

Impact of economic crises on long-term regional development in Poland¹

Jacek Batóg,^a Barbara Batóg^b

Abstract. The existing research indicates large differences in the degree of socio-economic development at the local and regional level in Poland. The study presented in this paper identifies the trends characterising the long-term economic development of regions in Poland. The research sample consisted of all types of gminas (lowest administrative units in Poland), i.e. rural, urban-rural, urban, and cities with powiat (county) status. A classification method based on the pattern and anti-pattern of development in a dynamic perspective was applied in the analyses, which made it possible to compare the values of the synthetic measure of development over time. The data used in the study came from the Local Data Bank of Statistics Poland and covered the years 2006–2021. The aim of the research was to determine the long-term economic path of development of the different types of gminas by voivodship (highest-level administrative unit in Poland).

The novelty of the study is not only the fact that it covers a long research period, but, more importantly, that it allows the comparison of the effects of two crises (of a different nature) on the development of gminas. The first of them resulted from the collapse of the US real estate market in 2007, and the second was caused by the outbreak of the COVID-19 pandemic in 2020. A strong differentiation in terms of the level of development of the particular types of gminas was observed across voivodships, as well as a strong similarity of their development paths throughout the studied period. The results based on the dynamic measure of development also indicate that rural and urban-rural gminas were more resilient to crises than urban gminas and cities with powiat status. It also became evident that gminas were significantly more resistant to the negative effects of the pandemic than to the financial crisis.

Keywords: regional development, economic crisis, COVID-19 pandemic, dynamic measure of development

JEL: C10, O12, O18, R11

Wpływ kryzysów gospodarczych na długookresowy rozwój regionalny w Polsce

Streszczenie. Dotychczasowe badania rozwoju społeczno-gospodarczego na poziomie lokalnym i regionalnym w Polsce wskazują, że jego stopień jest silnie zróżnicowany. W badaniu omawianym w artykule rozpoznano tendencje charakteryzujące długookresowy rozwój regionalny

¹ Artykuł został opracowany na podstawie referatu wygłoszonego na XXXI Konferencji Naukowej Sekcji Klasyfikacji i Analizy Danych PTS – SKAD 2022, która odbyła się w dniach 7–8 września 2022 r. w Warszawie. / The article is based on a paper delivered at the 31st Scientific Conference of the Classification and Data Analysis Section of the Polish Statistical Association – SKAD 2022, held on 7–8 September 2022 in Warsaw.

^a Uniwersytet Szczeciński, Instytut Ekonomii i Finansów, Polska / University of Szczecin, Institute of Economics and Finance, Poland. ORCID: <https://orcid.org/0000-0003-1413-7692>. Autor korespondencyjny / Corresponding author: jacek.batog@usz.edu.pl.

^b Uniwersytet Szczeciński, Instytut Ekonomii i Finansów, Polska / University of Szczecin, Institute of Economics and Finance, Poland. ORCID: <https://orcid.org/0000-0001-9236-7405>. E-mail: barbara.batog@usz.edu.pl.

rozwój gospodarczy w Polsce. Próba badawcza objęła wszystkie gminy w kraju: wiejskie, miejsko-wiejskie, miejskie i miasta na prawach powiatu. W analizach posłużono się metodą klasyfikacyjną opartą na wzorcu i antywzorcu rozwoju w ujęciu dynamicznym, pozwalającą porównywać wartości syntetycznej miary rozwoju w czasie. Wykorzystano dane z Banku Danych Lokalnych GUS za lata 2006–2021. Celem badania było wyznaczenie długookresowej ścieżki rozwoju poszczególnych rodzajów gmin w podziale na województwa.

Oryginalność badania polega nie tylko na wykorzystaniu danych obejmujących długi okres badawczy, lecz przede wszystkim na porównaniu efektów wpływu na rozwój gmin, jaki wywarły dwa kryzysy (o odmiennym charakterze): pierwszy – wywołany na rynku nieruchomości w Stanach Zjednoczonych w 2007 r., drugi – spowodowany wybuchem pandemii COVID-19 w 2020 r. Zaobserwowano silne zróżnicowanie poziomu rozwoju danego typu gmin w poszczególnych województwach oraz silne podobieństwo ich ścieżek rozwoju w całym badanym okresie. Uzyskane wyniki, oparte na dynamicznej mierze rozwoju, wskazują ponadto, że gminy wiejskie i miejsko-wiejskie charakteryzowały się większą odpornością na kryzys niż gminy miejskie i miasta na prawach powiatu. Uwidoczniała się także znacznie większa odporność gmin na negatywne skutki pandemii niż na kryzys finansowy.

Słowa kluczowe: rozwój regionalny, kryzys gospodarczy, pandemia COVID-19, dynamiczna miara rozwoju

1. Introduction

Quantitative and qualitative imbalances in the geographical distribution of resources and economic activities generate different levels of wealth and different degrees of control over local development (Capello, 2009). A regional development policy should take into account two characteristics of the regions it relates to: the differences in the level of socio-economic development of the areas (Bożek et al., 2021; Czyż & Hauke, 2015) and the different degrees of vulnerability and resilience to emerging crises depending primarily on their specialisation and level of urbanisation (Brakman et al., 2014; Christopherson et al., 2010).

