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Changes in the Socioeconomic Situation of the Capitals of the Former Voivodships after the Implementation of the Local Government Reform. Basic Trends

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Abstract

On January 1, 1999, Poland implemented an administrative reform that resulted in 31 cities losing their status as voivodship capitals. This change removed a significant, and for some cities, the most important factor driving their development. Negative consequences quickly emerged, including the out-migration of qualified staff, population decline, reduced investment and economic activity, and a decrease in the income of residents. The aim of the study is to assess the changes in the economic situation of these former voivodship capitals following the reform's implementation. Using statistical methods, convergence models, a taxonomic measure of development and the Wrocław taxonomy method the study examines the socioeconomic changes that occurred. The analysis is based on the average annual growth rates of ten selected indicators, focusing on changes in the socioeconomic situation rather than their absolute level of development. Therefore, cities ranked highest are those that developed the fastest in the analyzed period, not necessarily those with the highest level of economic development. The taxonomic measure of development shows values ranging from 0.31 to 0.65. This indicates that individual cities experienced different rates of development after the reform, but no clear leader emerged with the highest growth rate across most indicators. Similarly, no cities demonstrated consistently low growth rates across most indicators.

Keywords: three-tier administrative division, former voivodship capitals, beta and sigma convergence, taxonomic measure of development, Wrocław taxonomy

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Introduction

The administrative division in effect from June 1, 1975, to December 31, 1998, was established by the Act of May 28, 1975, on the two-tier administrative division of the State and on the amendment of the Act on National Councils. Although, as Miszczuk (2003) notes, the administrative division and the creation of a larger number of smaller voivodships stemmed from a desire to limit the influence of the first secretaries of the Polish United Workers' Party within the voivodships, the reform also largely achieved other objectives in the period from 1975 to 1998. These included:

- supporting the development of new, sufficiently large, and resilient centers of economic growth; and
- streamlining the structures of state administration management, which was intended to "bring the government closer to the citizen."

There is near-unanimous agreement on the positive impact of capital city status on urban development between 1975 and 1998. This consensus is evident in research on demographic and economic

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indicators, as well as in analyses residents' subjective perceptions (Kurniewicz, Swianiewicz, and Łukomska 2023, 27).

The analysis of socioeconomic changes in former voivodships capitals indicates:

- increase in the number of inhabitants and urban growth (Bocheński and Rydzewski 2020, 37);
- increased investments in new voivodship capitals (Kurniewicz, Swianiewicz, and Łukomska 2023, 26);
- the creation of numerous stable public-sector jobs, generating demand for employment in sectors providing goods and services to the administration; and
- enhanced prestige and attractiveness of cities.[1]

The new administrative division faced criticism. Scientists, politicians, and social groups negatively affected by the changes voiced their opposition.[2] However, it was only after the political system transformation in 1989, that more concrete work on the new administrative division of Poland was undertaken. It spanned nearly a decade and produced approximately 90 different proposals (Bocheński and Rydzewski 2020, 15). Some advocated retaining the 49 voivodships or implement only minor changes.

The new administrative division was implemented on January 1, 1999, per the Act of July 24, 1998, on the Establishment of the Basic Three-tier Administrative Division of the Country.[3] The act replaced 49 "small voivodships" with 16 "large voivodships," significantly reducing the number

Figure 1. Cities that lost the status of the capital of the voivodship on January 1, 1999

1. See: "Sytuacja byłych miast wojewódzkich w 20 lat po 'reformie powiatowej'" [The situation of former provincial cities 20 years after the "county reform"], report by Jakub Kwaśny, Centrum Polityk Publicznych, Kraków, December 2020, availabe at https://politykipubliczne.pl/wp-content/uploads/2021/01/17-Sytuacja-bylych-miast-wojewodzkich-last.pdf, page 4.

2. Every reform creates both winners and losers.

3. See: Ustawa z dnia 24 lipca 1998 r. o wprowadzeniu zasadniczego trójstopniowego podziału terytorialnego państwa. DzU z 1998 r. nr 96 poz. 603.

of cities with voivodship capital status (from 49 to 18).[4] Those that retained the status of voivodship centers became capitals of much larger regions, while those that lost it faced new challenges. To mitigate the impact, the government proposed granting former capitals the status of cities of powiat (county) rights. However, not all of them accepted this special legal status; Ciechanów, Piła, and Sieradz rejected it. These actions were insufficient, and many of these cities are now considered "victims of administrative reform" (Kurniewicz and Swianiewicz 2016, 26). The change was commonly viewed as a development destimulant for the 31 affected units.

The aim of the article is to assess the socioeconomic changes in the situation of former voivodship capitals following the implementation of the three-tier administrative division in Poland through 2022. For the clarity, 31 cities that lost their voivodship capital status will be referred to as **former capitals**, while 18 cities that retained the status will be referred to as **current capitals**.

The assessment employed statistical methods, convergence models, a taxonomic measure of development, and the Wrocław taxonomy method. The analysis is based on the average annual growth rates of selected 10 indicators, highlighting changes in the socioeconomic situation rather than the absolute development levels. Therefore, the highest-ranked cities are those that developed most rapidly in the analyzed period, not necessarily those with the highest overall level of economic development. This is particularly important when considering beta convergence, where cities with initially lower values exhibit higher growth rates, and when interpreting the taxonomic measure of development.

The article is organized as follows:

- The first chapter provides a literature review related to the topic.
- The second chapter presents the research methodology.
- The third chapter presents the results and discusses the research performed.
- The article ends with a summary.

1 Literature review

An extensive description of the decision-making process concerning the shape of administrative reform can be found in the work of Miszczuk (2003). The author, conducting detailed analyses of various concepts of administrative division of Poland proposed after the political system transformation, concluded that the final effect, reflected in the Act of July 24, 1998, was determined by political factors.

The results of most studies of the socioeconomic situation of former capitals have shown that the loss of capital status has caused a deterioration of this situation and, sometimes, even significant degradation of cities.

The negative impact of the 1998 reform on the development of the former voivodship centers is pointed out by Dziemianowicz[5] and Krysiński (2013), who analyze the social perception of the reform. Both authors notice that, in the public perception, the solutions introduced in 1999 had a negative impact on the development of former capitals and result in the progressive degradation of these centers. According to Dziemianowicz's[6] analyses — based on interviews with officials from former capitals — only 40% of respondents could identify any positive impact of the reform. Those who did primarily cited increased local government authority and resulting improvements (e.g., consolidation municipal and powiat budgets). Conversely, representatives from all the surveyed cities identified negative consequences.

According to Bocheński (2010), the cities potentially most affected by the effects of the last reform should be considered Koszalin, which has been performing voivodship functions since 1950,

4. In the Kujawsko-Pomorskie and Lubuskie voivodships, the seats of state authorities (voivode) and local authorities (marshal of voivodship) were located in two cities: in Bydgoszcz and Toruń, and Gorzów Wielkopolski and Zielona Góra respectively.

5. See: "Byłe stolice województw w rok po reformie" [Former voivodeship capitals one year after the reform], ekspertyza przygotowana na zlecenie Polskiej Agencji Rozwoju Regionalnego [expert opinion prepared for the Polish Agency for Enterprise Development], by W. Dziemianowicz, Warszawa 2000.

6. Ibid.

and Elbląg, whose service area was divided, and the city itself was incorporated into the voivodship with the capital in Olsztyn, although it naturally gravitates to Gdańsk and had no connections with Olsztyn.

Komorowski (2012) pointed out that the economic development level between former and current voivodship capitals is increasing. This divergence intensified after Poland joined the European Union.

