) regions with an average level of development, and (4) regions with a low level of development (Table 3, Figure 2).

Table 3. Classification of regions into groups based on the level of socio-economic development in the context of sustainable development.

Year	The Level of the Socio-Economic Development			
	Very High	High	Average	Low
2019	Mazowieckie Pomorskie	Dolnośląskie Łódzkie Małopolskie Opolskie Podlaskie Śląskie Wielkopolskie Zachodniopomorskie	Lubuskie Podkarpackie Warmińsko-mazurskie	Kujawsko-pomorskie Lubelskie Świętokrzyskie
2020	Dolnośląskie Małopolskie Mazowieckie Pomorskie	Łódzkie Śląskie Wielkopolskie Zachodniopomorskie	Lubuskie Opolskie Podlaskie Warmińsko-mazurskie	Kujawsko-pomorskie Lubelskie Podkarpackie Świętokrzyskie

Source: own study.

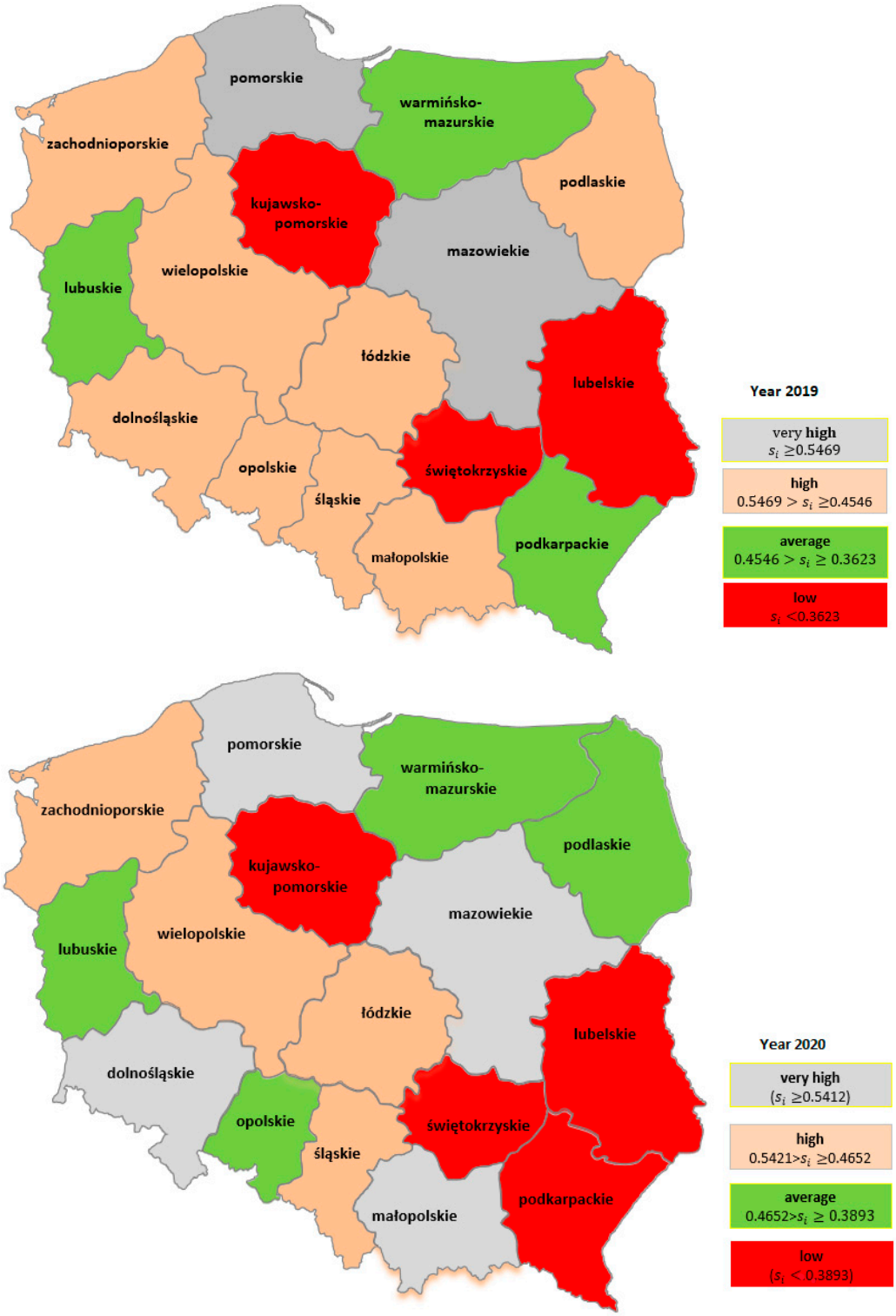

Figure 2. Classification of regions into groups based on the level of socio-economic development in the context of sustainable development—years 2019 and 2020. Source: own study.