The construction of regional policy tools should reflect the fact that regional development is not the sum of the 'levels' of development of the region's component administrative units, but the development of the component units is directly linked to the level of regional development (Adamowicz & Pyra, 2019). An important factor hindering the interpretation of the results of local surveys is also the 'fundamental oversimplification' of the binary division into urban and rural areas as their different functions do not form a fixed barrier delineating these two types of areas (Partridge et al., 2007). When conducting regional development policy, regardless of the prevailing paradigm of this development, we are often faced with the problem of assessing the degree and similarity of development between regions. The key research topic currently undertaken by scientists is to explain why regional economies differ in their resilience to various crises, which determines their highly geographically uneven effects over time and space, and the ability of these economies to adapt to major disruptions in the economic environment (Hu et al., 2022; Sensier et al., 2016). The aim of the research was to determine the long-term economic path

of development the different types of gminas² (rural, urban-rural, urban, and cities with powiat³ status) by voivodship.⁴ In the above-described context, our study has the potential to contribute to the body of the existing research in question.

The measurement of the level and tracing the paths of regional and local socio-economic development plays a crucial role in policy-making. It allows the allocation of resources across heterogeneous spaces and helps define policy priorities (Greco et al., 2018). The research approach used in this work not only made it possible to determine the long-term development path of different types of gminas, but also to determine their resilience to any emerging economic crises.

The novelty of our study, in addition to the fact that it uses data covering a long research period (2006–2021) and takes into consideration the full population of Polish gminas, is that it allows the comparison of the effects of two crises of a different nature on the development of gminas. The first of them resulted from the collapse of the US real estate market in 2007, while the second was caused by the outbreak of the COVID-19 pandemic in 2020.

2. Literature review

European governments included a regional dimension in their response to the 2007–2009 global crisis by channelling additional funds that targeted all or selected regions or sectors (Davies et al., 2010). The observed effects as well as the results of the measures implemented during the COVID-19 pandemic varied among countries, regions and local government units due to five main factors: the importance and type of spending responsibilities, the degree of the sensitivity of subnational government revenues to economic fluctuations, the flexibility of fiscal frameworks, the pre-pandemic condition of local finances, and the scope and efficiency of governmental support (Organization for Economic Co-operation and Development [OECD], 2021).

The results obtained by Webber et al. (2018) suggest that regions have empirically identifiable long-run and path-dependent development trajectories that are shaped to a large extent by the national trajectories. Regions with greater proportions of inhabitants employed in sectors that are less susceptible to demand fluctuations are likely to experience more stable growth rates and be more resilient to economic downturns. Christofakis et al. (2019) found that Greek regions with more traditional activities located outside large cities or strongly urbanised regions were more

² Gmina – the lowest-level unit of the basic tripartite territorial division of Poland.

³ Powiat – local self-government community (all inhabitants) and the relevant territory, i.e. a unit of basic territorial division, covering the area from several to more than a dozen gminas or the entire area of a city with powiat status (i.e. urban gmina, which was given powiat rights).

⁴ Voivodship – highest-level administrative unit in Poland.

resilient to crises than cities or urban centres. Areas most prone to permanent socio-economic marginalisation are clusters of rural gminas and functionally-connected small towns, characterised by their peripheral location in relation to the largest agglomerations, poor transport accessibility, low level of human capital, and under-investment in public infrastructure (Batóg & Batóg, 2021; Gray, 2014). Wang and Li (2022), using a multilevel logistic regression model, examined 284 Chinese cities in the period of 2003–2018 and found that there were five significant determinants of their economic resilience, namely: income inequality, innovation, government intervention, human capital and financial development. The researchers also showed that regional economic resilience was significantly affected by provincial trajectories. Nazarczuk (2015) concluded that the development of urban-rural and rural sub-regions depends on the distance to a major urban centre. The Australian experience indicated that local governments in areas dependent on housing and a single industry were the least resilient to the 2007 economic crisis (The Parliament of the Commonwealth of Australia, 2009). The results of Psycharis et al. (2014) for Greece showed that the most urbanised and highest-income regions were less resistant to the economic crisis than other regions, but at the same time benefitted from the recovery to the largest extent.

One important effect of emerging crises is their clear centre-periphery spatial pattern (Crescenzi et al., 2016), since their impact on regional and local finances varies greatly (OECD, 2021). Such disparities may become a barrier to maintaining a dynamic rate of development of the whole country or a specific region (Adamowicz & Pyra, 2019; Czyż & Hauke, 2015; Filipiak & Tarczyńska-Łuniewska, 2020), and the currently observed regional development disparities are likely to increase in the future (Bogdański, 2010).

