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DEMOGRAPHIC CHANGES AND THEIR IMPACT ON URBAN ECONOMIC BASE: THE CASE OF TOWNS LOCATED IN ŁÓDŹ VOIVODESHIP

WPŁYW PRZEMIAN DEMOGRAFICZNYCH NA BAZĘ EKONOMICZNĄ MIAST. PRZYKŁAD MIAST WOJEWÓDZTWA ŁÓDZKIEGO

ABSTRACT: Structural transformations that have been taking place in Poland since the 1990s triggered important changes in demographic and economic urban structures. Poland's opening to global processes brought Polish society to the stage of modern demographic development which has produced changes in, among others, vital statistics and spatial mobility of the country's residents. Systemic and structural transformation of the country at the early stages has significantly undermined its economy, in particular, in urban centres. Very much needed restructuring of urban economies resulted in the closure or bankruptcy of many enterprises. The economic function of towns and cities and their demographic structure have changed profoundly, exerting a mutual impact on each other. The paper is based on the assumption that there is a relationship between demographic changes in towns and cities and the urban economic base. Its goal is to identify the impact exerted by demographic changes on the economy of investigated towns. The problem is illustrated with cases of towns and cities in Łódź Voivodeship (territorial units with the city status as on 1 January 2018). The research time frame spanned 1995 and 2017.

KEY WORDS: demographic changes in cities, economic base, economic base theory, Łódź Voivodeship, population

ABSTRAKT: Zmiany strukturalne zachodzące w Polsce od lat 90. XX w. wywołały proces istotnych przemian w strukturze demograficznej i gospodarczej miast. Otwarcie Polski na procesy globalne, wprowadziło społeczeństwo polskie w fazę nowoczesnego rozwoju demograficznego, co owocuje zmianami m.in. w ruchu naturalnym i ruchliwości przestrzennej ludności. Transformacja ustrojowa i strukturalna kraju we wczesnym etapie spowodowała znaczne osłabienie jego gospodarki, w tym zwłaszcza ośrodków miejskich. Konieczna restrukturyzacja gospodarek miejskich przyczyniła się do likwidacji bądź upadku wielu przedsiębiorstw. Zmianie uległa funkcja ekonomiczna miast, co bez wątpienia wpłynęło na ich strukturę demograficzną i odwrotnie. W pracy przyjęto, że istnieje zależność pomiędzy zmianami demograficznymi miast a ich bazą ekonomiczną. Celem pracy jest określenie wpływu przemian demograficznych na gospodarkę badanych miast. Do prezentacji przedstawionego problemu posłużyły autorce

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SŁOWA KLUCZOWE: przemiany demograficzne miast, baza ekonomiczna, teoria bazy ekonomicznej, województwo łódzkie

Introduction

Over recent thirty years the settlement system in Poland has undergone deep changes. They were triggered by multiple factors, inter alia, by systemic and economic transformation after 1989, new administrative division introduced in 1999 or Poland's accessing the EU in 2004. Especially relevant in this case was the systemic transformation taking place in the late 1980s, which gave rise to political and economic transformations and contributed to many social and demographic changes. The aim of the paper is to investigate the impact of population changes in the towns covered by the study on their economic base.

All of these factors have led to radical changes in the living conditions and have significantly influenced the demographic behaviour of Polish society which has entered a modern phase of development. This is manifested, inter alia, by a decreasing birth rate and an increase in the spatial mobility of Poles. These phenomena are particularly visible in Polish towns and cities, which, regardless of their size, are subject to depopulation. The depopulation of towns and cities in Poland may be explained by the processes of suburbanisation and/or the entry of Polish society into the phase of the second demographic transition (Dybowska 2004; Kurek 2014, Kurek, Wójtowicz, Gałka 2020).