In 2019, the most numerous group included regions with a high level of development (eight regions), while the least numerous was the group with a very high level of development (two regions). There were five regions in the group with a medium and low level of development. In 2020, the year in which societies and economies were struggling with the pandemic, a change took place. Each group included the same number of regions (4 regions). Compared to 2019, two regions (Dolnośląskie, Małopolskie) were, despite the

pandemic, in the higher development group, while two other regions (Podlaskie, Podkarpackie) were in the lower development group. In 2020, the vast majority of regions (14 regions), including the Lubuskie region, were in the same group as in 2019. It can therefore be concluded that the COVID-19 pandemic did not have a significant impact on the level of socio-economic development of most Polish regions.

5. Conclusions

The research involved quantitative secondary data analysis. Sustainable development in the context of socio-economic conditions is influenced by various factors that influence acceleration or inhibition of change processes, with the COVID-19 pandemic being of particular importance recently. Their influence is characterized by a different intensity in the respective places in space, as well as variability over time. The SARS-CoV-2 virus pandemic has undoubtedly made it difficult to achieve the indicators defining the implementation of the sustainable development policy, especially in the economic dimension, but its effects are also visible in the social sphere. It should be emphasized, however, that the COVID-19 pandemic is not over and therefore its final and overall impact on the socio-economic consequences cannot be fully fathomed.

The article analyzes and assesses Polish regions in terms of socio-economic development in the context of the sustainable development implementation in 2019 and 2020, i.e., before and during the COVID-19 pandemic. Using the Hellwig method and the TOPSIS method, synthetic measures of socio-economic development were calculated, on the basis of which the analyzed regions were ranked. As a result of the research, four groups of regions were created, which are characterized by a similar level of socio-economic development. The research shows that it is not possible to clearly indicate what was the impact of the pandemic on the level of socio-economic development of Polish regions in the context of sustainable development implementation. In 2020, compared to 2019, about half of the regions, despite the pandemic, recorded a higher level of development, while the other half recorded a decrease in development. Additionally, in 2020, there was a reduction in disproportions between Polish regions in the level of their socio-economic development. The COVID-19 pandemic did not cause significant changes in the rankings of the level of development of Polish regions. Regions such as Pomorskie, Mazowieckie, Dolnośląskie, and Małopolskie, both before and during the pandemic, occupied the highest positions, while regions such as Świętokrzyskie, Kujawsko-Pomorskie, Warmińsko-Mazurskie, Podkarpackie, and Lubelskie occupied the lowest positions. The grouping indicates, however, that the COVID-19 pandemic did not have a significant impact on the level of socio-economic development in most Polish regions. The vast majority of regions, i.e., 14 out of 16 surveyed in 2020, were in the same group as in 2019.

Summarizing the situation of the Lubuskie region, where the authors focused their attention, it should be stated that the COVID-19 pandemic might have had a negative impact on the level of its socio-economic development. This is exemplified by the fact that in 2020, compared to 2019, this region recorded a decrease in the value of the synthetic measure and a decrease in its position in the rankings of regions.

Summing up, it should be emphasized that the COVID-19 pandemic is not over, and therefore, its impact on the socio-economic development of Polish regions cannot be finally assessed. Therefore, the presented results and conclusions should be treated with great caution. The research and its results may constitute basis for further research and analyses, preferably using other statistical methods, other diagnostic variables, or data from subsequent years.

Author Contributions: Conceptualization, A.B., J.J.-G. and J.W.; methodology, A.B., J.J.-G. and J.W.; software, A.B., J.J.-G. and J.W.; validation, A.B., J.J.-G. and J.W.; formal analysis, A.B., J.J.-G. and J.W.; investigation, A.B., J.J.-G. and J.W.; resources, A.B., J.J.-G. and J.W.; data curation, A.B., J.J.-G. and J.W.; writing—original draft preparation, A.B., J.J.-G. and J.W.; writing—review and editing, A.B., J.J.-G. and J.W.; visualization, A.B., J.J.-G. and J.W.; supervision, A.B., J.J.-G. and J.W.; project administration, A.B., J.J.-G. and J.W. All authors have read and agreed to the published version of the manuscript.