3. Research method

As Bąk (2015) indicates in his work, previous research shows that there is no clear indication of which linear ordering procedures are best for both empirical and simulation data. In the analysis of the long-term development paths of gminas, a dynamic formulation of Hellwig's synthetic measure of development (SMR) was used (Hellwig, 1968). Hellwig's original method involves calculating a measure of development based on the distance between objects and the development pattern, which can result in negative values of this measure. Therefore, in this study, the normalisation process was based on the distance between the pattern (theoretical object with the best empirical values of variables) and the anti-pattern (theoretical object with the worst empirical values of variables). Dynamic approach means that a common pattern and anti-pattern were determined for the whole analysed period.

Outlier observations occurred in the different types of gminas, which may have had a significant impact on reducing the range of variability of the synthetic measure, causing problems with identifying the level of development of the objects under study. Diverse approaches to identifying and eliminating the negative impact of abnormal observations can be found in the literature (Batóg, 2015). These include, for example, correcting the coordinates of model objects (Głowicka-Wołoszyn & Wysocki, 2018) or median standardisation (Łuczak & Kurzawa, 2017). In this study, 16 objects recognised as outliers were eliminated, based on the level of the coefficient of variation characterising each variable.

The study for the period of 2006–2021 covered all Polish gminas, which were divided into cities with powiat status (66), urban gminas (242), urban-rural gminas (652) and rural gminas (1590). The study used data from the Local Data Bank of Statistics Poland⁵. The evaluation of the level of economic development of the studied gminas was based on the following variables (available at the gmina level and guaranteeing that the sample was sufficiently varied):

- the revenue of a gmina's budget *per capita* in PLN;
- REGON⁶-registered entities per 1,000 population;
- floor area of dwellings put into use per 1,000 population in m²;
- capital expenditure *per capita* in PLN;
- employees per 1,000 population.

It is worth noting that for all the above variables, their higher values indicate a higher level of economic development.

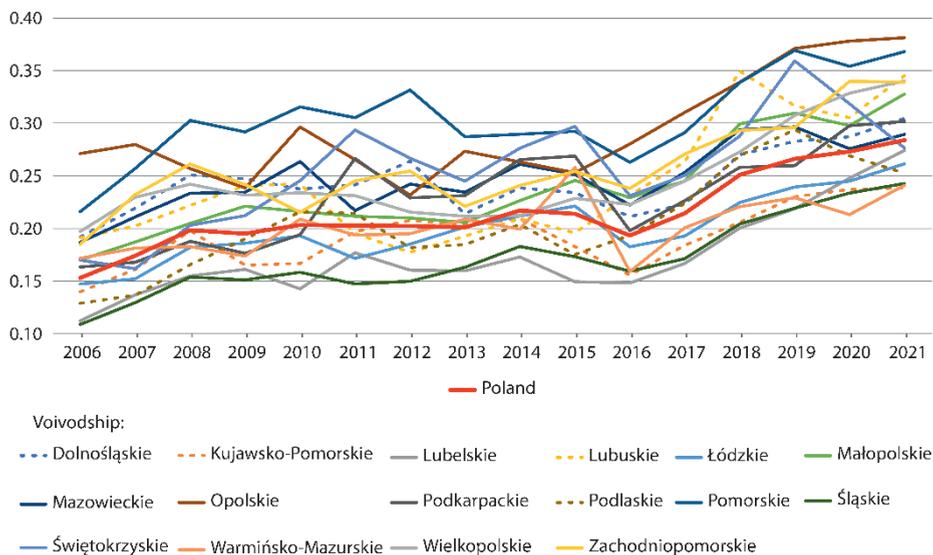
The obtained results were presented for the different types of local government units aggregated within each voivodship and compared with the whole country. All four types of the analysed local administrative units were characterised by identical general trends of change in time.

4. Results

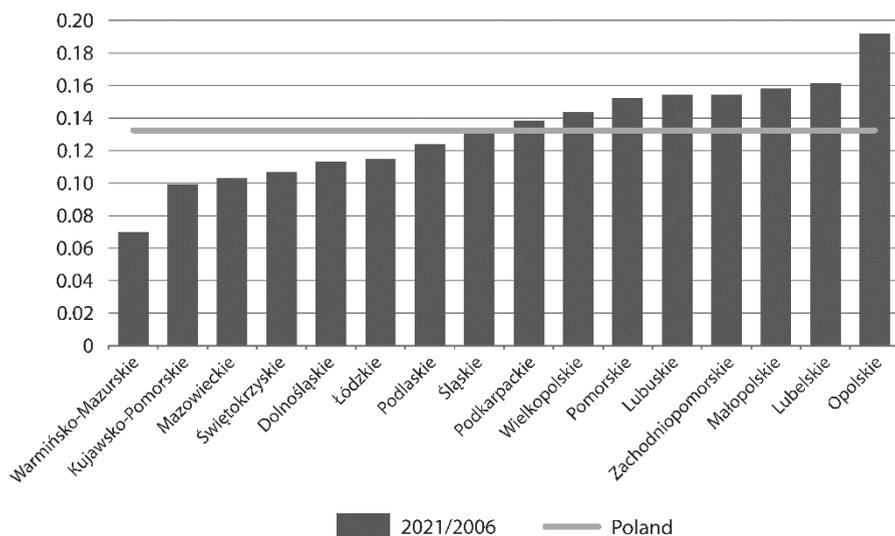
Figures 1, 3, 5 and 7 show an improvement in the level of gminas' development between 2006 and 2008, a slump and relative stabilisation between 2009 and 2015, followed by a significant decline in 2016 (being the effect of a reduction in property investment resulting from a change of the EU financial perspectives) and a strong increase between 2017 and 2021. As the figures suggest, the period of stagnant local development driven by the global crisis originating in the United States lasted for seven years.