Suburbanization is considered from different points of view, most often being examined with respect to the following four aspects: demographic, economic, social, and spatial. These aspects are interlinked and intertwined, creating an individual picture of the phenomenon for each city, depending primarily on a number of local conditions. Suburbanisation in the economic aspect is understood as the movement of people, capital and economic entities from the inner parts of the town/city (city core) to the external (suburban) zones (Lisowski, Grochowski 2007). The spatial aspect of suburbanisation is related, among others, to the urbanisation of the suburban zone (rural areas) and the expansion of the urban landscape (Szymańska and Biegańska 2011). Socio-demographic suburbanisation is one of the phases of the city's development cycle, characterised by a population decline in central parts of the town/city and intensive demographic development of the suburban zone (Van den Berg et al. 1982). Suburbanisation triggers a number of factors, including: increase in the residents' wealth, higher rent of land, development of transport and motorisation, better availability of credit, but also an increase in environmental awareness (Kurek 2008, 2014; Szymańska and Wylon 2019). The effects of suburbanisation are as complex and multi-faceted as the process itself. There is no doubt, however, that one of the most important is the population of suburban areas at the expense of the urban core.

The entry of Polish society into the phase of the second demographic transition is indicated as one of the reasons for the decrease in the population of Poland, and in particular, the population of Polish cities. According to the concept of the second demographic transition, contemporary demographic phenomena are the result of transformations in the sphere of values, norms and attitudes of societies and, above all, matrimonial and procreative patterns. This is manifested, among other things, by a drop in fertility below the level guaranteeing generational replacement, but also by a new model of family and family development principles. The model approach also includes changes in the migration balance (positive migration balance with an economic background compensated for the natural loss) (Lesthaeghel 2014; Van de Kaa 2003). The total fertility rate[1] is the most commonly used measure of the second demographic transition. Its significant decreases occurred in Northern and Western Europe in the 1960s and the 1970s, and in the next decade became visible also in Southern Europe. Since the 1990s the phenomenon of reduced fertility has also been recorded in Central and Eastern European countries, including Poland (Billari 2005; Zaidi and Morgan 2017). The drop in the fertility rate may result from many other factors, i.e., structural changes (related, inter alia, to urbanisation, changes in social structures and state organisation, and resulting in an improvement in the quality of life or an increase in the level of education), cultural (the so-called "silent revolution", consisting in, among other things, contesting traditional values, spreading of pluralistic and liberal values, universalism, individualism, which leads to changes in the division of roles between women and men or an increase in women's independence in the choice of life careers), and technological (including the development of methods and means of birth control, the development of medical technologies, which results in, for example, an increase in individual awareness and responsibility and social acceptance of voluntary childlessness (Kurek 2012: 219-220). In the case of Poland and the former Eastern Bloc countries, the political and economic transformation was not without significance and contributed at least to the acceleration of demographic changes (Kotowska 1999, 2010; Stryjakiewicz et al. 2018). The observed low fertility rate has its consequences – it is manifested by ageing of the population, which in turn leads to depopulation of cities. Although, this relationship applies not only to cities, in cities is just visible more strongly. (Trzepacz et al. 2019).

Irrespective of interpretation or justification, one cannot deny that depopulation is visible in Poland, especially in Polish cities (in the years 1995-2017 the decrease in urban population was 3.21%).[2] Depopulation affects all spheres of city life, including its economy. The paper assumes that there is a correlation between demographic changes taking place in cities and their economy. The aim of the paper is to investigate the im-

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[1] Total Fertility Rate (TFR) – an indicator showing the average number of children who would be born per woman within her childbearing period (15-49 years of age) according to a current schedule of age-specific fertility rates (Holzer 1999: 265).

[2] Own calculation based on Local Data Bank.

pact of population changes in the towns covered by the study on their economic base. Two hypotheses were adopted: (H1) if the demographic situation of cities is changing favourably, these changes trigger a growth in their economic base and (H2) if the demographic situation of cities is undergoing worsening, these changes trigger a decline in value of their economic base.