Potocki and Babczuk, after analyzing the socioeconomic situation of former capitals from 1999 to 2014, negatively assessed the polarization-diffusion model of national development adopted in state policy.[7] This model focuses on supporting select metropolitan centers, assuming that their development will "radiate" outward, stimulating growth in the rest of the region. However, they argue that this radiation is limited to a narrow zone around large cities, while other areas, including most former capitals, stagnate.

Filip Springer's project, a reporter's journey through former voivodship capitals, offers compelling insight. It represents a pioneering documentary experiment in Poland, utilizing the internet, social media, and collaboration with major press and radio outlets. The project culminated in a reportage book, the creation of which the public could follow in real time. Springer visited 31 former capitals, interviewed officials, entrepreneurs, and activists. He found that many residents and authorities feel betrayed by the government's failure to implement the promised support program (Springer 2016). Statements from the former employees of liquidated voivodship offices and institutions in former capitals present an image of "looting" in 1999.[8] Valuable assets (e.g., computers, furniture, electronics) were transferred to the new voivodship capitals. Yet, as Springer writes, "Poland is not only Kraków, Warszawa, Gdańsk, or Wrocław. It is also cities-archipelagos, viewed by the rest of the country with slight contempt, spoken of mockingly or jokingly. Yet, you can also succeed in them. A success that tastes better, because you finally achieved it at home."

Kisiała (2017) calculated the values of the Hellwig (1968) taxonomic measure of development for 49 cities in 1999 and 2015 and compared them. The 1999 synthetic index value placed one former capital in the top five of the ranking, four in the top ten, and eight in the top eighteen. The 2015 ranking, based on similar data, showed losses in the position of these cities. The top five included only the current capitals; only one former capital remained in the top ten, and only three remained in the top eighteen. The research clearly indicate that former capitals are in a worse developmental situation compared to the cities that retained voivodship center status after the 1999 local government reform.

Szukalski (2018) assessed demographic processes from 1975 to 2017 in former and current capitals. He argues that being a voivodship city was and is an important factor of development, due to the provision of stable government and administrative jobs. Such cities also become regional educational (especially at the level of higher education), commercial, and cultural centers. Moreover, the regional capital serves as its showcase, typically attracting public investment. Losing capital status means a restriction of privileges and reduced importance for the urban center.

Gorzelak (2018, 50) points out that the loss of voivodship functions led to a decline in a city's importance within the urban hierarchy. He justifies this fact by stating that "authorities invest mainly around themselves," resulting in concentration of offices, institutions, and related infrastructure in voivodship capitals.

Zaborowski (2019) argues that losing voivodship capital status goes beyond the loss of prestige and privileges or unequal access to funds and investments. He emphasizes the systematic deprivation human resources as the most significant consequence. He highlights the ongoing trend of larger cities "sucking out" high school graduates, who then contribute to those cities' labor markets instead of their home regions.

7. See: "Wybrane aspekty marginalizacji dawnych miast wojewódzkich" [Selected aspects of the marginalization of former provincial cities], article by Jacek Potocki and Arkadiusz Babczuk, Uniwersytet Ekonomiczny we Wrocławiu, September 2015, available at http://www.jacekpotocki.pl/files/Dawne_miasta_wojewodzkie_2015.pdf.

8. M. Kowerski, as an official of the Voivodship Office in Zamość, witnessed this practice, observing even incomplete chairs were loaded onto trucks and taken to Lublin.

Kwaśny notes that cities serving as voivodship capitals from 1975 to 1998 developed numerous supra-local functions and were considered, regardless of population size, in the same category as Warsaw, Kraków or Poznań.[9] Losing capital status resulted in the elimination or downgrading of many public administration institutions and the transfer of management for various institutions (especially in culture and environmental protection,) to the new regional capital. He identifies deindustrialization and suburbanization as additional adverse factors affecting former capitals nationwide.

Bocheński and Rydzewski (2020), using simple statistical and cartographic methods, attempted to capture the changes that occurred in 49 cities after the 1975 and 1999 reforms, i.e., after changes in the administrative division related to the increase and subsequent decrease in the number of voivodship centers. They analyzed changes in population, migration, population growth, economic entities, unemployment, and the state of the institutional base. They positively verified the hypothesis that obtaining voivodship capital status contributed to the dynamic development of a given center, including population growth, development of the public services sector, and improved transport accessibility, which affected 31 cities from 1975 to 1998. Conversely, the loss of voivodship capital status after 1998 caused opposite phenomena. Therefore, compared to the current capitals, former voivodship centers experienced a greater population decrease, fewer government and local government administration institutions and state-owned enterprises, and often lower transport accessibility.

Only a few studies show the positive impact of losing voivodship capital status on the socioeconomic situation of former capitals. In Polish literature, these include the works of Kurniewicz and Swianiewicz (2016) and Kurniewicz, Swianiewicz, and Łukomska (2023). Both are based on data from 1992 to 2013 and use Hellwig's taxonomic measure of development. In the first paper, the authors collected data from 92 cities with populations ranging from 50,000([10]) to 300,000 people. Using five indicators, they calculated the values of Hellwig's taxonomic measure of development, enabling analysis of changes in the rankings of all cities from 1992 to 1998 and 1998 to 2013 (i.e., six years before the reform and 15 years after). From 1992 to 1998, when the centers in question were still the capital, cities with 50,000 to 100,000 inhabitants experienced an average hierarchical promotion of almost five positions, and those with 100,000 to 250,000 inhabitants, an average of four. After losing their status, the trend remained positive but with significantly weaker dynamics. From 1998 to 2013, the corresponding promotion in both smaller and larger centers averaged less than two positions. In the second paper, limiting the number of indicators to four, they calculated the values of Hellwig's taxonomic measure of development for each of the 49 cities (31 former and 18 current capitals) from 1993 to 2013. They estimated panel models with fixed random effects of the synthetic measures, incorporating binary variables identifying the 31 cities that lost the capital status (1) and the 18 that did not (0), time (1 for "the year after the reform" and 0 for "the year before"), the product of both variables and control variables. The estimation results led the authors to conclude: "the situation of former capitals after the reform did not differ from that observed in cities that managed to maintain this status. As indicated by the model taking into account control variables, the location of cities in relation to the western border of the country was more important for economic development than administrative status" (Kurniewicz, Swianiewicz, and Łukomska 2023, 33).[11]

2 Data and methodology

The research on changes in the socioeconomic situation covered 31 cities that lost voivodship capital status due to the local government reform at the end of 1998. The research covered the period from 1998 to 2022. The following methods were used for the analysis:

9. See: "Sytuacja byłych miast wojewódzkich w 20 lat...," page 4.

10. Therefore, the study did not cover the five smallest former capitals: Ciechanów, Krosno, Sieradz, Skierniewice, and Tarnobrzeg.

11. The results obtained by the authors are interesting, yet surprising. It is unfortunate that the article included only selected elements of estimation and not full models.

- Student's t-test to compare the differences in the rates of change of the socioeconomic situation of former and current capitals
- beta and sigma models of convergence for the variables adopted in the study
- Taxonomic Measure of Development (TMD)
- Wrocław taxonomy

To describe changes in socioeconomic situations, 10 indicators (presented in table 1) were selected from 25 initially analyzed.

The data were obtained from the Local Data Bank of the Statistics Poland.[12] Due to the data availability, changes in indicator values were analyzed in different time intervals. This inconvenience was mitigated by taking into account the average annual growth rates of the values of individual indicators, which are the diagnostic variables in this study:

$$rX_i = \sqrt[n-1]{\frac{x_{in}}{x_{i1}}}, \tag{1}$$

where:
rX_i — average annual growth rate of i-th indicator,
x_{in} — value i-th indicator in the last period,
x_{i1} — value of i-th indicator in the base period, and
n — the number of years covered by the analysis.