Funding: Co-financed by the Marshal's Office of Lubuskie Province.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: All relevant data are within the paper.

Acknowledgments: The article was developed as part of the implementation of a research project co-financed by the Marshal's Office of Lubuskie Province in the framework of the competition Small Grants for Public Universities from Lubuskie Province.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Variables characterizing the area of demographic changes in Polish regions in 2019 and 2020.

Region	D1		D2		D3		D4		D5		D6	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
DS	−2.00	−4.09	1.357	1.333	−0.1	−0.2	28.7	29.9	9.28	8.87	1128.2	1296.6
KP	−1.33	−3.60	1.369	1.308	−0.6	−1.1	26.4	27.5	9.32	8.70	1065.1	1230.6
LU	−1.77	−4.38	1.324	1.271	0.7	0.1	27.9	28.8	9.13	8.57	1089.6	1295.3
LB	**−2.01**	**−3.95**	**1.326**	**1.306**	**−1.9**	**−1.0**	**26.2**	**27.4**	**8.92**	**8.55**	**1092.8**	**1249.8**
LD	−3.64	−6.09	1.349	1.339	0.2	−0.4	30.7	31.8	8.80	8.53	1244.2	1462.3
MA	1.16	−1.01	1.487	1.449	0.3	−0.3	25.5	26.2	10.85	10.36	968.6	1136.7
MZ	0.35	−1.99	1.570	1.529	4.6	3.5	27.7	28.6	11.01	10.45	1065.7	1243.8
OP	−2.24	−4.86	1.273	1.225	−8.6	−8.0	27.8	28.8	8.63	8.11	1086.4	1296.5
PK	0.27	−2.15	1.336	1.296	−1.1	−1.8	24.9	25.7	9.69	9.21	941.5	1135.8
PD	−0.98	−3.45	1.374	1.307	0.8	1.2	26.3	27.2	9.62	8.97	1059.9	1242.8
PM	1.54	−0.50	1.598	1.531	−0.7	−1.1	25.5	26.5	11.14	10.44	960.3	1093.6
SL	−2.49	−4.86	1.360	1.324	−3.6	−2.3	29.0	30.1	8.95	8.46	1144.2	1332.1
SK	−3.45	−6.36	1.235	1.177	−0.1	−0.7	29.6	30.7	8.26	7.71	1171.4	1407.2
WM	−1.39	−3.27	1.322	1.274	−3.3	−2.7	24.4	25.5	9.05	8.52	1044.5	1179.5
WP	0.92	−1.18	1.537	1.507	−0.8	−0.4	25.2	26.1	10.72	10.25	979.9	1143.1
ZP	−2.27	−4.31	1.299	1.254	−1.9	−1.6	27.5	28.9	8.60	8.11	1087.5	1242.3
sd	1.61	1.74	0.11	0.11	2.76	2.35	1.82	1.90	0.93	0.90	81.13	100.05
A	−1.21	−3.50	1.382	1.339	−1.0	−1.1	27.1	28.1	9.50	8.99	1070.6	1249.3
rv	133.1	49.6	7.7	8.0	273.9	223.8	6.7	6.7	9.8	10.0	7.6	8.0
MIN	−3.64	−6.36	1.235	1.177	−8.6	−8.	24.4	25.5	8.26	7.71	941.5	1093.6
MAX	1.54	−0.5	1.598	1.531	4.6	3.5	30.7	31.8	11.14	10.45	1244.2	1462.3

Notes: sd—standard deviation, a—average, rv—ratio volatility; DS—Dolnośląskie, KP—Kujawsko-pomorskie, LU—Lubelskie, LB—Lubuskie, LD—Łódzkie, MA—Małopolskie, MZ–Mazowieckie, OP—Opolskie, PK—Podkarpackie, PD—Podlaskie, PM—Pomorskie, SL—Śląskie, SK—Świętokrzyskie, WM—Warmińsko-mazurskie, WP—Wielkopolskie, ZP—Zachodniopomorskie; Source: own study based on local bank data, available at https://bdl.stat.gov.pl/BDL/start (accessed on 1 May 2022).

Table A2. Variables characterizing the area of the labor market in Polish regions in 2019 and 2020.