⁵ <https://bdl.stat.gov.pl/bdl>.

⁶ REGON – The National Official Business Register in Poland.

Figure 1. Average SMR values for cities with powiat status by voivodship

Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

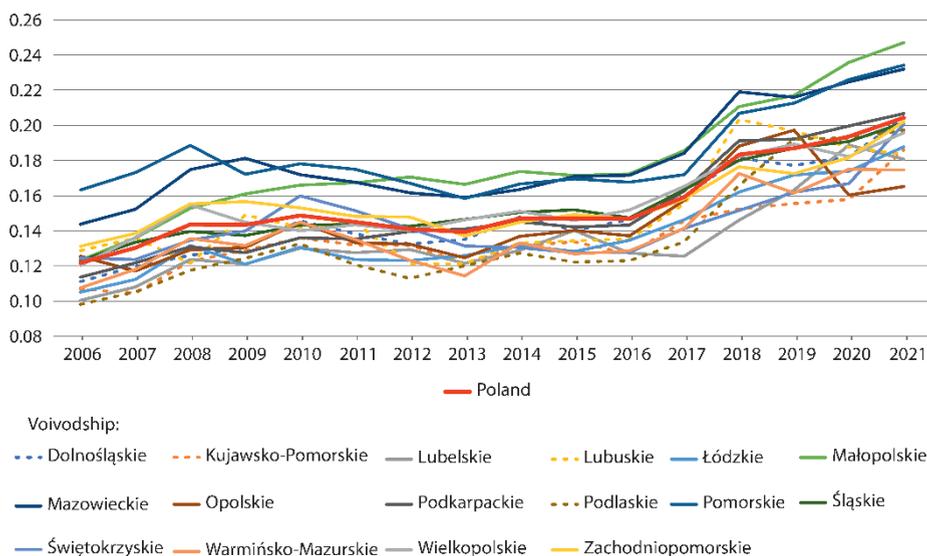
Figure 2. Change in the average values of SMR in cities with powiat status by voivodship (2021/2006)

Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

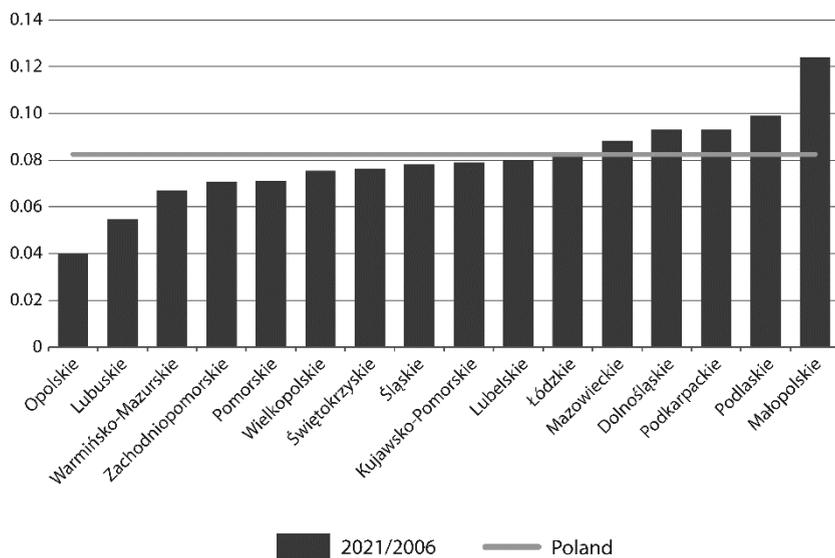
In the period under study, the development of cities with powiat status in individual voivodships varied greatly throughout the whole considered period (Figure 1). During the first crisis which reached Poland in 2009, the greatest slowdown in development occurred in groups of cities with powiat rights in Kujawsko-Pomorskie and Opolskie Voivodships. During the second crisis in 2020, the least favourable situation was observed in cities with powiat status in Mazowieckie, Podlaskie, Świętokrzyskie and Warmińsko-Mazurskie Voivodships. The highest improvement in the level of development of this type of cities occurred in Opolskie Voivodship, while the lowest in Warmińsko-Mazurskie (Figure 2).

In the case of urban gminas, a division into two groups with distinct levels of development was observed. The first one comprised urban gminas with a higher level of the SMR measure located in Małopolskie, Pomorskie and Mazowieckie Voivodships (Figure 3). These also proved resistant to the crisis caused by the outbreak of the pandemic in 2020 and recorded the highest growth in development. The second group included urban gminas in Opolskie and Lubuskie Voivodships, which developed the slowest (Figure 4). The stagnation recorded in Lubuskie Voivodship began in as early as 2019, while Opolskie Voivodship lost its development momentum in 2020.

