

## Demographic changes in Polish cities in the years 1950-2016

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**Abstract.** The study presents the demographic development of big cities ( $\geq 100,000$  inhabitants within the city's administrative borders) in Poland from 1950 to 2016. The article demonstrates the similarities and differences in these cities' demographic development, showing demographic trends in Poland's various periods of socio-economic development using the graphical trajectory method. The presented study on demographic development of Polish cities uses trajectories, showing them to be an additional useful tool in analyses of demographic development of cities, regions and other territorial units. It was indicated that this simple graphic representation opens new interpretative possibilities; it demonstrates development stages, shows both the process nature (demographic development of cities in this case), and whether this process is progressive or regressive in nature. The trajectory method allows us to read the dynamics of changes in a particular process (in the distances between successive trajectory points).

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## 1. Introduction

The transformations in Poland after the Second World War changed the dynamics of socio-demographic and economic phenomena. Three periods clearly emerge here: the end of the war to 1989, 1989–2004 and post-2004, i.e. after Poland's accession to the EU (including the related opening up of European labour markets and free movement of people).

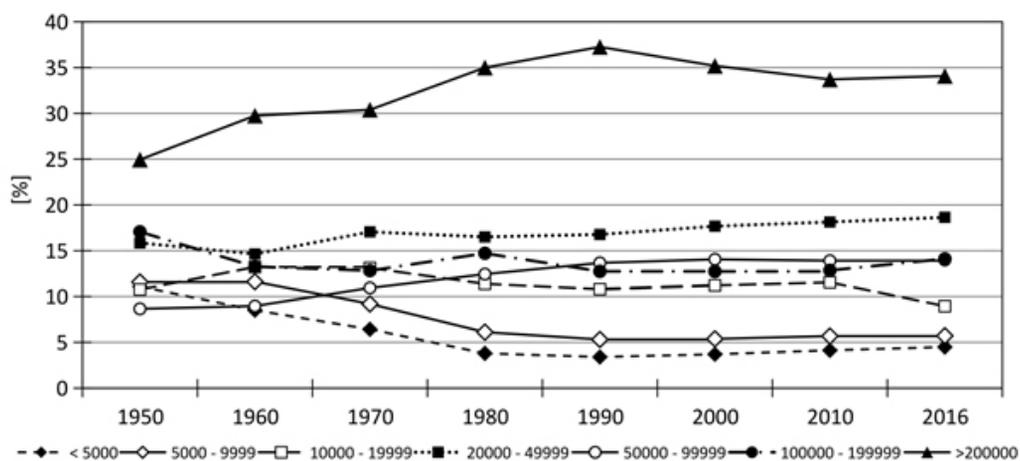
This is also reflected in the demographic development of cities in Poland, where recent years have seen declines in population, as is the case for the country as a whole. The trends seen in almost 30 years of demographic processes indicate that the population situation in Poland is problematic and the country is experiencing a demographic crisis. With the current low fertility rate and rapid rate of emigration of young people, no significant changes are expected to provide stable demographic development in the near future. That is why it is extremely important to identify and trace the trends of demographic development, which constitutes an important research task.

## 2. Research objective and study object

The aim of the study is to present the demographic development of big cities ( $\geq 100,000$  inhabitants)

in Poland from 1950 to 2016. This will demonstrate the similarities and differences in these cities' demographic development, showing demographic trends in Poland's various periods of socio-economic development using the graphical trajectory method. It will also show whether the changes that took place after 1950 affected the demographic trends of individual cities after 1989. The choice of big cities is not accidental, because these 43 cities total more than 10 million inhabitants, which is more than 28% of the total population of Poland and almost 47% of the total urban population (Fig. 1, Table 1). Thus, the study included all cities that in the research period (1950–2016) had a population of  $\geq 100,000$  residents.

The choice of research period is also not accidental: it contains the post-war period after 1950, as well as the post-1989 transformation period, and the changes that took place in Poland after joining the EU – three periods in which there were fundamental changes to the organisation, structure and functioning of the state, the society and the country's economy that were significantly reflected in the country's demographics. The demographic situation is evolving, and recent years have brought Poland many unfavourable processes, such as the aging of the population, a drop in birth rate, huge changes in the economic structures of population age (young, working-age and elderly) and significant emigration, especially of young people. This study has two goals: one methodical and one investigative.



**Fig. 1.** Percentage share of cities of various size categories in Poland, 1950–2016

Source: Own study based on stat.gov.pl data

**Table 1.** Characteristics of changes in the network of cities of  $\geq 100,000$  residents in Poland, 1950–2016

	1950	1960	1970	1980	1990	2000	2010	2016
number of cities of $\geq 100,000$ pop.	17	22	24	36	43	41	39	39
population in cities of $\geq 100,000$ (in thousands)	4,210	6,128	7,391	10,438	11,812	11,421	10,912	10,815
% share of population in cities of $\geq 100,000$ relative to total urban population	45.5	42.6	43.3	49.8	50.2	48.3	46.6	46.8
% share of population in cities of $\geq 100,000$ relative to total population	16.8	20.6	22.6	29.2	31.0	29.9	28.3	28.1

Source: Own study based on stat.gov.pl data

### 3. The trajectory as a method of studying the path of demographic development of cities

The term “trajectory” derives from physics, where it is used in ballistics and means the curve or path describing the movement of a body (a “missile” in ballistics). In this sense, a trajectory can be interpreted in both a spatial and a temporal sense. The former focuses on the path that the body takes through space, while the second relates to the time needed to cover the distance from the starting point to the end point (assumed to be the target) (definition of “trajectory” from the Cambridge Advanced Learner’s Dictionary & Thesaurus© Cambridge University Press).