All diagnostic variables are stimulants: the higher the value, the higher the rate of development of a given city.[13]

The study began with a comparison of the differences in means of average annual growth rates of individual diagnostic variables in former and current capitals using the t-Student test.

Beta and sigma convergence models were then estimated for individual diagnostic variables in former and current capitals. The concept of economic convergence (catch-up effect) derives from the neoclassical theory of growth, represented mainly by the Solow-Swan model (Solow 1956; Swan 1956), and refers to a situation where per capita income (e.g., measured by GDP per capita) in poorer countries (regions) grows faster than in rich countries (regions). In the case of Poland, the Central Statistical Office calculates GDP only up to the NUTS-3 level, meaning GDP data is available only for six cities (Warszawa, Kraków, Łódz, Wrocław, Poznań, and Szczecin). Occasionally, research is carried out for powiats, consisting of distributing GDP calculated for the NUTS-3 level to individual powiats (see e.g., Ciołek 2017). The irregularity of such studies makes them impossible to use in this work. Therefore, convergence models for individual variables were built.

Table 1. Indicators of the socioeconomic situation of cities adopted for the study

Symbol	Content of the indicator	Observation period
X_1	Number of inhabitants (thousand people)	1998–2022
X_2	Population of working age per 100 people of post-working age	2002–2022
X_3	City budget revenues per inhabitant (PLN thousand)	2002–2022
X_4	Entities entered into the National Official Business Register (REGON) per 10 thousand population	2002–2022
X_5	Average gross monthly salary (PLN thousand)	2004–2022
X_6	Number of unemployed at the end of the year (thousand people)	2003–2022
X_7	Total sold production of industry per inhabitant (entities with the number of employed persons > 9) (PLN thousand)	2005–2021
X_8	Dwellings per 1000 inhabitants	2003–2022
X_9	Dwellings equipped with a flush toilet (% of all dwellings)	2003–2022
X_{10}	Hospital beds per 1000 inhabitants	2005–2022

12. The database is available at https://bdl.gov.pl/.
13. A formal description of the three types of variables (stimulants, destimulants and nominants) can be found in the paper by Kukuła (2000, 53–54).

The following models were estimated:

2.1 Beta convergence

Beta-convergence occurs when the values of selected variables approach a common level. This type of convergence has two variants: absolute and conditional convergence. The first assumes that the value of a variable grows faster in cities with a lower initial level. Therefore, beta convergence was verified using a cross-section regression model of i-th variable:

$$rX_i = \alpha + \beta X_{i1} + \varepsilon. \tag{2}$$

For the convergence phenomenon to occur, the estimated value of the parameter should be less than zero and statistically significant; otherwise divergence is present. In the case of conditional convergence, model (2) is extended to include additional independent variables describing other factors that may affect the average annual growth rate of i-th variable.

2.2 Sigma Convergence

Sigma convergence means decreasing dispersion (diversity) of i-th variable over time. Measures of dispersion or concentration of the variable under study are used to verify sigma convergence. As proposed by Friedman (1992), linear trend models are a suitable tool for verifying sigma convergence. In this work, a linear trend model of the coefficients of variation of the analyzed variable was used to verify the sigma convergence:

$$V_{it} = \alpha_0 + \alpha_1 t, \tag{3}$$

where V_{it} is the coefficient of variation of the i-th variable in the year t, and significance of parameter is verified. A negative and statistically significant value of parameter means that volatility decreases over time, indicating sigma convergence.

2.3 The Taxonomic Measure of Development (TMD)

The taxonomic measure of development (TMD) aims to classify objects (cities) according to their level or rate of socioeconomic development. It is calculated as a function of the values of variables adopted to describe the analyzed phenomenon. There are many proposals for such measures in the literature. The first proposal was created in 1968 by Professor Zdzisław Hellwig (1968).[14] This method calculates the distance of the analyzed object (city), described as a point in the multidimensional space, from the artificial pattern of development. In this case of stimulants, this pattern is a point with coordinates that are the maximum values of individual variables. The smaller the distance of a given object from the pattern, the higher its level of development.

In this work, the zero unitarization method was used. For this purpose, each of the diagnostic variables was unitized (Kukuła 2000, 79):

$$ux_{ij} = \frac{rx_{ij} - rx_{i\,\min}}{rx_{i\,\max} - rx_{i\,\min}}, \tag{4}$$

where:

ux_{ij} — the unitized value of the i-th diagnostic variable in the j-th city, $i = 1, 2, ..., 10$; $j = 1, 2, ..., 31$,

rx_{ij} — average annual growth rate of the i-th diagnostic variable in the j-th city,

$rx_{i\,\min}$ — minimum value of the average annual growth rate of the i-th diagnostic variable, and

$rx_{i\,\max}$ — maximum value of the average annual growth rate of the i-th diagnostic variable.

Unitized diagnostic variables take values from the range [0; 1], and the higher the value, the better the situation of the city in the sphere described by a given variable. The taxonomic measure of development for each city is the arithmetic mean of the unitized average annual growth rates of adopted to study the variables:

14. A broad and up-to-date overview of the methodological aspects related to this method and the results of empirical research can be found in the paper by Roszkowska (2024).

$$\text{TMD}_j = \frac{1}{n}\sum_{i=1}^{n} ux_{ij}. \tag{5}$$

TMD_j — the value of the taxonomic measure of development for j-th former capital — takes values from the range [0; 1], and the higher its value, the higher the socioeconomic development of the city.

2.4 Wrocław taxonomy

The authors of the Wrocław taxonomy were Florek, Łukaszewicz, Perkal, Steinhaus, and Zubrzycki (1951). It is used to divide the analyzed objects (cities) which are vectors (points) in a multidimensional space of selected diagnostic variables, into more homogeneous groups – those in which objects are located close to each other in this space but are far from objects classified into other groups.

The procedure in this method can be divided into the following stages:

- Assuming that each city is a point in the n-dimensional space of the diagnostic variables, the distance matrix (usually Euclidean) D between the cities is calculated.
- In each row of matrix, the distance D is searched for the smallest element. This indicates the pair of cities closest to each other based on the adopted variables. This is presented in the form of an unoriented graph, in which the lengths of the arcs are proportional to the distance. An unoriented graph is a graph in which vertices are connected by lines with no direction (edges).
- It is checked whether the obtained graph is coherent — i.e., whether each of its two different vertices (cities) are connected by an unbroken sequence of edges (chain). If the constructed graph is not coherent, its individual components are connected in a place determined by the minimum distance between cities. This procedure is repeated until a coherent graph, which is the Wrocław dendrite, is obtained.
- To divide a set of cities into any number of k groups, the longest edges in the $k-1$ dendrite are discarded. The method of determining the number k may vary. The number k can be determined *a priori*. The authors proposed the "natural division." Based on the ordered sequence of lengths of individual dendrite edges

$$d_1 \geq d_2 \geq \ldots \geq d_n, \tag{6}$$

the quotients of the length of adjacent edges are calculated as

$$w_j = \frac{d_j}{d_{j+1}} \qquad \text{for } j = 1, 2, \ldots, n-1, \tag{7}$$

where d_j is the length of the j-th edge.

A set of discriminated (separated) cities naturally decays into k parts if $w_k < w_{k+1}$. Other methods of dividing the dendrite exist.