The theory of economic base explains the city's growth based on the idea that its economy is divided into two categories. The first one includes all the activities performed by the city for the benefit of the outside world. Such functions are called city-forming or exogenous. They provide foundations for city development and existence, impact its population and territorial growth. The second element of the city's economy are endogenous or complementary functions, which are provided for the city's inhabitants, to the benefit of the local market. The endogenous sector is the basis for organising the city and supports the development of the exogenous sector (Dziewoński 1967; Jerczyński 1973, 1977). The development of exogenous functions contributes to the development of supporting, endogenous sectors (e.g. subcontractors, local and regional service market). Income from exports allows financing imports and purchase of local products and services. This gives rise to multiplier effects (North 1955). According to the theory of economic base, those spatial units that have developed a strong economic base with high local multiplier effects will be successful.

Therefore, it seems justified to link demographic changes with the economic base and to try to answer the question whether and how population changes affect the city economy (see also: Bogdański 2019a, 2019b; Krzysztofik and Szmytkie 2018; Poinsot, Philippe, Ruault, Jean-François 2019).

Material and research methods

The author focused on towns located in Łódź Voivodeship (territorial units with city status on 1 January 2017) to discuss the above stated problem. Łódź, the capital city of the voivodeship, was excluded from the survey, as it differed significantly from the other towns and cities in terms of the statistics and measures adopted in the study. Notably, the investigated towns make a set of units strongly diversified in terms of size, heterogeneous when it comes to their administrative status (seats of land counties, city counties, but also urban-rural municipalities). The set brings together both old towns with Medieval origins and younger towns less than two hundred years old. It seems that these several features should be reflected in the diversity and functioning of the economies of these units, which may be additionally shaped by the demographic changes taking place in them.

The time span of the research covered the years 1995-2017 (changes are presented in 2 sub-periods: 1995-2005, 2005-2017, the choice of examined years being caused by availability of statistical data; additionally set periods are marked by a similar period). The study uses the existing data from the Statistics Poland (Polish abbr. GUS) on the basis of which demographic indicators were calculated (birth rate, migration balance,

real growth). These data were also the basis for calculating the average growth rate index,[3] which allowed presenting the dynamics of population changes in the examined cities. Changes in the size structure of cities were also analysed. In this study, the author adopted a seven-point classification (Table 1) used by the Statistics Poland as well as in the literature on the subject (Runge 2012; Szymańska 2007).

Table 1

Size categories of the examined cities over the period 1995-2017

Size category	Size sub-category	Population
Small towns	The smallest towns	below 5,000
	Small towns	<5,000–10,000)
	Bigger small towns	<10,000–20,000)
Medium-sized towns	Smaller medium-sized towns	<20,000–50,000)
	Bigger medium-sized towns	<50,000–100,000)
Big cities	Big cities	<100,000–200,000)
	Very big cities	above 200,000

Source: own compilation based on the data of Statistics Poland (PL abbr. GUS).

The data of the Statistics Poland (GUS) helped in identifying the employee surplus indicator,[4] which was used to determine the size of the economic base in the studied towns. The study is based on data from Statistics Poland on the number of employees working in the examined towns in 3 years: 1995, 2005, 2017. Data for 1995 and 2005 presented employment in three sectors: industry and services – market and non-market services, according to the Polish Classification of Economic Activities 2004 (PL abbr. PKD). On the other hand, data for 2017 presented employment according to PKD 2007, whose sections were divided into groups: industry, sections G, H, I and J and other services (the author considered sections G, H, I and J as market services, and other services as non-market services). The analysed data did not include people working in microenterprises (up to 9 persons), individual farms in agriculture, foundations, as-

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[3] Average rate indicator calculated based on the formula: $[(n+1)-n]/n$, where $n+1$ denotes the value for the examined period; n – value for the period precedig the examined period (Kassyk-Rokicka 2011: 106-107; Runge 2007: 599-603). Based on a five-point (normalised) standard scale, the author identified intervals to which urban development types were allocated. To find out about the normality of the distribution, Shapiro-Wilk test was applied, whose value was $W(82) = 0.98$; $p = 0.297$. Data distribution is close to normal.