In our study, the concept of a trajectory is understood as a graphical portrayal of a process (a series of changes over time). Trajectories are a specific, graphical representation of the developmental path of a given phenomenon (process) from the first year (decade) to the last decade, and thus illustrate an ongoing process. The method was used in this sense by Parysek (2004) and Parysek, Mierzejewska (2012).

The authors present demographic development trajectories for cities of 100,000 and more people. It should be mentioned that this is a less-common method of presenting a given phenomenon over time, but it gives a new perspective on various processes, including demographic processes.

The trajectory is drawn using a very simple method. An event, or two successive measurements of a given variable over time, are presented as a point in a two-axis coordinate system (e.g., a single point’s x-axis value might represent the population in 1960, while its y-axis value might represent the population in a previous year, e.g. 1950). This is repeated for successive years in the time series, and successive points are connected with a line to show the development trajectory (the course and dynamic, or intensity, of the process).

The characteristic feature of this method is that a dynamic event is mapped as a specific point in a two-axis coordinate system. This point, however, portrays a change that occurred in a year, and the mapped trajectory shows the changes that happened from year to year or for 5-year, 10-year intervals, etc. over the period under consideration.

Conclusions on changes, or more precisely the process shown by the mapped line (the trajectory), can be drawn based on its shape and the distance between successive points or years. It should be emphasised that the mapped trajectory illustrates the general direction of the process, and it should be interpreted supported by analyses of other concrete data. The use of this method (as well as many others) is not the entirety of the research process, which should always be thoroughly investigated and verified.

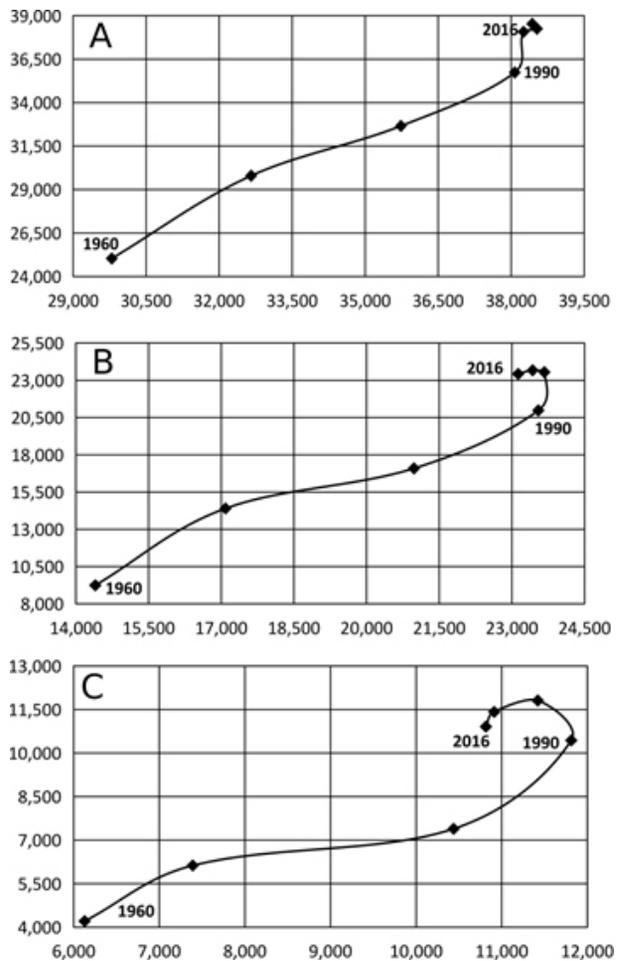
#### 4. Results: the demographic development trajectories of cities in Poland

As mentioned earlier, the demographic development (i.e. population growth or decline) in Poland is clearly decreasing, as reflected in the trajectory, which clearly shows that in the years 1990–2000 there was dynamic change in trajectory direction (quite a short distance between successive points, and very short between the points 2010–2016 – Fig. 2A). The trajectory of demographic development of cities in Poland reveals that large cities show the directions and dynamics of demographic changes, the shorter the distances in general and for cities of over 100,000 are similar, but, from 1990 onwards, the trajectories of big cities show a clear and dramatic turnaround, and a greater decrease in population from 1990 to 2016 (Fig. 2C). The main factors in changes in urban population in the study period are natural increase, migration balance, real increase and number of cities. After World War II (WWII) there was a rapid growth in urbanisation in Poland. The characteristic trait of Polish urbanisation in the socialist period (1950–1989) was its heavy dependence on industrialisation processes.

The development of heavy and mining industries resulted in the demographic growth of cities. Post-war Poland was characterised by accelerated urbanisation as a result of industrialisation and socio-economic changes. In the 30 years after WWII, Poland transformed from a country in which most of the population lived in rural areas to a country of clearly urban character. In the years 1950–1989, the share of urban population increased from 42.5% to 61.8%. The rapid growth in urban population and urbanisation were of course not an exclusively Polish phenomenon, as most countries underwent heavy urbanisation after WWII. The specific character of Polish urbanisation lies in the factors that conditioned its course and shaped its social consequences (Szymańska, Matczak, 2002).