3 Results

3.1 Differences in the rates of change of the socioeconomic situation of former and current voivodship capitals

The years 1976–1998 were very favorable for the demographic development of former capitals. As a result of the extension[15] of the administrative boundaries, positive natural growth, and positive net migration, the number of their inhabitants increased by 924,200 (i.e., 44.6%). This population increase occurred in all cities, with Suwałki, Łomża, and Sieradz experiencing more than twofold increases. During this time, the number of inhabitants of current voivodship cities increased by 15.4%. The average annual growth rate of former capitals was more than two and a half times higher than that of current capitals, and the difference was statistically significant (Student's t-test,

15. We agree with Szmytkie (2019, 20) that the extension of administrative boundaries, despite the usual decrease in population density, is a manifestation of urban development. This study analyzes the changes in the number of inhabitants within the city area at each moment of the analysis. However, we believe that the impact of changes in city boundaries on the population is an interesting topic that requires further research.

Table 2. Changes in the number of inhabitants of former voivodship capitals compared to population changes in Poland (as on December 31)

	Population (in thousands)				Population average annual growth rate (%)				Share in the Polish population (%)	
Year	Poland	Cities	Current capitals	Former capitals	Poland	Cities	Current capitals	Former capitals	Current capitals	Former capitals
1975	34,185.0	18,816.0	6,722.0	2,072.6					19.7	6.1
1998	38,283.0	23,689.0	7,756.2	2,996.8	0.49	1.01	0.62	1.62	20.3	7.8
2022	37,766.3	22,489.9	7,778.2	2,604.1	−0.06	−0.23	0.01	−0.58	20.6	6.9

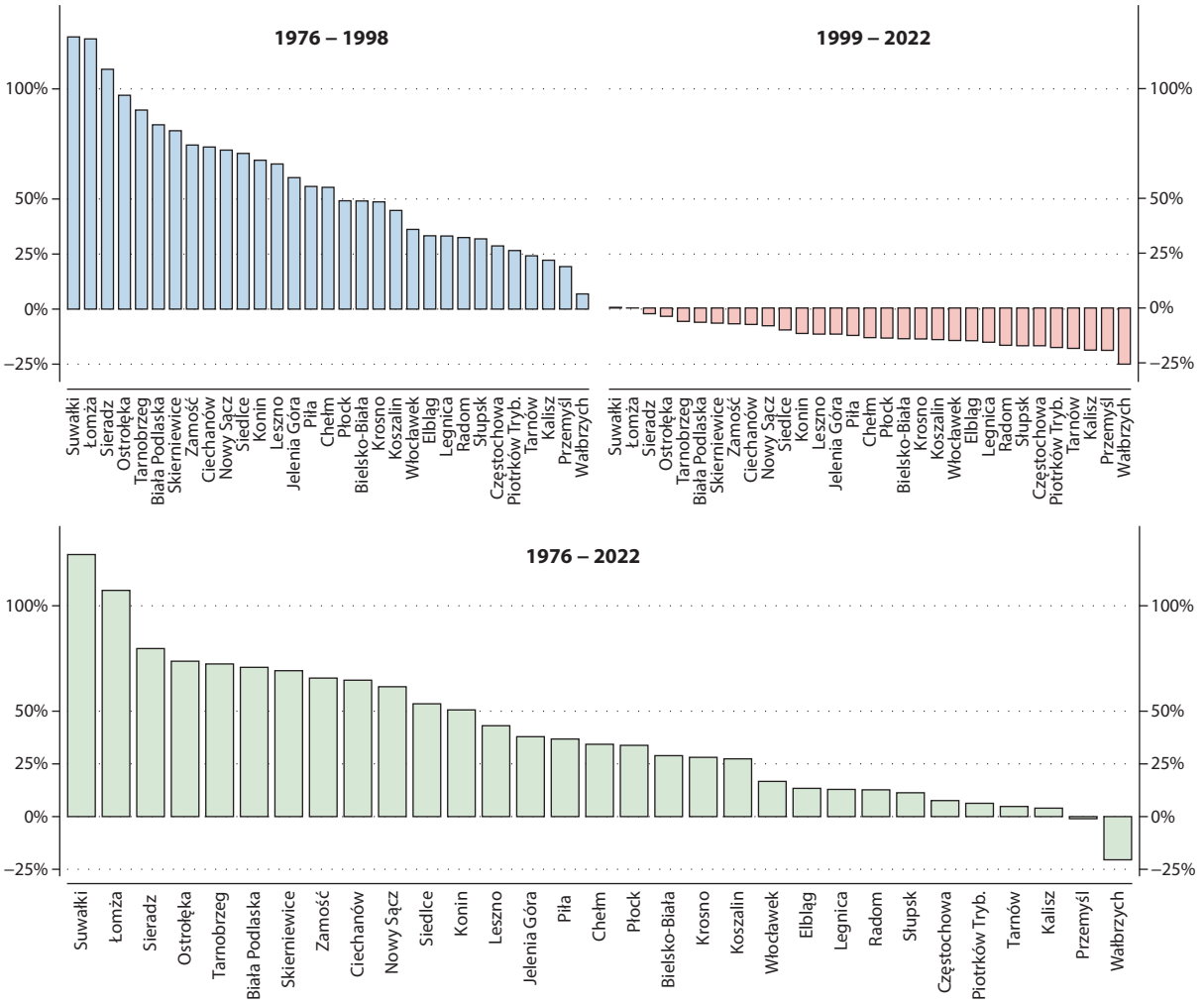

Figure 2. Growth rate of the inhabitant number in former voivodship capitals in the years 1976–2022

$p = .0001$). The share of the former capitals' population in the total number of Polish residents increased from 6.1% at the end of 1975 to 7.8% at the end of 1998. After the 1998 reform came into force, the trends reversed. From 1999 to 2022, the number of inhabitants in former voivodship cities decreased by 392.7 thousand (i.e., 13.1%), and their share of the Polish population decreased to 11.6%. Only Suwałki and Siedlce recorded minimal population growth (by 0.29%) and 0.01%, respectively). The largest decrease in the number of inhabitants was recorded in Wałbrzych (25.6%). As a result, at the end of 2022, Wałbrzych and Przemyśl had fewer residents than at the end of 1975 (by 20.5% and 1.0%, respectively). Only in Suwałki and Łomża did the number of inhabitants more than doubled compared to 1975. During this time, the number of inhabitants of current capitals

Tab. 3. Comparison of values of variables used for the study between former and current capitals