Region	L1		L2		L3		L4		L5	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
DS	4.6	5.6	76.3	76.5	57.1	56.9	4.8	4.2	102.7	103.1
KP	7.9	9.0	72.5	72.8	55.2	54.6	6.6	5.4	86.7	87.5
LU	7.5	8.2	71.0	72.0	54.5	54.6	5.9	3.7	88.1	89.0
LB	**4.9**	**6.3**	**73.3**	**74.3**	**55.0**	**54.8**	**5.1**	**7.0**	**88.0**	**87.5**
LD	5.4	6.2	76.0	78.0	56.0	56.6	3.8	4.1	92.4	93.2
MA	4.1	5.3	74.0	74.4	56.3	56.6	3.3	2.3	98.4	100.2
MZ	4.4	5.2	78.9	78.5	60.3	60.1	3.3	3.1	120.6	119.2
OP	5.8	6.9	74.7	75.1	55.1	54.7	4.1	3.8	90.9	91.9
PK	7.9	9.1	69.6	70.7	54.1	53.9	6.5	6.4	84.7	85.2
PD	6.9	7.8	74.6	74.8	55.8	55.5	4.6	4.3	88.3	89.3
PM	4.5	5.9	77.1	76.6	58.8	58.4	4.6	3.6	99.2	99.3

Table A2. *Cont.*

Region	L1		L2		L3		L4		L5	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
SL	3.6	4.9	72.6	72.4	52.8	52.6	4.6	4.8	99.9	98.7
SK	8.0	8.5	71.4	73.8	53.8	55.1	5.5	3.9	86.7	86.9
WM	9.1	10.2	69.5	70.7	52.7	53.4	8.1	7.2	83.4	85.3
WP	2.8	3.7	77.2	77.1	58.9	57.6	3.9	3.4	90.5	90.3
ZP	6.8	8.4	72.0	72.6	53.8	54.2	6.0	6.4	92.1	92.3
sd	1.87	1.84	2.80	2.45	2.21	1.97	1.32	1.46	9.28	8.80
A	5.9	7.0	73.8	74.4	55.6	55.6	5.0	4.6	93.3	93.7
Rv	31.7	26.4	3.8	3.3	4.0	3.5	26.2	31.8	9.9	9.4
MIN	2.8	3.7	69.5	70.7	52.7	52.6	3.3	2.3	83.4	85.2
MAX	9.1	10.2	78.9	78.5	60.3	60.1	8.1	7.2	120.6	119.2

Source: own study based on local bank data, available at https://bdl.stat.gov.pl/BDL/start (accessed on 1 May 2022).

Table A3. Variables characterizing the area of social integration in Polish regions in 2019 and 2020.

Region	Y1		Y2		Y3		Y4		Y5		Y6	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
DS	14.5	13.2	32.93	22.60	3.3	3.0	4.3	3.8	1955.2	2031.2	1382.6	1355.3
KP	23.2	20.3	36.25	38.06	6.6	6.0	4.3	3.7	1770.8	1845.3	1232.3	1168.6
LU	28.8	26.6	25.35	25.15	5.4	4.7	4.8	4.6	1556.8	1679.0	1114.4	1132.6
LB	**14.5**	**15.5**	**48.67**	**40.31**	**5.1**	**4.7**	**3.5**	**3.2**	**1794.1**	**1971.5**	**1223.7**	**1157.3**
LD	16.5	17.0	37.00	33.18	4.5	4.0	4.1	3.6	1809.7	1871.8	1374.6	1225.5
MA	18.5	15.5	38.46	45.63	4.1	3.7	4.3	4.1	1773.1	1914.7	1077.7	1041.5
MZ	17.3	18.4	36.29	32.90	3.9	3.5	4.0	4.1	2108.0	2240.5	1476.3	1443.0
OP	17.0	16.3	32.09	30.43	4.0	3.6	3.9	3.7	1687.3	1711.3	1332.1	1287.3
PK	22.3	22.6	35.33	35.02	6.2	5.4	4.0	3.8	1471.5	1588.6	1015.7	930.9
PD	20.8	24.5	33.10	22.64	6.1	5.5	4.1	4.2	1741.7	1948.3	1029.5	1020.4
PM	15.3	12.2	39.91	50.73	4.8	4.3	4.1	3.7	1860.0	1799.1	1360.5	1328.7
SL	13.8	12.2	37.79	39.10	3.0	2.8	3.8	3.5	1897.4	2050.4	1330.4	1270.9
SK	20.7	17.8	38.23	40.73	6.3	5.6	3.7	3.6	1626.5	1726.9	1059.1	994.0
WM	24.2	24.4	30.18	31.40	8.0	7.2	4.4	4.1	1597.2	1884.1	1006.9	1073.4
WP	17.5	18.0	45.11	45.26	4.3	3.9	3.7	3.5	1807.0	1789.1	1162.8	1123.4
ZP	17.1	14.1	40.65	38.34	4.8	4.3	4.2	3.9	1801.1	1862.1	1263.4	1242.5
sd	4.15	4.51	5.59	8.17	1.34	1.18	0.32	0.34	157.02	160.83	151.92	142.85
A	18.9	18.0	36.7	35.7	5.0	4.5	4.1	3.8	1766.1	1869.6	1215.1	1174.7
Rv	22.0	25.0	15.2	22.9	26.6	26.2	7.8	8.9	8.9	8.6	12.5	12.2
MIN	13.8	12.2	25.4	22.6	3.0	2.8	3.5	3.2	1471.5	1588.6	1006.9	930.9
MAX	28.8	26.6	48.7	50.7	8.0	7.2	4.8	4.6	2108.0	2240.5	1476.3	1443.0