This raises the question of whether the processes of urban population concentration in Poland were related to simultaneous “deep” intense transformations in cities; that is, whether there were vertical changes, such as modernisation, diffusion of innovation and propagation of the urban lifestyle. Modernisation is not discussed here because it has broad

and diverse meanings in different spheres. Suffice to mention that, for example, in the sphere of social organisation, S. Eisenstadt believes that the level of urbanisation, or degree to which the population is concentrated into large cities, is the most important indicator of modernisation. According to Eisenstadt, this is due to its direct relationship with other important transformation processes (Węgleński, 1992). Of particular importance are the relationships between: urbanisation and the growth of the social scale; urbanisation and social diversification; urbanisation and transformation in social and professional structures, and increased social and spatial mobility; and transformations in the broader



**Fig. 2.** Trajectory of total population, urban population and population of cities of  $\geq 100,000$  inhabitants in Poland, 1950–2016

Explanations: A – total population; B – urban population and population of cities of  $\geq 100,000$  inhabitants; X – population in thousands in the current year (decades); Y – population in thousands in the previous year (decades)

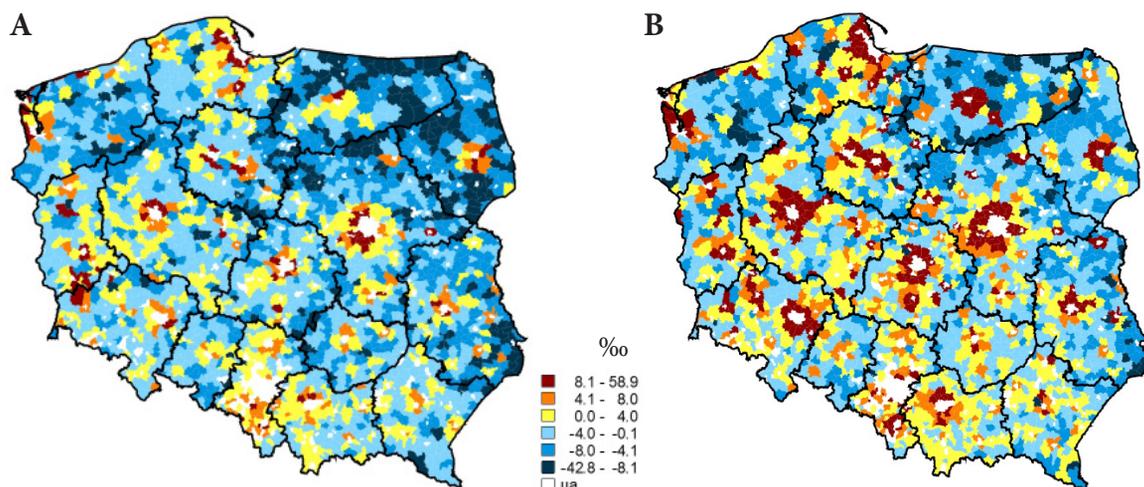
Source: Own study based on stat.gov.pl data

socio-economic infrastructure of cities and its modernisation. Although we do not examine all of these issues in this document, we draw attention to the social and professional changes that both determine and result from modernisation processes, as well as the issue of social and spatial mobility. It only needs to be mentioned here that in the earlier phase of urbanisation in Poland there was a mass transition in employment from agriculture to industry and construction (from sector I to sector II until the 1960s and 70s), and this was considered a measure of modernisation. This is of course associated with heavy migration from rural areas to cities, as reflected in trajectory maps (Szymańska, Matczak, 2002). The next phase is characterised by a rapid increase in service sector employment (sector III), with a decline in sectors I and II from the end of the 1970s to the present. Since 1989, the socio-economic transformation that was introduced has slowed the influx of people into cities, resulting in their depopulation and in suburbanisation, which is reflected in the outflow of urban populations to suburban areas (Szymańska, 2002; Szymańska and Biegańska, 2010; Szymańska and Biegańska, 2011; Biegańska, 2013) – see Fig. 3, 4.

An important role was played by demographic processes other than urban–rural migration. After the end of communism, Poland, like other Central and Eastern European countries, had to cope with a dramatic drop in births, a negative real increase

and the onset of population aging, which particularly affected urban areas (Kurek, 2007).

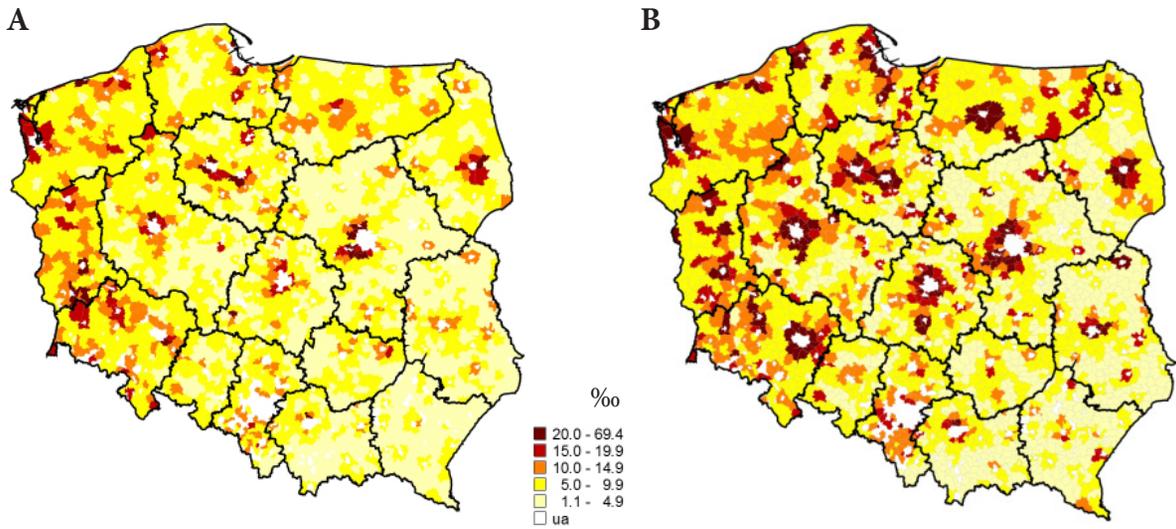
Comparing the graphic image of the trajectory for cities of more than 400,000 inhabitants, we note some similarities in development between Gdańsk and Wrocław, as well as between Szczecin and Poznań. The city of Łódź has an unparalleled trajectory, in which we notice an extremely rapid decline in population since 1990, and if we generalise somewhat we can state that the trajectories for Warsaw and Kraków have some similarities (see Fig. 5). In almost every analysed case, a city's demographic growth collapses after 1990, which, as already mentioned, is the result of socio-economic transformations that led to negative natural and real growth and to suburbanisation. The process of suburbanisation began with the largest cities, and gradually spread to cities in lower size categories (Szymańska, et al., 2006). This is confirmed by studies by Szymańska and Biegańska, in which many periurban areas have been characterised by a positive natural growth since 1993, while municipalities near large urban centres show quite a high influx of population from cities and positive index of migration effectiveness (Szymańska and Biegańska, 2010; Szymańska and Biegańska, 2011a; Szymańska and Biegańska, 2011b; Biegańska, 2013). Many studies show that population started flowing to periurban areas already in the early 1990s. There are various motives for migration to suburban (periurban) areas