Variable	Capitals of voivodships	2022		Average annual growth rate in% or percentage point change				
		Mean	Variability index (%)	Total	Minimum	Maximum	Variability index (%)	p-value[a]
X_1	curent	432.1	95.5	−0.1	Katowice (−0.9)	Rzeszów (0.8)		.0016
	former	84.0	50.2	−0.5	Wałbrzych (−1.2)	Suwałki (0.0)		
X_2	curent	238.8	10.0	−2.9	Gorzów (−4.0)	Warszawa (−1.0)		<.0001
	former	215.0	8.8	−4.0	Wałbrzych (−3.1)	Ostrołęka (−5.3)		
X_3	curent	8.7	10.5	7.3	Katowice (6.3)	Kraków (8.0)	6.6	.0545
	former	8.1	14.3	7.0	Nowy Sącz (5.8)	Wałbrzych (9.0)	15.5	
X_4	curent	1803.6	20.4	1.6	Bydgoszcz (0.5)	Warszawa (3.0)	41.1	.0009
	former	1313.5	14.7	0.9	Włocławek (−0.5)	Biała Podlaska (2.2)	57.2	
X_5	curent	6.9	11.3	5.8	Katowice (5.1)	Kraków (6.9)	6.7	.2093
	former	6.1	8.9	6.0	Konin (5.2)	Tarnów (6.9)	5.5	
X_6	curent	7,528.7	83.0	−7.1	Gorzów (−10.7)	Rzeszów (−2.5)		.7409
	former	1,998.2	67.1	−7.3	Wałbrzych (−10.9)	Przemyśl (−4.7)		
X_7	curent	49.9	50.2	5.4	Katowice (−1.2)	Lublin (10.5)	47.0	.2503
	former	47.8	67.0	6.3	Elbląg (1.8)	Siedlce (11.3)	41.5	
X_8	curent	515.3	7.0	1.7	Białystok (1.4)	Kraków (2.1)	13.9	.0002
	former	451.1	6.1	1.4	Skierniewice (1.2)	Siedlce (1.7)	10.1	
X_9	curent	97.9	1.2	0.1	Łódź (0.3)	Warszawa (0.0)	72.3	.0115
	former	97.8	2.3	0.2	Wałbrzych (0.4)	Piła (−0.0)	57.2	
X_{10}	curent	8.6	26.7	0.3	Gorzów (−1.7)	Olsztyn (3.0)	558.2	.2977
	former	7.8	27.5	−0.0	Ciechanów (−2.7)	Nowy Sącz (2.6)		

[a] Student's t-test of differences in means significance level

increased by 0.3%, with the increase resulting primarily from the population growth in Warsaw (243.5 thousand, or 15.0%). The total number of inhabitants in other cities decreased by 197.4 thousand (2.4%). The average annual growth rate in former capitals was negative and significantly lower than in current capitals (Student's t-test, $p = .0016$).

The population decrease in former capitals resulted primarily from negative net migration and, since the second decade of the 21st century, also from negative natural growth.[16] The process of expanding city boundaries was limited (Szmytkie 2019, 24–25). The area of former capitals increased by 1.3%, with seven cities experiencing slight decreases and nine remaining unchanged. In the remaining 13 cities, the increases were several percent (up to 5.7%), and only in Ostrołęka and Koszalin did they exceed 15% (15.4% and 18.2% respectively). Much greater changes occurred in current voivodship capitals, whose total area increased by 10.5%. This was driven by three cities: Opole (an increase of more than half), Rzeszów (an increase of almost two and a half times), and Zielona Góra (an almost fivefold increase). Primarily sparsely populated or even uninhabited areas were incorporated, which did not significantly impact population growth. Due to boundary expansion, the number of inhabitants increased by 9.3 thousand (by 7.3%) in Opole, 8,800 (by 10.0%) in Rzeszów, and 19,600 (by 14.1%) in Zielona Góra (Szmytkie 2019, 25). However, population density in Zielona Góra decreased 4 times.

Since the second decade of the current century, the phenomenon of numerous baby boomers (born in the 1950s) reaching the retirement age has been observed. This has caused an increase in the demographic burden, which is the ratio of the number of people of working age to 100 people of post-working age. Between 2002 and 2022, the demographic burden increased drastically in both former and current capitals, but more so in former capitals. At the end of 2002, there were 492 people of working age per 100 people of post-working age in former capitals (430 people in current capitals). By the end of 2022, this decreased to 215 people (239 people in current capitals). The average annual rate of decline of this coefficient in former capitals was 4.9% (which means an increase in the demographic burden) and was significantly higher than in current voivodship capitals (Student's t-test, $p = .0009$).

It can be said that the trends in demographic processes presented above were a continuation of those noted by Bocheński and Rydzewski (Bocheński and Rydzewski 2020, 34–80) in the years 1975–2018.

Revenues of city budgets per inhabitant and the rate of change in the analyzed period were higher in the current voivodship capitals, but the differences were not significant (Student's t-test, $p = .0545$). On the other hand, former voivodship cities were characterized by higher volatility of both income per capita and the rate of change. The rate of increase in budget revenues per capita in Wałbrzych was more than half higher that in Nowy Sącz.

In the analyzed period, the differences in economic activity between the two types of cities, measured by changes in the number of registered business entities per 10,000 population, deepened. At the end of 2002, the economic activity index in former capitals amounted to 1,093, and in current capitals, it was only 204 higher. After 20 years, this difference grew to 490. The average annual growth rate of the number of registered entities per 10,000 population in current capitals was 80% higher than in former ones. In Włocławek, there was a decrease in the number of registered enterprises (by 0.5% on average annually).

From 2004 to 2022, the average gross monthly salary in current capitals was higher than in former capitals, although the difference decreased from 19.2% in 2006 to 14.1% in 2022. Among current capitals in 2022, Warsaw employers paid the most (PLN 8,540.1), and Gorzów Wielkopolski employers paid the least (PLN 5,890.9). Among former capitals, Radom employers paid the most (PLN 7,898.5), and Chełm employers paid the least (PLN 5,420.9). The average annual growth rate of average salaries in former capitals was slightly higher than in current capitals (6.0% vs. 5.8%), but the difference was not statistically significant (Student's t-test, $p = 0.2093$). The variation in average annual rates among both former and current capitals was small (coefficient of variation 5.5% and 6.7%, respectively).