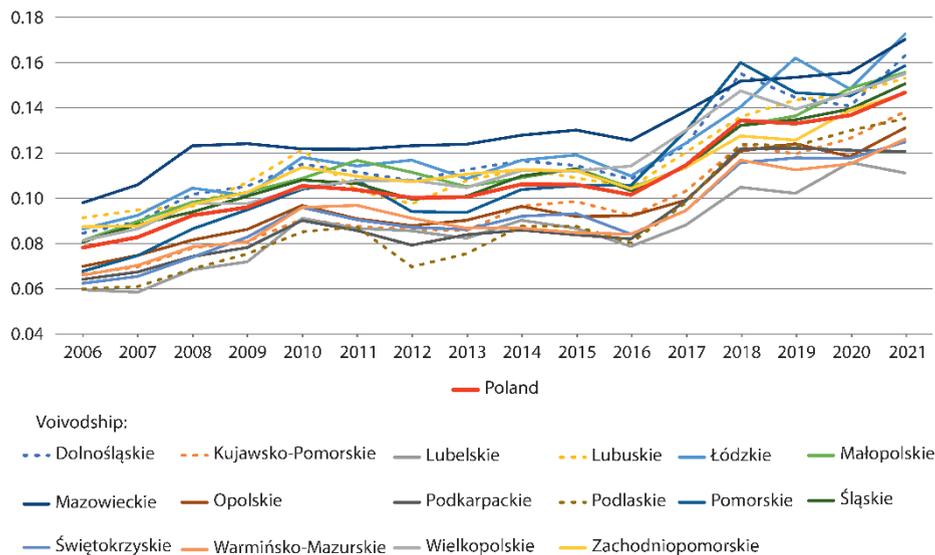
Figure 3. Average SMR values for urban gminas by voivodship



Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

Figure 4. Change in the average values of SMR for urban gminas by voivodship (2021/2006)

Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

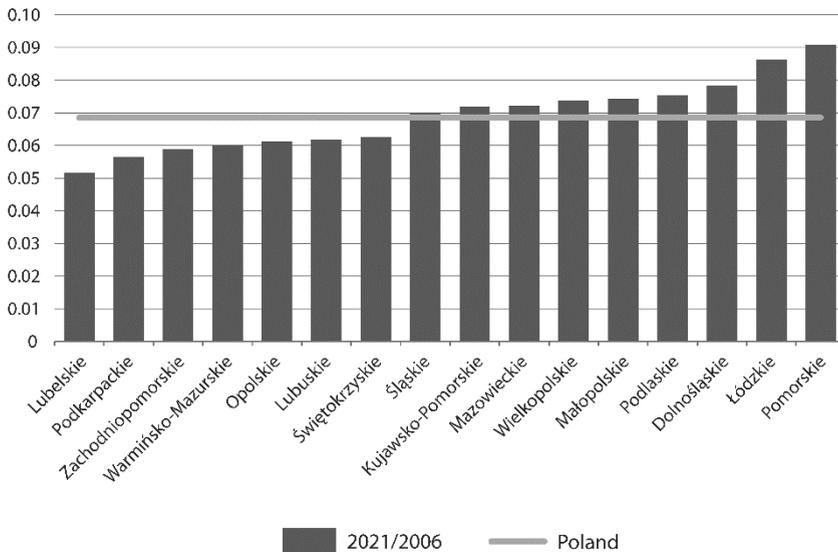
Figure 5. Average SMR values for urban-rural gminas by voivodship

Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

When observing the changes in the level of development of urban-rural gminas, one can see that Mazowieckie Voivodship lost its leading position in the last four of the studied years (Figure 5). During the first crisis of 2009, the greatest slowdown in development occurred in urban-rural gminas in Łódzkie Voivodship, whereas the second crisis saw the highest decrease in the level of economic development in Dolnośląskie, Łódzkie and Opolskie Voivodships.

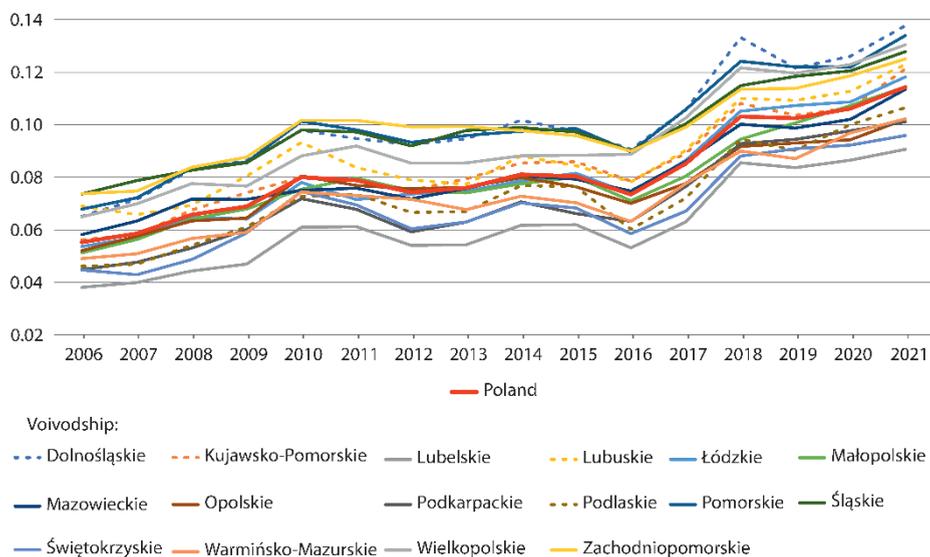
Urban-rural gminas in Łódzkie and Pomorskie Voivodships developed the fastest, while those in Lubelskie the slowest (Figure 6).