**Fig. 3.** Total migration balance per 1,000 population in rural areas in Poland

Source: Szymańska, Biegańska, 2010

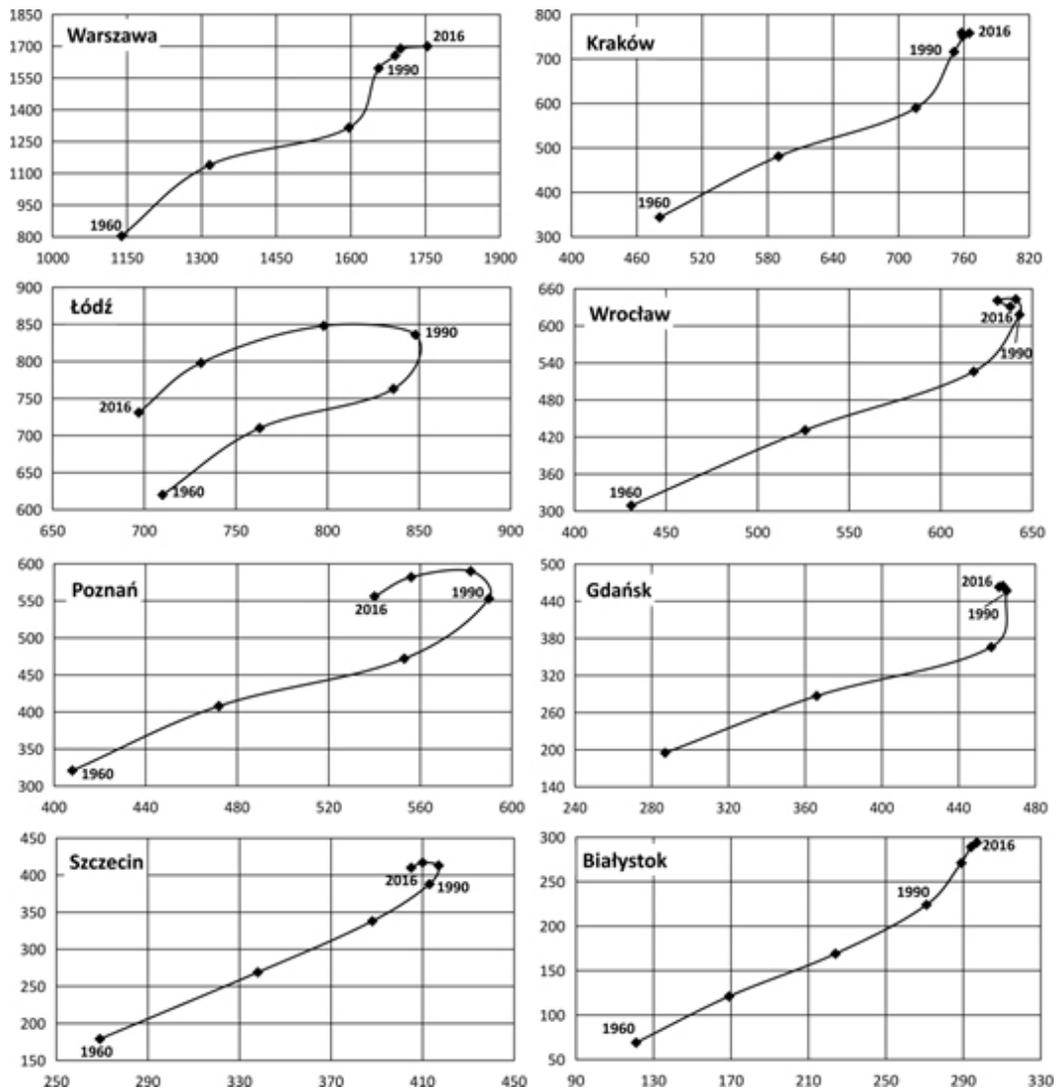
Explanation: A – 1995-1999, B – 2005-2009; ua – urban areas