16. This process occurred throughout Poland, but it was more intense in former capitals.

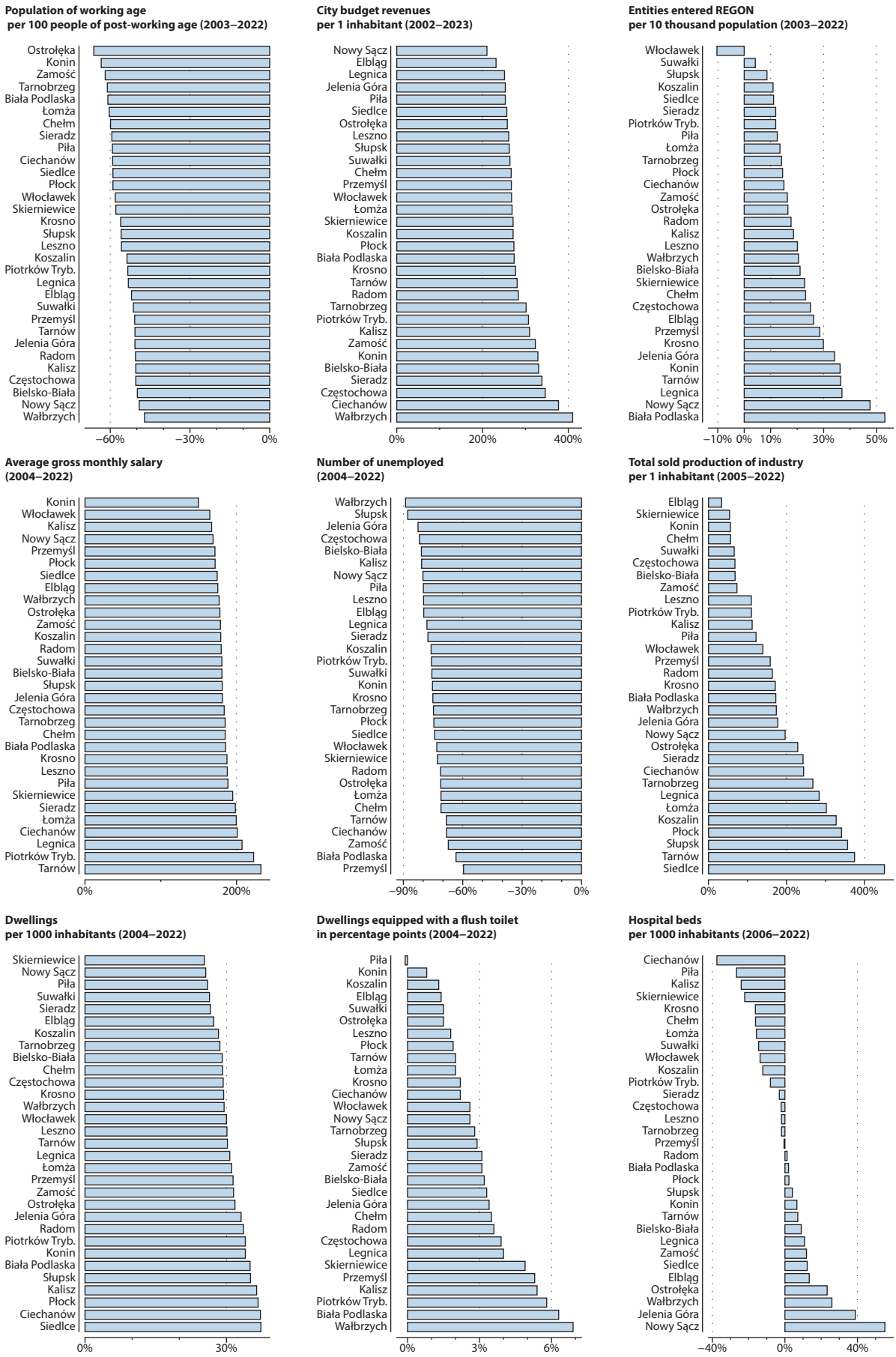

Figure 3. Growth rate of the diagnostic variables in former voivodship capitals

At the end of 2022, compared to the end of 2003, the number of unemployed decreased significantly in both former and current capitals, with the scale of the reduction being almost identical. In current voivodship capitals, unemployment decreased from 422,900 people to 111,900 (by 73.5%), and in the former capitals, from 261,000 people to 61,900 people (by 76.3%). However, the difference in the average annual rate of decline in the number of unemployed was statistically insignificant (Student's t-test, $p = 0.7409$). Among current capitals, the largest reduction in unemployment was recorded in Gorzów Wielkopolski (average annual rate of decline: 10.7%), and the lowest in Rzeszów (average annual rate of decline: 2.5%). Among former capitals, the respective values were Wałbrzych (10.9%) and Przemyśl (4.7%).

The differences in the average annual growth rates of sold production of industry per inhabitant by entities employing more than nine people also did not differ significantly between the two groups of cities (Student's t-test, $p = .2503$).

Between 2004 and 2022, the number of dwellings per 1000 inhabitants increased faster in current capitals (by 37.8%) than in former capitals (by 31.0%). As a result, the difference between former and current capitals has increased, from 29.6 dwellings per 1000 inhabitants at the end of 2003 to 64.2 at the end of 2022. At the end of 2022, the number of dwellings per 1,000 inhabitants in current capitals was 515.3 and in former capitals 451.1. The average annual growth rate of the dwellings in current capitals was significantly higher compared to former capitals (Student's t-test, $p = .0002$). The largest number of inhabitants per 1,000 population among former capitals was recorded by Wałbrzych (501.0), but among current capitals, Wałbrzych would rank only in 10th place. Among current capitals, the highest value of the indicator is in Łódź (571.4).

Dwellings in Polish medium and large cities have been characterized by good infrastructure for many years. Of several available equipment indicators (water supply, bathroom, flush toilet, central heating, and gas), the percentage of dwellings equipped with a flush toilet was used for the study. At the end of 2003, 96.0% of dwellings in current voivodship capitals were equipped with a flush toilet. In former capitals, this percentage was 94.7%. In the analyzed period, a faster increase in this ratio was recorded by former capitals, and at the end of 2022, the ratios for both groups were almost equal (97.8% for former and 97.9% for current capitals). The average annual growth rate of the indicator in former capitals was significantly higher than in the current capitals (Student's t-test, $p = .0115$). The analyzed cities are characterized by very low variability in the percentage of dwellings equipped with a flushable toilet. At the end of 2022, the highest percentage was recorded in Ostrołęka (99.5%), and the lowest in Wałbrzych (86.9%). However, Wałbrzych recorded the highest increase in this indicator (by 6.8 percentage points).

Both current and former voivodship capitals experienced large and multidirectional changes in the condition of the hospital base, in this study measured by the number of hospital beds per 1,000 population. This indicator in current capitals increased from 8.2 at the end of 2005 to 8.6 at the end of 2022 (by 4.8%). In former capitals, the ratio decreased by 0.06 to 7.8 (i.e., by 0.05%), but in Nowy Sącz, it increased by 55.1%, in Jelenia Góra by 38.8%, and in Wałbrzych by 25.9%. Conversely, it decreased by 26.7% in Piła and by 37.5% in Ciechanów.

3.2 Beta and sigma models of convergence for the variables adopted in the study

In the beta convergence models for former capitals, the values of the parameters at variables X_2, X_3, X_4, X_5, and X_9 are negative and statistically significant at the 0.05 significance level. This means that in the analyzed period cities with:

- a higher number of people in working age per 100 people in post-working age at the end of 2002 were characterized by a lower growth rate of this indicator; due to the systematic decrease in the value of this indicator in the analyzed period, the growth rate was negative; in effect, cities with a higher value of the indicator in 2002 experienced a greater decrease in 2022;
- higher budget revenues per capita in 2002 were characterized by a lower growth rate of this income;
- a larger number of entities in the REGON register per 10,000 population at the end of 2002 were characterized by a lower growth rate of the number of these entities;
- higher average gross monthly salaries in 2004 were characterized by a lower rate of their growth;

- a higher percentage of dwellings equipped with a flush toilet at the end of 2003 were characterized by a lower growth rate of this indicator.

This means that in the analyzed period, there was convergence (catch-up effect) in former capitals in the areas described by the above variables. Additionally, the estimation of the convergence model of the number of inhabitants (X_1) is worth noting. In this case, the parameter is also negative, and the empirical significance level is only slightly above .05, at .0585. Therefore, we can assume that the number of inhabitants in the smallest former capitals grew faster than in larger ones. Thus, this case also exhibits beta convergence.

For variables X_6, X_7, X_{10}, the parameters were also negative but not statistically significant, while the insignificant parameter at the variable X_8 was positive. Consequently, there are no grounds for determining the directions of changes in these variables. In current voivodships, convergence was shown by four of the same variables as in former capitals. However, the variable X_4 was "replaced" by the variable X_7. Thus, cities with high total sold production of industry per inhabitant in 2005 were characterized by a lower increase in this production in subsequent years.