Source: own study based on local bank data, available at https://bdl.stat.gov.pl/BDL/start (accessed on 1 May 2022).

Table A4. Variables characterizing the area of economic potential in Polish regions in 2019 and 2020.

Region	G1		G2		G3		G4		G5		G6	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
DS	8.0	2.7	11,590	10,394	119.0	124.2	30.5	29.8	2.3	2.1	21.5	25.8
KP	6.0	4.0	5848	6267	75.2	73.7	48.7	49.0	3.0	3.1	39.2	41.4
LU	8.8	1.3	6040	6065	52.4	51.6	43.5	43.1	1.8	2.2	36.2	35.1
LB	**6.7**	**1.8**	**6252**	**5910**	**99.6**	**98.2**	**44.0**	**42.7**	**3.0**	**3.1**	**14.1**	**14.5**
LD	9.4	4.7	7435	6962	95.2	93.7	19.6	20.1	4.8	5.0	37.7	35.9
MA	7.5	1.4	7114	7075	74.9	73.9	36.8	35.5	2.4	2.5	54.4	57.0
MZ	9.1	1.6	13,477	12,955	178.7	176.9	34.3	35.7	4.6	4.6	87.3	87.3
OP	7.7	1.0	7958	6791	99.5	96.5	41.2	40.1	2.2	2.0	36.3	34.7
PK	8.2	−0.7	6773	6217	65.7	68.2	39.2	38.2	1.5	1.3	57.2	49.1
PD	8.8	3.2	7157	7196	60.2	60.1	31.2	32.8	3.4	3.2	15.6	15.7
PM	8.4	−0.9	7336	7447	88.7	88.0	34.4	33.6	5.2	5.3	43.4	42.8
SL	6.7	−1.9	8198	7374	107.4	109.7	32.6	32.2	1.8	1.6	30.1	27.8

Table A4. *Cont.*

Region	G1		G2		G3		G4		G5		G6	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
SK	6.7	2.4	4999	4930	57.6	58.6	42.4	43.4	2.6	2.7	91.8	89.7
WM	7.3	4.1	5882	5851	56.8	56.7	29.7	25.5	3.3	3.1	34.2	26.4
WP	8.6	2.2	8522	7924	107.5	106.5	34.9	35.0	5.6	4.8	78.9	79.4
ZP	7.7	2.4	6695	8822	81.6	80.2	32.5	33.7	4.0	3.9	88.5	90.8
sd	0.99	1.83	2173.44	1966.63	31.69	31.66	7.09	7.20	1.29	1.23	25.92	26.16
A	7.9	1.8	7580	7386	88.8	88.5	36.0	35.7	3.2	3.2	47.9	47.1
Rv	12.59	100.19	28.67	26.63	35.71	35.76	19.7	20.2	40.1	38.9	54.11	55.55
MIN	6.0	−1.9	4999	4930	52.4	51.6	19.6	20.1	1.5	1.3	14.1	14.5
MAX	9.4	4.7	13,477	12,955	178.7	176.9	48.7	49.0	5.6	5.3	91.8	90.8

Source: own study based on local bank data, available at https://bdl.stat.gov.pl/BDL/start (accessed on 1 May 2022).

Table A5. Variables characterizing the area of economic innovation in Polish regions in 2019 and 2020.