**Fig. 4.** Inflow from urban to rural areas per 1,000 population in Poland

Source: Szymańska, Biegańska, 2010

Explanation: A – 1995-1999, B - 2005-2009; ua - urban areas



**Fig. 5.** Trajectories of big cities in Poland, 1950-2016

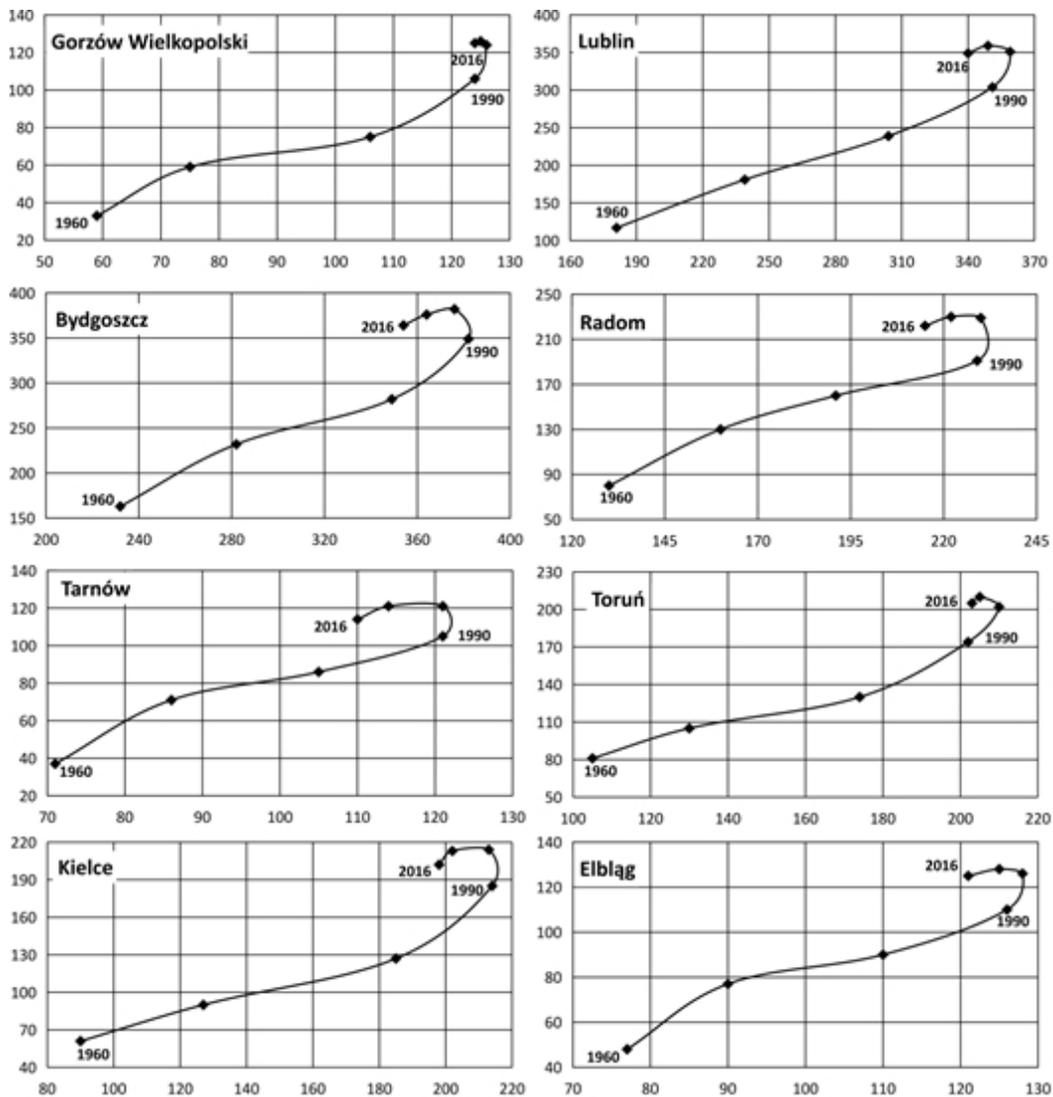
Explanations: X – population in thousands in the current year (decade), Y – population in thousands in the previous year (decade)

Source: Own study based on stat.gov.pl data

– economic, social and environmental factors. Regardless of what motivates migrants, their choices confirm that the suburbanisation processes in Polish rural areas, particularly counter-urbanisation and urban sprawl, are advancing (Szymańska, Biegańska, 2011a, 2011b, Biegańska, 2013). “...The mobility of population living in rural areas was increasing. An average rate of total migration was 24‰ between 1999 and 2004, but in the years 2005–2011 it reached almost 26‰. The index of migration effectiveness pointing to growing interest in rural areas as a migration destination confirms this trend. Compared with the years 1999–2004 when its rural

value was 4 people per 100 migrants, in the period 2005–2011 it was almost 10 people (it was minus 2 per 100 migrants in 1991). A high rate of total migration and a high index of migration effectiveness were found in the periurban areas of large cities...” (Biegańska, 2013: 18).

Another group of 22 cities (Fig. 6) – including very general ones – has similar directions of demographic development trajectory, but the speed of population decrease is diverse here. In the cities of Gorzów Wielkopolski, Toruń, Bielsko-Biała and Gdynia, the decreasing population phenomenon is weakest. Meanwhile, in other cases, since 1990,



**Fig. 6.** Trajectories for cities of 100,000–400,000 inhabitants, 1950–2016  
 Explanations: X – population in thousands in the current year (decade), Y – population in thousands in the previous year (decade)  
 Source: Own study based on stat.gov.pl data