Sigma convergence models of seven variables (X_1, X_2, X_3, X_4, X_5, X_7, and X_9) describing changes in former capitals indicate decreased variability of the values of these variables in the analyzed period. This also indicates convergence of cities in the areas described by these variables. However, in the case of the number of dwellings per 1,000 inhabitants (X_8) and the number of hospital beds per 1,000 inhabitants, there was divergence (i.e., an increase in the volatility). For

Table 4. Directions of changes in the values of selected socioeconomic variables in former and current capitals

	Former capitals			Current capitals		
	Parameter[a]	r[b]	p-value	Value[a]	r[b]	p-value
Variable	Beta convergence					
X_1	−0.0019	−.3435	.0585	0.0002	.1607	.5241
X_2	−0.0063	−.8251	**<.0001**	−0.0117	−.7888	**.0001**
X_3	−0.9681	−.5809	**.0006**	−1.0408	−.7663	**.0002**
X_4	−0.0012	−.3949	**.0279**	0.0018	.3632	.1385
X_5	−0.7403	−.4915	**.0050**	−0.5981	−.5366	**.0217**
X_6	−0.0001	−.2524	.1707	<0.0001	.0169	.0677
X_7	−0.0477	−.2969	.1111	−0.0865	−.6376	**.0044**
X_8	0.0006	.0713	.7032	−0.0022	−.2300	.3584
X_9	−0.3994	−.8498	**<.0001**	−0.5429	−.9412	**<.0001**
X_{10}	−0.1128	−.2004	.2797	0.0241	.0383	.8801
Variable	Sigma convergence					
X_1	−0.1274	.9936	**<.0001**	−2.2490	−.2483	.2313
X_2	−0.2830	−.9380	**<.0001**	−0.1702	−.8809	**<.0001**
X_3	−0.2210	−.6678	**.0009**	−0.3949	−.8163	**<.0001**
X_4	−0.1020	−.6820	**.0007**	0.4820	.9302	**<.0001**
X_5	−0.1150	−.7930	**.0001**	−0.2126	−.9250	**<.0001**
X_6	0.3168	.4235	.0628	0.4586	.5683	***.0089***
X_7	−1.9124	−.7536	**.0005**	−2.0219	−.9350	**<.0001**
X_8	0.0414	.9237	***<.0001***	0.0532	.6158	***.0038***
X_9	−0.0837	−.9218	**<.0001**	−0.0708	−.9294	**<.0001**
X_{10}	0.1968	.6674	***.0025***	0.2311	.7884	***.0001***

Remark: Results marked with bold indicate convergence, while results marked with red italics indicate divergence. Other cases mean no decision.

[a] Value of model estimated parameter

[b] Pearson correlation coefficient

unemployment (X_8), no decision can be made. Sigma convergence models of variables describing changes in current voivodship capitals showed similar results to the former capitals models. The only differences are the lack of sigma convergence for the number of inhabitants (X_1) and the divergence for unemployment.

3.3 Taxonomic Measure of Development

When interpreting the results of the classification using the taxonomic measure of development (TMD), it should be noted that the values are calculated based on the average annual growth rates of the diagnostic variables. Therefore, they reflect changes in the socioeconomic situation of cities, not their absolute level of development. Consequently, the cities that developed more rapidly during the analyzed period are ranked highest, not those with the highest overall level of economic development. This distinction is particularly important when variables exhibit beta convergence, meaning that cities with initially lower values had higher growth rates.

The values of the taxonomic measure of development range from 0.31 to 0.65, with a mean of 0.47 and a median of 0.48. The volatility coefficient is relatively small at 17.5%, so there is no clear leader with the highest growth rate across most variables. Similarly, no cities exhibit the lowest growth rates for most variables. Identifying factors that might influence this classification is challenging. City size often plays a role in such situations, but the correlation coefficient between TMD and the 2022 population was only .218 and statistically insignificant. Perhaps the growth rate was determined by the location (e.g., Siedlce or Tarnów as "satellites" of Warsaw and Kraków, respectively) or, as Kurniewicz, Swianiewicz, and Łukomska (2023, 33) suggest, proximity to Poland's western border. Undoubtedly, the activity of local authorities also played a crucial role.

Wałbrzych surprisingly demonstrated the fastest development rate in the analyzed period, as it also experienced the largest population decrease. Wałbrzych also recorded the lowest percentage of dwellings equipped with a flush toilet in 2022, but it had the highest increase in this indicator. Siedlce and Tarnów followed Wałbrzych in the ranking.

Włocławek ranked last. This result aligns with a monograph devoted to this city, aptly titled "Disappearing Poland" (Witwicki 2021). The author writes: "Disappearing Poland is a story of transformation told from the perspective of a medium-sized city. Włocławek is the Polish Detroit, an industrial center driving the nail into its own coffin. Instead of grand politics, we have the stories of people here: from those who collected scrap metal to those who flirted with nascent capitalism. In the background: ruined factories, nascent small businesses, and brutal administrative reform. The city is falling, but people remain in it." However, people also seem reluctant to stay in cities with high growth rates, such as Wałbrzych, with its significant population decrease, or Tarnów, as illustrated by the article titled "Tarnów as a ghost city. So what if it's cheap? There are no good jobs, so there are no people" (Pakuła and Sąder 2024).