[4] Employment surplus indicator calculated from the formula: $ZegziMj = ZiMj – (ZMj \cdot ZiK/ZK)$ where: $ZegziMj$ – people working in the exogenous sector i in town Mj (i = 1, 2,…, m; j = 1, 2,.., n); $ZiMj$ – people working in sector i in city Mj; ZiK – people working in sector i in the country; ZMj – total number of people working in town Mj; ZK – total number of people working in the country. The indicator was calculated separately for the employment in the industry, market services and non-market services. Next, these values were added up, reaching the size of the economic base of particular units. (Jerczyński 1971; Sokołowski 2008).

sociations and other organisations and clergy. The employee surplus indicator (residual indicator) is one of the indirect research methods used in the theory of economic base.

In order to determine the types of cities by the structure of the economic base, the author used the typology proposed by Sokołowski (2008: 260), based on the Ossan triangle method. In this classification, 10 types were distinguished. Types P, R, N (industry, market services and non-market services) included towns with the domination of one economic sector (over 50%), with a low share of the remaining ones (less than 25%), type M had a mixed character, with a balanced share of particular sectors. The remaining 6 types represented also the mixed type (PR, RP, RN, NR, PN, NP), with a predominance of one of the sections and a significant share of the supplementary section (25-50%).

Demographic changes in the examined cities of Łódź Voivodeship over the period 1995-2017

In the years 1995-2017, the size structure of the surveyed towns did not undergo any significant transformations, although demographic processes taking place in them were very much differentiated. While some of the towns were struggling with the demographic crisis, others recorded growth at that time (Table 2, Figure 1). In 1995, small towns constituted over a half of the analysed units (25 out of 41). This category was dominated with the smallest small towns (11). There were 7 small and 7 bigger small towns. In total, there were 16 medium-sized towns, most of them were smaller medium-sized towns (9). In the next analysed period, the biggest changes took place in the group of medium-sized towns. Two bigger middle-sized towns (Kutno and Radomsko) were included in the subcategory of smaller middle-sized towns, whose total number was 10 back in 2005. One middle-sized smaller town (Łask) moved to the category of small towns. On the other hand, in the general category of small towns, Żychlin was degraded to the subcategory of small towns (from bigger small towns). In

Table 2

Changes in the number of cities belonging to individual size classes of the examined towns in Łódź Voivodeship in 1995-2017

Size category	Size sub-category	Year		
		1995	2005	2017
Small towns	The smallest towns	11	11	13
	Small towns	7	8	8
	Bigger small towns	7	7	8Bi
Medium-sized towns	Smaller medium-sized towns	9	10	9
	Bigger medium-sized towns	7	5	5

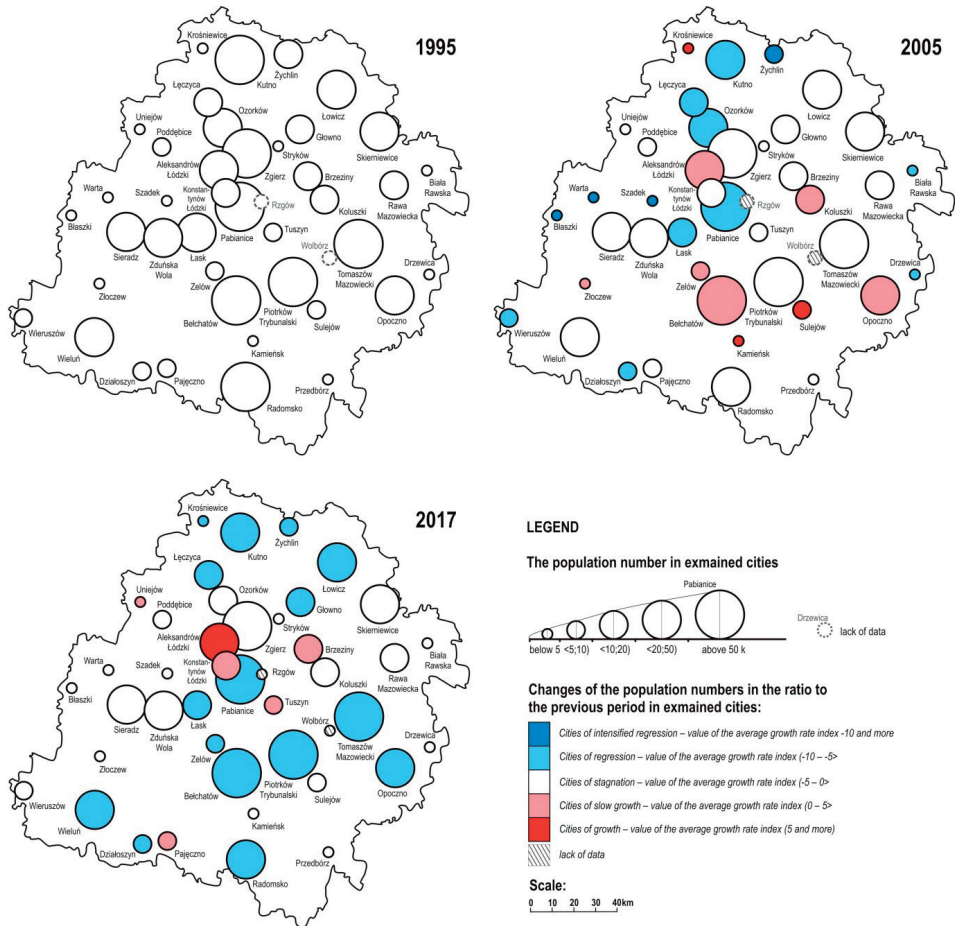Source: own compilation based on Statistics Poland.