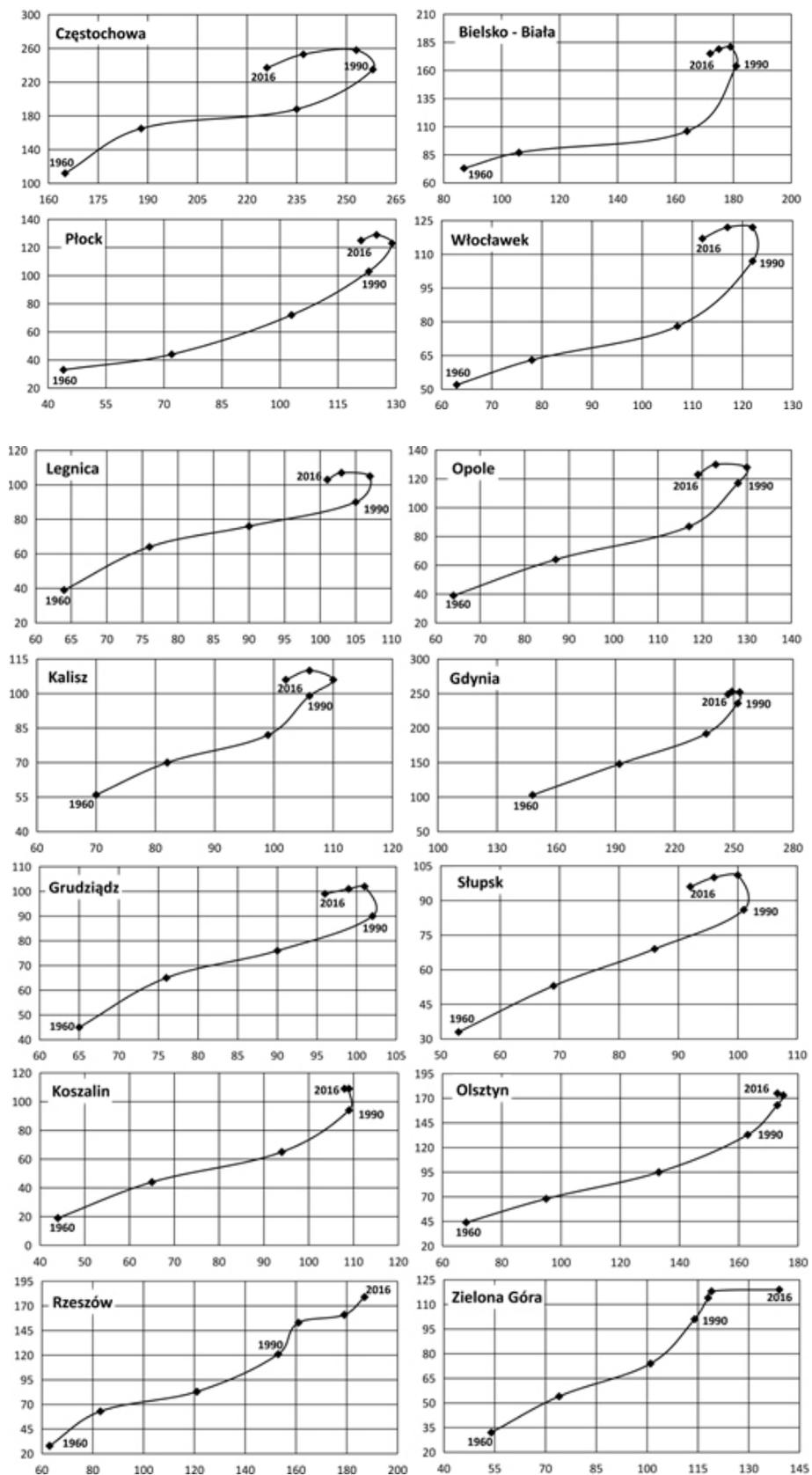


Fig. 6. Continuation

Explanations: X – population in thousands in the current year (decade), Y – population in thousands in the previous year (decade)

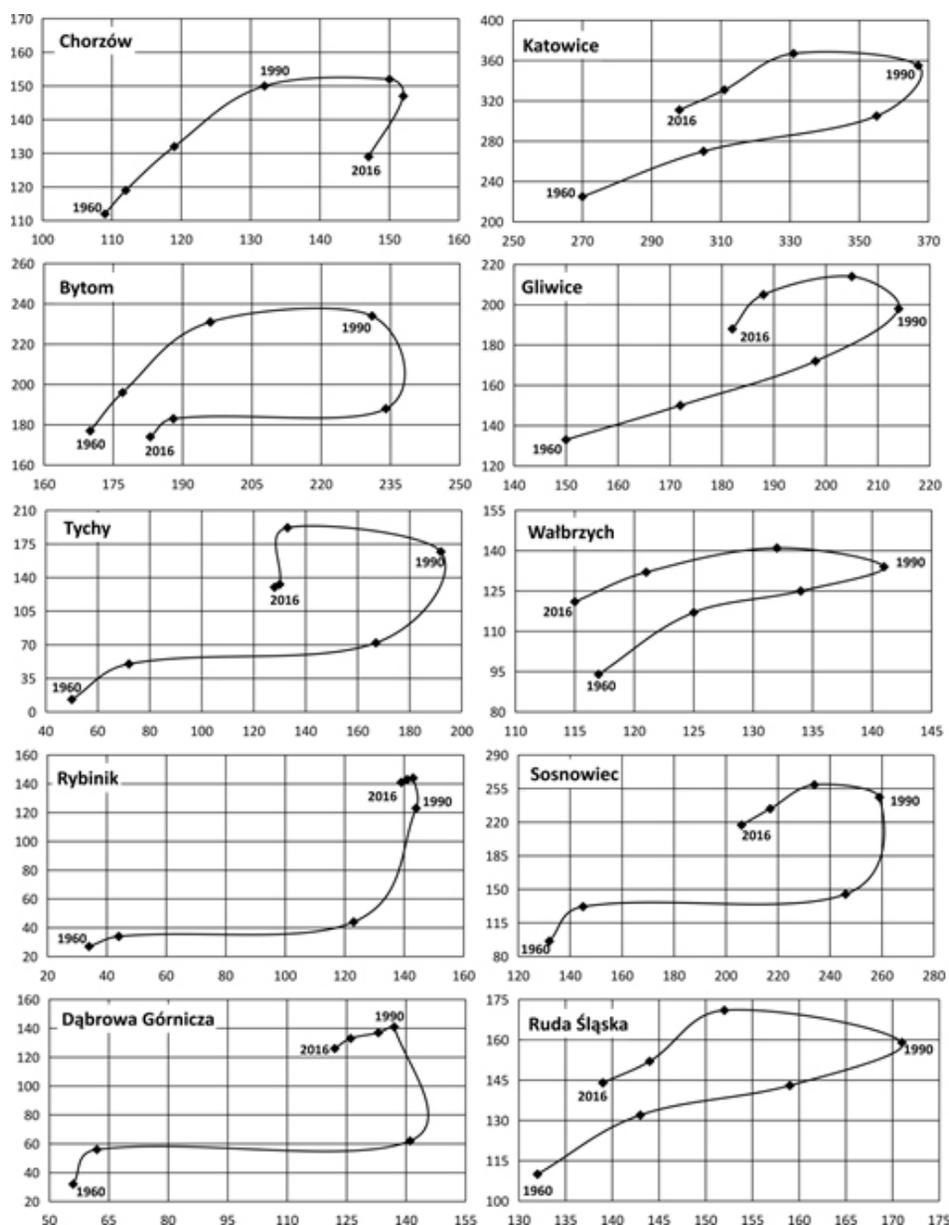
Source: Own study based on stat.gov.pl data