Figure 6. Change in the average values of SMR for urban-rural gminas by voivodship (2021/2006)

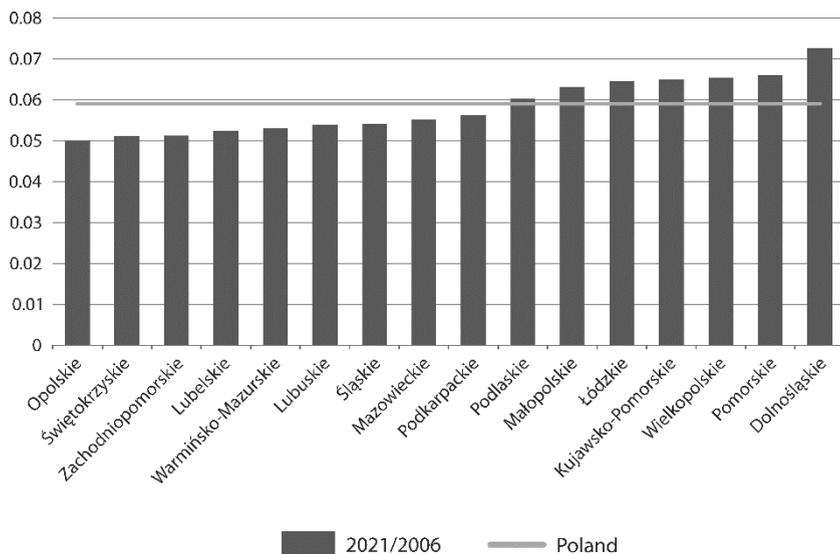


Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

The development of rural gminas differed from the previously discussed types of gminas, since the hierarchy in terms of the development level remained unchanged: the ranking of the voivodships was similar each year (Figure 7). In 2009, the greatest slowdown in development occurred in some rural gminas in Wielkopolskie Voivodship, although in most voivodships, this type of gminas proved resilient to the first crisis. In 2020, rural gminas were slightly affected by the crisis only in Pomorskie Voivodship.

Figure 7. Average SMR values for rural gminas by voivodship

Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

Figure 8. Change in the average values of SMR for rural gminas by voivodship (2021/2006)

Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

Compared to other voivodships, the highest increase in the level of development of rural gminas occurred in Dolnośląskie, while the lowest in Opolskie Voivodship (Figure 8).

When analysing the changes in the level of development of the different types of local government units during the last two economic crises, it can be concluded that they were significantly more resilient to the negative effects caused by the pandemic than the crisis that hit in 2009. Cities with powiat status and urban gminas showed particularly strong resilience in this case (see the Table), which is reflected by the high values of the positive increments of the SMR measure.

Table. Changes in the average values of SMR for gminas by voivodship in the two studied crisis periods

Voivodship	Cities with powiat status		Urban gminas		Urban-rural gminas		Rural gminas	
	2009–2008	2020–2019	2009–2008	2020–2019	2009–2008	2020–2019	2009–2008	2020–2019
Dolnośląskie	-0.004	0.004	0.004	0.005	0.004	-0.004	0.003	0.004
Kujawsko-Pomorskie	-0.033	0.007	0.006	0.002	0.003	0.007	0.007	0.003
Lubelskie	0.006	0.029	-0.003	0.026	0.004	0.014	0.003	0.003
Lubuskie	0.019	-0.011	0.027	-0.009	0.010	0.002	0.011	0.004
Łódzkie	0.004	0.006	-0.011	0.002	-0.003	-0.014	-0.001	0.001
Małopolskie	0.016	-0.012	0.008	0.019	0.004	0.012	0.004	0.007
Mazowieckie	0.001	-0.021	0.007	0.009	0.001	0.002	0.000	0.003
Opolskie	-0.018	0.007	0.001	-0.037	0.005	-0.006	0.001	0.001
Podkarpackie	-0.011	0.038	-0.003	0.007	0.004	-0.001	0.007	0.003
Podlaskie	0.024	-0.025	0.007	0.001	0.007	0.007	0.007	0.010
Pomorskie	-0.011	-0.015	-0.017	0.013	0.008	-0.001	0.002	0.000
Śląskie	-0.003	0.014	-0.002	0.004	0.007	0.005	0.003	0.002
Świętokrzyskie	0.009	-0.041	0.005	0.005	0.009	0.000	0.010	0.001
Warmińsko-Mazurskie	-0.009	-0.016	-0.004	0.013	0.002	0.003	0.002	0.010
Wielkopolskie	-0.011	0.021	-0.010	-0.007	0.000	0.007	-0.001	0.003
Zachodniopomorskie	-0.019	0.044	0.001	0.009	0.005	0.013	0.004	0.005
Poland	-0.003	0.007	0.000	0.007	0.004	0.004	0.003	0.004

Source: authors' calculations based on data from the Local Data Bank of Statistics Poland.