Region	I1		I2		I3		I4	
	2019	2020	2019	2020	2019	2020	2019	2020
DS	15.4	31.2	7.7	5.9	1.08	1.12	14.4	9.7
KP	17.2	28.2	8.7	6.8	1.36	1.44	14.3	11.6
LU	10.8	25.8	4.7	3.3	0.68	0.73	13.5	8.2
LB	**12.1**	**30.9**	**10.2**	**8.1**	**0.76**	**0.79**	**11.4**	**8.0**
LD	10.2	19.5	2.7	1.7	0.35	0.32	12.3	6.9
MA	14.8	29.2	8.1	7.0	0.91	0.93	15.0	9.3
MZ	19.3	35.0	9.3	8.5	1.78	1.86	15.6	11.8
OP	17.7	37.9	10.3	7.1	2.76	2.78	15.8	10.5
PK	11.7	24.4	4.7	4.4	0.48	0.42	17.7	7.1
PD	17.7	28.0	5.7	5.2	0.67	0.73	18.6	13.0
PM	12.3	29.1	5.5	3.1	0.64	0.66	22.6	13.4
SL	15.4	31.1	6.8	4.7	1.08	1.16	14.0	11.1
SK	13.8	29.5	7.6	6.9	0.67	0.73	14.0	9.5
WM	11.5	25.8	5.1	3.8	0.31	0.31	13.6	8.2
WP	15.8	31.0	3.4	1.8	0.46	0.47	12.8	6.8
ZP	15.8	29.7	7.2	4.8	0.66	0.66	12.8	8.0
sd	2.83	4.18	2.53	2.12	0.63	0.65	3.17	2.19
A	14.3	29.0	6.9	5.2	0.88	0.91	14.6	9.4
Rv	19.8	14.4	36.4	40.7	70.9	71.3	21.8	23.1
MIN	10.2	19.5	2.7	1.7	0.31	0.31	8.8	6.8
MAX	19.3	37.9	10.9	8.5	2.76	2.78	22.6	13.4

Source: own study based on local bank data, available at https://bdl.stat.gov.pl/BDL/start (accessed on 1 May 2022).

Table A6. Variables characterizing the area of sustainable production patterns in Polish regions in 2019 and 2020.

Region	P1		P2		P3		P4	
	2019	2020	2019	2020	2019	2020	2019	2020
DS	438.8	434.6	2.47	2.60	9.0	10.2	236.0	270.3
KP	248.5	257.2	0.63	0.58	45.5	45.4	337.4	351.1
LU	380.5	340.6	1.67	1.79	23.2	21.9	86.8	94.6
LB	**311.5**	**306.7**	**7.17**	**7.13**	**21.6**	**22.5**	**37.6**	**38.1**
LD	367.1	437.7	0.73	0.80	5.4	6.0	35.7	37.8
MA	351.9	313.0	1.41	1.27	10.6	14.6	922.7	881.0
MZ	512.5	372.5	1.72	1.72	5.4	6.5	124.0	121.3
OP	476.1	395.6	0.45	0.58	4.0	4.1	315.5	314.3

Table A6. *Cont.*

Region	P1		P2		P3		P4	
	2019	2020	2019	2020	2019	2020	2019	2020
PK	407.2	380.1	2.06	2.00	24.0	23.0	57.0	53.8
PD	347.7	302.2	3.78	4.01	75.2	79.8	38.7	40.4
PM	362.3	388.9	2.31	2.34	51.9	56.6	257.9	252.1
SL	573.6	441.2	0.74	0.72	4.4	7.4	1363.2	1340.3
SK	369.3	443.0	1.61	1.43	21.1	29.6	256.2	272.8
WM	234.3	206.5	8.63	8.36	85.7	87.1	17.2	28.1
WP	376.0	341.0	1.17	1.25	25.3	29.2	239.8	237.8
ZP	332.7	378.2	8.54	8.68	55.6	58.5	173.1	167.4
sd	89.75	68.23	2.87	2.85	26.31	26.86	374.34	364.08
A	376.7	353.6	2.84	2.84	30.6	32.8	284.2	282.1
Rv	23.8	19.3	100.9	100.1	86.0	81.8	131.7	129.1
MIN	234.3	206.5	0.5	0.6	4.0	4.1	17.2	28.1
MAX	573.6	443.0	8.63	8.68	85.7	87.1	1363.2	1340.3

Source: own study based on local bank data, available at https://bdl.stat.gov.pl/BDL/start (accessed on 1 May 2022).

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