Fig. 1. Size structure and average growth rate of population growth in examined towns in the years 1995-2017
Source: own compilation based on own calculations and data from Statistics Poland.

2017, the subcategory of the smallest small towns increased from 11 to 13 compared to the previous analysed period. This resulted from two territorial units receiving city status (Rzgów – 2004 and Wolbórz – 2011, Figure 1). The second change consisted in the transition of Ozorków from the category of medium-sized towns to the category of small towns (Figure 1).

Over the period covered by the study, the size structure of the analysed towns did not fluctuate significantly. The biggest changes occurred in the category of the smallest small and medium-sized towns. In each of the examined periods, the smallest small towns prevailed in the size structure. A slight decrease in the subcategory of medium-sized bigger towns was also visible. Remarkably, none of the towns was included in the group of big cities (over 100k residents) in the whole analysed period.

Taking into account the average demographic growth rate, the author distinguished 5 growth types of cities:

– Cities of intensified regression – value of the average growth rate index -10 and more;

 – Cities of regression – value of the average growth rate index (-10 – -5⟩;

 – Cities of stagnation – value of the average growth rate index (-5 – 0⟩;

 – Cities of slow growth – value of the average growth rate index (0 – 5⟩;

 – Cities of growth – value of the average growth rate index (5 and more).

In the years 1995-2017, the average demographic growth rate of the analysed towns and cities was not very diverse (Figure 1). In the first analysed period, the beginning of depopulation can be observed. Out of 41 territorial units, 11 were classified as regressive (increased regression and regression), 18 as stagnant and 12 as growth towns (slow growth and growth). Among units with a positive development rate, slow growth cities dominated (9). The highest population growth was recorded in 3 small towns: Kamieńsk, Krośniewice, and Sulejów (over 5%). In the category of intensified regression, there were 3 small towns (Błaszki, Szadek and Żychlin). Both small towns (4) and medium-sized towns (4) belonged to the regression category. The largest was the category of stagnant cities, which consisted of 18 towns, including 8 medium-sized and 10 small towns. It is worth noting that in the type of stagnating cities as many as 10 reported average growth rate below -3%. It was a clear indication that in the next period those units would move from the stagnant to regression category of cities.

Between 2005 and 2017 the depopulation processes intensified. During this period, only 7 towns belonged to the category of slow growth and normal growth. The highest average growth rate was recorded in Aleksandrów Łódzki (5.1%). Among the remaining cities with a positive rate, only the category of small towns occurred. Again, the most numerous category was the one of stagnant cities. There were 18 towns, including 13 small and 5 medium-sized towns. Sixteen towns were getting depopulated, of which as many as 9 were medium-sized towns.