Urban-rural and rural gminas were less sensitive to both periods of developmental instability. The crisis that reached Poland in 2009 significantly slowed down the development of cities with powiat status, as did the turmoil caused by the coronavirus in 2020 (Table 1). These findings are consistent with the results obtained in the studies conducted by Christofakis et al. (2019) and Psycharis et al. (2014).

5. Conclusions

In Poland, the different types of gminas in voivodships are characterised by a relatively heterogeneous level of development. However, at the same time, the results of the conducted research indicate that in the studied years, all types of

gminas in Poland showed a similar pattern of economic development. The decrease in the level of the development of all considered gminas (with the exception of urban gminas) that occurred in 2016 were caused by a reduction in property investment resulting from the exhaustion of EU funds from the 2007–2013 financial perspective and the slow mobilisation of such funds guaranteed by the 2014–2020 perspective. The markedly different sensitivity of the different types of gminas to the negative effects of the COVID-19 crisis and the financial crisis that reached Poland in 2009 is also evident and consistent with the previous studies discussed in Hu et al. (2022). Cities with powiat status and urban gminas were highly resistant only to the COVID-19 crisis, while rural and urban-rural gminas were resilient to both crisis periods. In other words, financial economic downturns have a greater negative effect on local units with a higher level of urbanisation. Taking into account the development of all types of gminas over the whole period under study, the greatest increase in the level of local development occurred in Małopolskie Voivodship and the smallest in Warmińsko-Mazurskie and Świętokrzyskie Voivodships. Future research studying the impact of the war in Ukraine on the development of Polish territorial units would definitely prove valuable and complement the results presented in this paper.

References

- Adamowicz, M., & Pyra, M. (2019). Links Between the Level of Local and Regional Development – Problems of Measuring. *Proceedings of the 2019 International Conference 'Economics Science for Rural Development'*, (51), 14–22. <https://doi.org/10.22616/ESRD.2019.052>.
- Batóg, J. (2015). Identyfikacja i znaczenie obserwacji nietypowych w modelach konwergencji dochodowej. *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Krakowie. Cracow Review of Economics and Management*, (5), 5–15. <https://doi.org/10.15678/ZNUEK.2015.0941.0501>.
- Batóg, J., & Batóg, B. (2021). Typology and Development of Local Administrative Units: Spatial Discriminant Analysis. *European Research Studies Journal*, 24(4B), 548–569. <https://doi.org/10.35808/ersj/2675>.
- Bąk, A. (2015). Zagadnienie wyboru optymalnej procedury porządkowania liniowego w pakiecie pllord. *Prace Naukowe Uniwersytetu Ekonomicznego We Wrocławiu. Research Papers of Wrocław University of Economics*, (384), 33–41. <https://doi.org/10.15611/pn.2015.384.03>.
- Bogdański, M. (2010). Urban Determinants of Polarisation of Economic Development in Poland. *Olsztyn Economic Journal*, 5(2), 269–279. <https://doi.org/10.2478/v10021-010-0021-3>.
- Bożek, J., Szewczyk, J., & Jaworska, M. (2021). Zmiany w poziomie rozwoju społecznego województw w latach 2010 i 2019 z zastosowaniem dynamicznego miernika syntetycznego. *Nierówności Społeczne a Wzrost Gospodarczy*, (1), 109–123. <https://doi.org/10.15584/nsawg.2021.1.6>.
- Brakman, S., Garretsen, H., & van Marrewijk, C. (2014). *The Crisis and Regional Resilience in Europe: On the Importance of Urbanization and Specialization* (Cesifo Working Paper No. 4724). <https://www.cesifo.org/en/publications/2014/working-paper/crisis-and-regional-resilience-europe-importance-urbanization-and>.