there has been a trajectory of rapid population decline, which can be seen particularly clearly in the examples of Częstochowa and Tarnów (see Fig. 6). As with the largest cities, in other size categories of cities (with a few exceptions), we also notice unfavourable demographic changes – negative natural growth; a negative migration balance (Długosz, 2005).

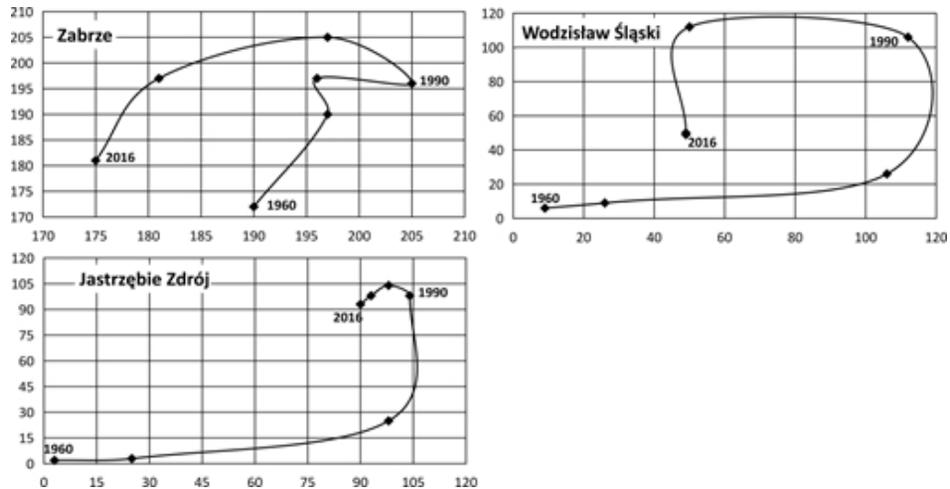
There is an unusual shape to the trajectories of the cities of the Upper Silesia Conurbation and Walbrzych in Lower Silesia, where the “shrinking town” phenomenon is observed. The cities with the highest pace of depopulation are those urban

centres that were centrally planned industrial centres based on coal mining, the metals industry, the chemicals industry or textiles. However, economic changes and opening up to the global market have led to the collapse of such plants. Economic difficulties, the lack of new residents and migration back to hometowns led to a rapid decline in the populations of these cities.

Migrations played a key role in the declining demographic trajectory of cities in Silesia, resulting in (as in the case of other major urban centres) increases in the populations of neighbouring communes (suburbanisation) (Szukalski, 2014) (Fig. 7).



**Fig. 7.** Trajectories of cities in Upper Silesia Conurbation and Walbrzych in Lower Silesia in Poland  
 Explanations: X – population in thousands in the current year (decade), Y – population in thousands in the previous year (decade)  
 Source: Own study based on stat.gov.pl data



**Fig. 7.** Continuation

Explanations: X – population in thousands in the current year (decade), Y – population in thousands in the previous year (decade)

Source: Own study based on stat.gov.pl data

**5. Conclusions**

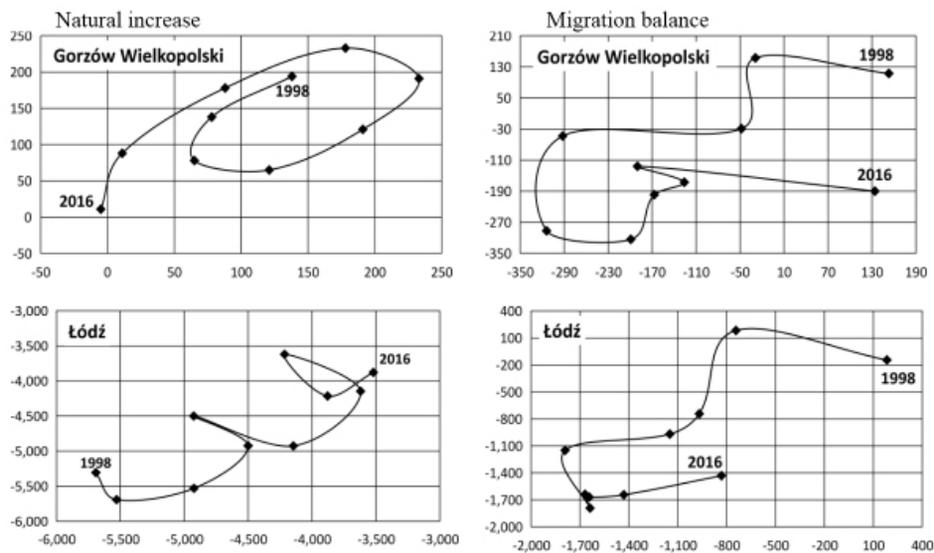
The presented study on demographic development of Polish cities uses trajectories, showing them to be an additional useful tool in analyses of demographic development of cities, regions and other territorial units.