The period covered by the study is the time when the examined towns of Łódź Voivodeship began to experience depopulation which then clearly gained strength and finally tackled towns of all size categories. Notably, the phenomenon affected all the biggest cities of the region, whose stagnation and subsequent depopulation began already in the mid-1990s.

Changes in the economic base of the investigated towns and cities of Łódź Voivodeship in the years 1995-2017

The size of the economic base indicates that the towns covered by the study were not large centres of exogenous employment in any of the analysed years (Figure 2). In the category of the smallest towns, in 1995, the employee surplus index did not exceed 1,000. The situation of Drzewica (997), where a large industrial plant was based, was the best. In Warta and Krośniewice, the size of the economic base was about 700 people. In

the remaining towns, the index ranged from 285 in Kamieńsk to 606 in Stryków. In the next analysed period, employment in the exogenous sector increased in only 4 towns (Figure 2). The discussed index increased significantly in Stryków (from 606 to 894). It was connected with the A2 motorway, which was being built at that time, and the logistic centres emerging in its vicinity. The impact of this factor was also very visible. In the next investigated period, the residual index for Stryków amounted to 3,509 (the constructed junction of the A1 and A2 motorways contributed to the development of
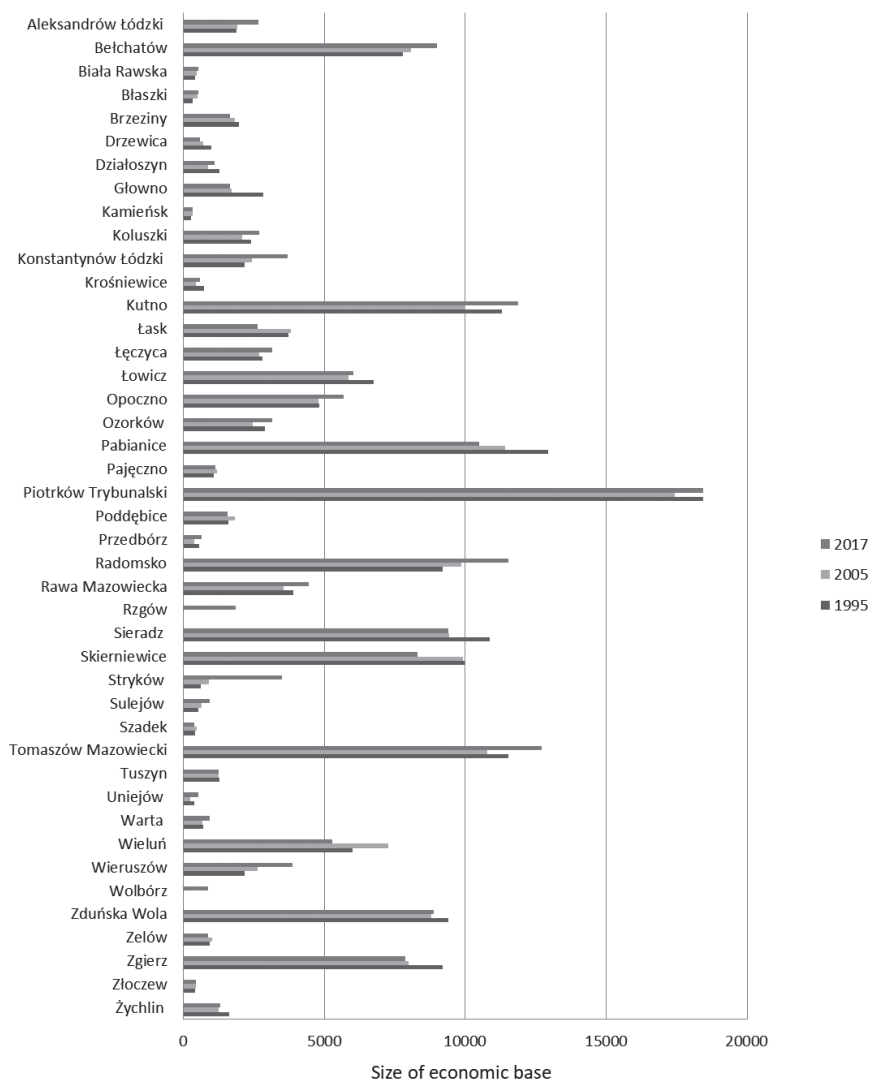