- Capello, R. (2009). Regional Growth and Local Development Theories: Conceptual Evolution Over Fifty Years of Regional Science. *Géographie, économie, société*, 11(1), 9–21. <http://doi.org/10.3166/ges.11.9-21>.
- Christofakis, M., Gaki, E., & Lagos, D. (2019). The impact of economic crisis on regional disparities and the allocation of economic branches in Greek regions. *Bulletin of Geography. Socio-economic Series*, (44), 7–21. <http://doi.org/10.2478/bog-2019-0011>.
- Christopherson, S., Michie, J., & Tyler, P. (2010). Regional resilience: theoretical and empirical perspectives. *Cambridge Journal of Regions, Economy and Society*, 3(1), 3–10. <https://doi.org/10.1093/cjres/rsq004>.
- Crescenzi, R., Luca, D., & Milio, S. (2016). The geography of the economic crisis in Europe: national macroeconomic conditions, regional structural factors and short-term economic performance. *Cambridge Journal of Regions, Economy and Society*, 9(1), 13–32. <https://doi.org/10.1093/cjres/rsv031>.
- Czyż, T., & Hauke, J. (2015). Entropy in Regional Analysis. *Quaestiones Geographicae*, 34(4), 69–78. <https://doi.org/10.1515/quageo-2015-0037>.
- Davies, S., Kah, S., & Woods, C. (2010). *Regional Dimensions of the Financial and Economic Crisis*. European Policies Research Center. https://pure.strath.ac.uk/ws/portalfiles/portal/4308880/EPRP_70_RegionalDimensionsoftheFinancialandEconomicCrisis.pdf.
- Filipiak, B. Z., & Tarczyńska-Łuniewska, M. (2020). Socio-Economic Potential of Regions – Theory and Practice. *Folia Oeconomica Stetinensia*, 20(1), 95–116. <https://doi.org/10.2478/fole-2020-0006>.
- Głowicka-Wołoszyn, R., & Wysocki, F. (2018). Problem identyfikacji poziomów rozwoju w zagadnieniu konstrukcji cechy syntetycznej. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu. Research Papers of Wrocław University of Economics*, (508), 56–65. <https://doi.org/10.15611/pn.2018.508.06>.
- Gray, D. (2014). Economic approaches to the rural. In G. Bosworth, P. Somerville (Eds.), *Interpreting Rurality: Multidisciplinary Approaches* (pp. 32–53). Routledge.
- Greco, S., Ishizaka, A., Matarazzo, B., & Torrisi, G. (2018). Stochastic Multi-attribute Acceptability Analysis (SMAA): An Application to The Ranking of Italian Regions. *Regional Studies*, 52(4), 585–600. <https://doi.org/10.1080/00343404.2017.1347612>.
- Hellwig, Z. (1968). Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju oraz zasoby i strukturę wykwalifikowanych kadr. *Przegląd Statystyczny*, 15(4), 307–327.
- Hu, X., Li, L., & Dong, K. (2022). What matters for regional economic resilience amid COVID-19? Evidence from cities in Northeast China. *Cities*, 120, 1–11. <https://doi.org/10.1016/j.cities.2021.103440>.
- Łuczak, A., & Kurzawa, I. (2017). Ocena poziomu zrównoważonego rozwoju powiatów w Polsce z wykorzystaniem metod taksonomicznych. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu. Research Papers of Wrocław University of Economics*, (469), 109–118. <https://doi.org/10.15611/pn.2017.469.11>.
- Nazarczuk, J. M. (2015). Kryzys gospodarczy a różnicowanie regionalne w UE. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu. Research Papers of Wrocław University of Economics*, (380), 50–59. <https://doi.org/10.15611/pn.2015.380.04>.

- Organization for Economic Co-operation and Development. (2021). *The Territorial Impact of COVID-19: Managing the Crisis and Recovery across Levels of Government*. https://read.oecd-ilibrary.org/view/?ref=1095_1095253-immmbk05xb7&title=The-territorial-impact-of-COVID-19-Managing-the-crisis-and-recovery-across-levels-of-government.
- Partridge, M., Bollman, R. D., Olfert, M. R., & Alasia, A. (2007). Riding the Wave of Urban Growth in the Countryside: Spread, Backwash, or Stagnation?. *Land Economics*, 83(2), 128–152. <https://doi.org/10.3368/le.83.2.128>.
- Psycharis, Y., Rovolis, A., Tselios, V., & Pantazis, P. (2014). Economic Crisis And Regional Development In Greece. *Région et Développement*, (39), 67–85. <https://regionetdeveloppement.univ-tln.fr/wp-content/uploads/3-Psycharis.pdf>.
- Sensier, M., Bristow, G., & Healy, A. (2016). Measuring Regional Economic Resilience across Europe: Operationalising a Complex Concept. *Spatial Economic Analysis*, 11(2), 128–151. <http://dx.doi.org/10.1080/17421772.2016.1129435>.
- The Parliament of the Commonwealth of Australia. (2009). *The Global Financial Crisis and regional Australia*. <https://www.aph.gov.au/binaries/house/committee/itrdlg/financialcrisis/report/gfc%20final%20report.pdf>.
- Wang, X., & Li, M. (2022). Determinants of Regional Economic Resilience to Economic Crisis: Evidence from Chinese Economies. *Sustainability*, 14(2), 1–25. <https://doi.org/10.3390/su14020809>.
- Webber, D. J., Healy, A., & Bristow, G. (2018). Regional growth paths and resilience: A European analysis. *Economic Geography*, 94(4), 355–375. <https://doi.org/10.1080/00130095.2017.1419057>.