It was indicated that this simple graphic representation opens new interpretative possibilities, it demonstrates development stages, shows both the

process nature (demographic development of cities in this case), and whether this process is progressive or regressive in nature.

The trajectory method allows us to read the dynamics of changes in a particular process (in the distances between successive trajectory points).

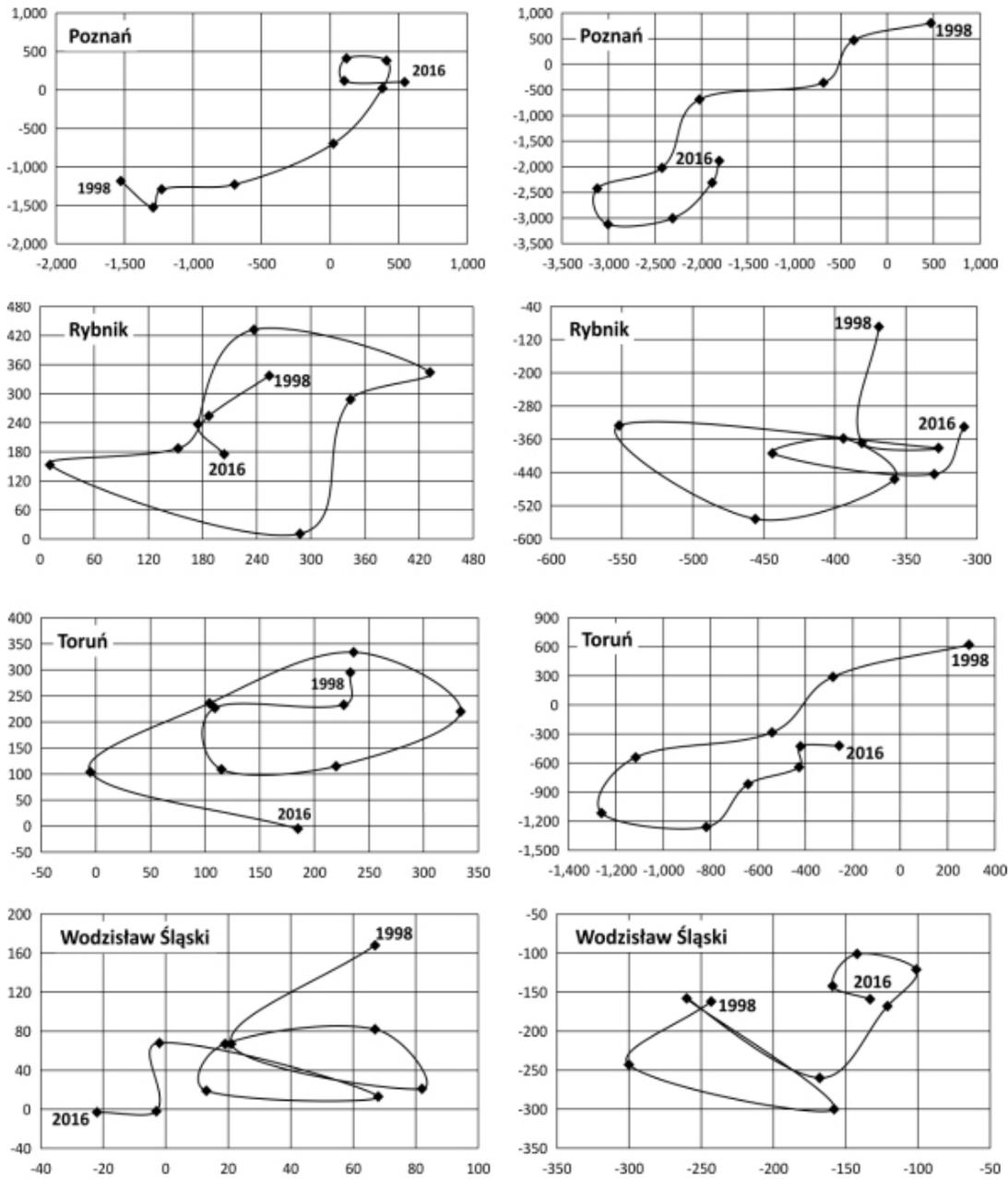
The obtained trajectories of demographic development of cities in Poland lead us to conclude that we are able to categorise cities basing on picture shape. Our study distinguishes 3 categories (Fig. 5, 6, 7).



**Fig. 8.** Trajectories of selected cities in Poland based on natural increase and migration balance (1996 - 2016 every two years)

Explanations: X – population in the current year, Y – population in the previous year

Source: Own study based on stat.gov.pl data



**Fig. 8.** Continuation

Explanations: X – population in the current year, Y – population in the previous year

Source: Own study based on stat.gov.pl data

We can report that, in demographic development (shown as trajectory picture), cities in Poland generally show certain similarities in terms of dynamics and direction (big cities, cities 100,000–400,000 inhabitants – cf. Fig. 5 and 6) and the cities of Upper Silesia Conurbation and Wałbrzych in Lower Silesia), each of which has a different trajectory) (cf. Fig. 7).

Of course, the mapped trajectories of demographic development of cities from 1950 to 2016

(inclusive) show the main direction of this process. For a more detailed analysis, reference should be made to various numerical data and to studies into the causes and effects of specific types of demographic development (cf. Fig. 8). It would undoubtedly be worth showing the trajectories for natural movement, and for migratory movement, and to compare them against those presented here.

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