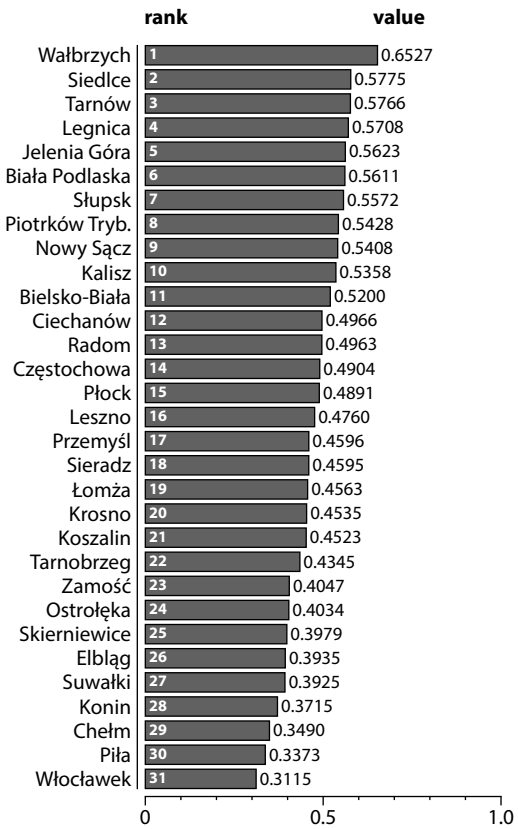

Figure 4. Ranking of former capitals by taxonomic measure of development

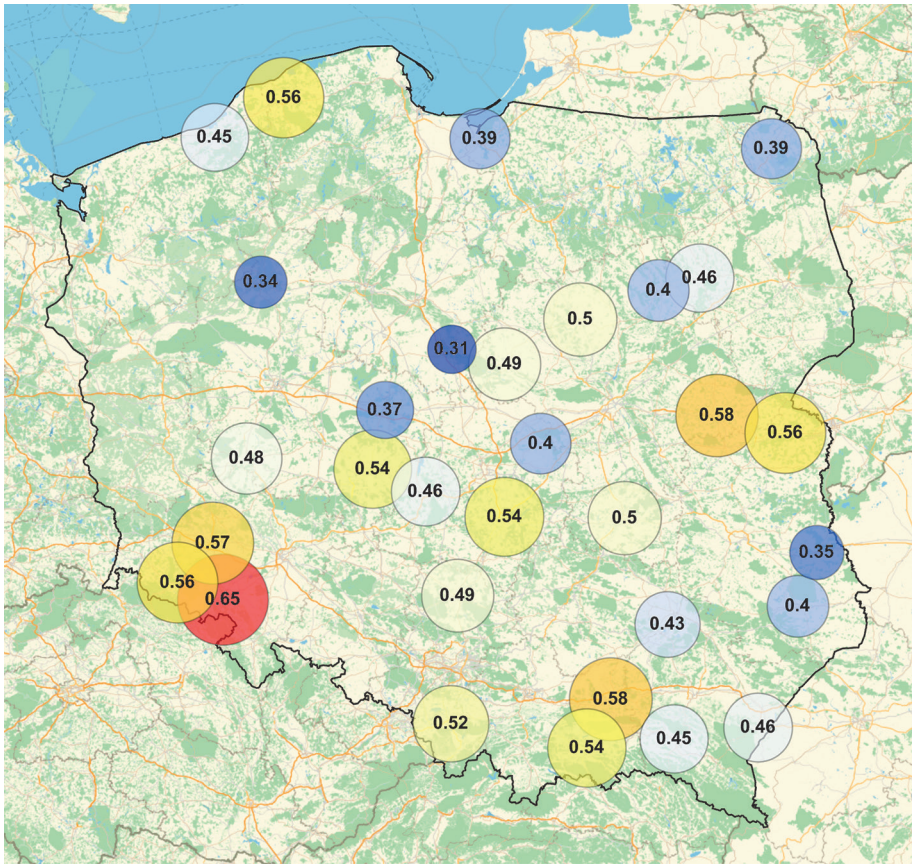

Figure 5. Spatial distribution of the taxonomic measure of development

3.4 Wrocław taxonomy

Applying the Wrocław taxonomy algorithm[17] at the first level yielded three relatively homogeneous groups, in terms of socioeconomic growth rate, consisting of 14, 12, and 5 cities, respectively. At the second level, each group was further divided into 4, 5, and 2 subgroups, respectively. The validity of the division into three groups was further confirmed by the Kruskal-Wallis test (see fig. 7) with

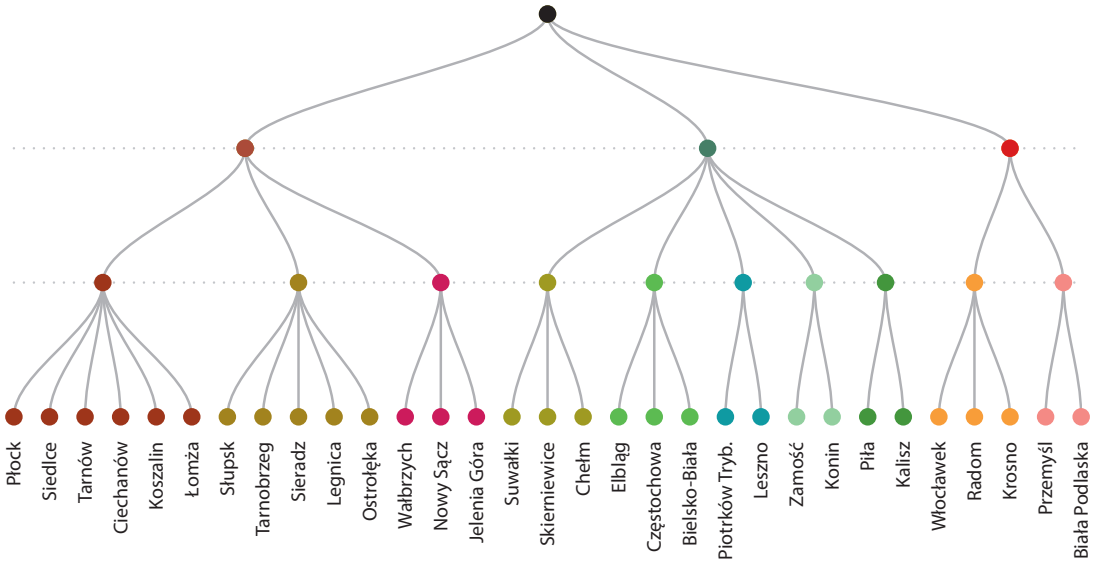

Figure 6. Division of the capitals of former voivodships into homogeneous groups, based on average annual growth rates of selected diagnostic variables

17. A computer program developed by Kolenda (2006) was used for calculations.

Table 5. Homogeneous groups of former capitals isolated by the Wrocław taxonomy

Group	Composition of the group
I	Płock, Siedlce, Tarnów, Ciechanów, Koszalin, Łomża, Słupsk, Tarnobrzeg, Sieradz, Legnica, Ostrołęka, Wałbrzych, Nowy Sącz, Jelenia Góra
II	Suwałki, Skierniewice, Chełm, Elbląg, Częstochowa, Bielsko-Biała, Piotrków Trybunalski, Leszno, Zamość, Konin, Piła, Kalisz
III	Włocławek, Radom, Krosno, Przemyśl, Biała Podlaska

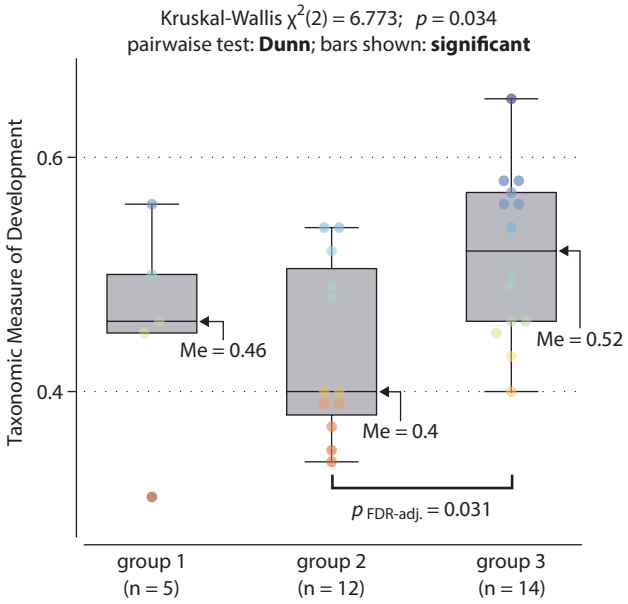

Figure 7. Graphical and numerical results of Kruskal-Wallis test on Taxonomic Measure of Development by the three defined groups of cities

Dunn's test of multiple comparisons (Dunn 1964). The false discovery rate (FDR) was controlled using the Benjamini-Hochberg adjustment (Benjamini and Hochberg 1995). It is worth noting that this division is not a regionalization; cities in a given group are often geographically distant from each other.

Summary

The loss of regional capital status signifies losing one of the city's most important functions. This often leads to the out-migration of skilled workers, population decline, reduced investment and economic activity, and decreased resident income. These adverse phenomena were experienced by cities that lost their voivodship capital status due to the administrative reform implemented on January 1, 1999. Individual cities have recovered from this situation in different ways and, as the research demonstrates, at varying rates. This study could not definitely identify the factors determining the calculated taxonomic measure of development. Undoubtedly, the action of local authorities and communities played a crucial role (Springer 2016), especially since initiatives undertaken by the government and new voivodships assemblies were largely unsuccessful. One example is the program "Dialogue and Development. Actions to Maintain the Conditions for the Development of Areas and Cities Losing Voivodship Status" developed by the Government Center for Strategic Studies and adopted by the Council of Ministers in March 1998. This program aimed to:

- create a forum for dialogue and cooperation between local authorities, partners, and government bodies implementing the administrative reform;
- help cities losing capital status transition from administrative centers to thriving economic educational, and cultural hubs; and
- stimulate local economic development and improve quality of life by creating sustainable jobs.

However, it ended with a pilot project in 1999 and was not continued (Bocheński and Rydzewski 2020, 18). Another example is the "Support Program for Former Voivodship Cities" developed by the Marshal's Office of the Lubelskie Voivodship,[18] which also did not progress beyond the discussion phase.

As the research shows, former capitals still require support. However, their leaders must understand that initiatives should originate locally. A recent example is the initiative Tarnów's mayor to establish the "Union of former voivodship cities" (Sajdak 2024). These cities represent over 2.5 million people. Joint actions can yield greater results than individual efforts.

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