Fig. 2. Size of the economic base in the examined towns of Łódź Voivodeship over the period 1995-2017

Source: own compilation based on own calculations and data from Statistics Poland.

the logistics industry in Stryków). By 2017 the economic base of Uniejów, which became the first thermal health resort in Poland, also significantly expanded. A well-developed exogenous sector (in relation to the number of inhabitants) could be found in Rzgów (1,855) – a large retail and wholesale centre. In the group of small towns, in the years 1995-2017, the employee index fluctuated slightly. In 1995, the index ranged from 553 in Sulejów to nearly 2,200 in Wieruszów (Figure 2). By 2005 a decrease in the economic base was recorded in only 3 cities (Działoszyn, Tuszyn, Żychlin). Again, the lowest index was found in Sulejów (656) and the highest in Wieruszów (2,632). In 2017, the residual index decreased in 3 units: Pajęczno, Poddębice, and Zelów. Its value ranged from 868 in Zelów to 3,879 in Wieruszów. In this group, Poddębice and Wieruszów had the most developed exogenous sector, probably due to their administrative functions (county towns). In the group of bigger small towns, in 1995, the size of the exogenous sector in most towns exceeded 2,000, except for Brzeziny and Żychlin. It reached its highest value in Rawa Mazowiecka (3,916), which was both an industrial and administrative centre. By 2005 only in 3 towns did the surplus of employees decrease. The biggest decrease was recorded in Głowno. Also in 2017, the residual ratio decreased in only 3 towns (Brzeziny, Głowno, Łask).

In the medium-sized towns, the exogenous employment sector was clearly much bigger than in the small towns (Figure 2). In 1995, in cities with 20,000-50,000 inhabitants, Aleksandrów Łódzki and Ozorków – the smallest in its size category (1,884 and 2,900 residents, respectively) – had the least developed economic base. In the remaining towns, the residual index exceeded 4,000. The highest value was recorded in Kutno and Sieradz (over 10,000, large industrial plants were operating here, and Sieradz used to be the voivodeship capital). Until 2005, due to the transformation of the economy, most large enterprises were closed down or their employment was reduced, which was visible in the size of the economic base of the discussed group of towns. Only in 3 towns did the analysed indicator increase (Aleksandrów Łódzki, Radomsko, Wieluń).

The biggest decrease in the size of the economic base was observed in Łowicz, Kutno, and Sieradz. Until 2017, the exogenous sector in this group of towns was gradually growing. The exceptions were Sieradz, Skierniewice, and Wieluń, where the residual index decreased. In the group of bigger medium-sized towns, the largest three ones amongst the analysed towns: Tomaszów Mazowiecki, Pabianice, and Piotrków Trybunalski, had the largest economic base (Figure 2). In the remaining towns in this size category, at the beginning of the discussed period, the number of people working in the exogenous sector exceeded 10,000. Until 2005, the economic base in this group got strongly limited, mainly due to the restructuring and liquidation of the largest employers, that is industrial plants in those towns. In 2017, a reversal of this trend could be observed – the size of the exogenous sector increased compared to the previous period. The exception was Zgierz, where the size of the economic base decreased in 2017.

In general, in the years 1995-2005, the size of the economic base in most of the investigated towns (24) was decreasing, whereas in the period 2005-2017 – it exhibited visible increasing tendencies (in 26 towns). However, in the entire discussed period,

between 1995 and 2017, 18 towns experienced a decrease, sometimes very clear, in the exogenous sector (Table 3). In 13 towns this was associated with a high, above 10%, decrease in the total number of employees. These decreases concerned all size categories of towns, but particularly affected the bigger small towns, i.e. Głowno, Łask and the smallest small towns, e.g. Krośniewice or Drzewica, whose economies were based primarily on industrial plants. Slightly smaller decreases in the exogenous sector, with a simultaneous high decrease in the total number of employees, were recorded in 6 towns (Table 3). In 4 towns: Kutno, Tuszyn, Szadek and Pajęczno both the surplus of employees and the number of employees remained at a similar level. There was also quite a large group of towns where the number of employees was stagnating, while the number of employees in the exogenous sector was growing quite strongly (8 towns). Some of those towns were in the proximity and within the range of impact of motorways and expressways and logistic centres established around them (e.g. Wieruszów, Rawa Mazowiecka, Tomaszów Mazowiecki, Radomsko). In 9 towns, both analysed variables increased, mainly due to the development of the service sector (Aleksandrów Łódzki, Uniejów, Stryków). That concerned mainly small towns (Kamieńsk, Błaszki, Biała Rawska, Stryków). In 5 towns, both analysed variables increased mainly as a result of the development of the non-market services sector. As many as 4 of them belonged to the group of the smallest towns (Biała Rawska, Błaszki, Kamieńsk and Stryków). Only two medium-sized towns were in this group – Bełchatów and Aleksandrów Łódzki.

Table 3

Dynamics of employment in the exogenous sector against the change in total employment
in the investigated cities in 1995 and 2017

		Employment dynamics over the period 1995-2017		
		Decrease ⟨-10% and more⟩	Stagnation (+/-10%)	Increase ⟨10% and more⟩
Employment dynamics in the exogenous sector over the period 1995–2011	decrease ⟨-10% and more⟩	Drzewica, Głowno, Łowicz, Działoszyn, Żychlin, Pabianice, Łask, Zgierz, Krośniewice, Skierniewice, Brzeziny, Sieradz	Wieluń	—
	stagnation (+-10%)	Poddębice, Zelów, Piotrków Trybunalski, Zduńska Wola, Ozorków, Złoczew	Tuszyn, Kutno, Pajęczno, Szadek	—
	increase (10% and more)	Sulejów	Wieruszów, Rawa Mazowiecka, Tomaszów Mazowiecki, Opoczno, Warta, Przedbórz, Radomsk, Łęczyca	Bełchatów, Koluszki, Aleksandrów Łódzki, Konstantynów Łódzki, Uniejów, Kamieńsk, Błaszki, Biała Rawska, Stryków

Source: own compilation based on own calculations and data from Statistics Poland

In the years 1995-2017, all 10 functional types were found in the examined set of towns (Table 4). At the beginning of the investigated period, the centres with the leading role of industry dominated – 12 towns represented type P, 8 – PN, and 7 – PR.

Towns of Łódź Voivodeship examined against the type of their economic base
in the years 1995, 2005, and 2017

Type of economic base	1995	2005	2017
P[a]	Aleksandrów Łódzki, Drzewica, Działoszyn, Konstantynów Łódzki, Ozorków, Opoczno, Pabianice, Radomsko, Sulejów, Tomaszów Mazowiecki, Wieruszów, Żychlin	Konstantynów Łódzki, Ozorków, Stryków, Szadek, Wieluń, Wieruszów, Zelów, Złoczew, Żychlin	Sulejów, Wieruszów
R	—	—	Wolbórz
N	Warta	Przedbórz, Warta	Brzeziny, Pajęczno, Warta
M	Bełchatów, Biała Rawska, Łęczyca, Pajęczno, Piotrków Trybunalski, Sieradz, Skierniewice, Zelów	Opoczno, Piotrków Trybunalski, Rawa Mazowiecka, Sieradz, Skierniewice, Zgierz	Głowno, Opoczno, Przedbórz, Rawa Mazowiecka, Stryków, Wieluń, Złoczew
NP	Tuszyn	Brzeziny, Kamieńsk, Poddębice, Pajęczno	Bełchatów, Drzewica, Kamieńsk, Łask, Piotrków Trybunalski, Poddębice, Sieradz, Skierniewice, Tomaszów Mazowiecki, Tuszyn, Zgierz
NR	Kamieńsk, Przedbórz	Bełchatów, Łęczyca, Uniejów	Biała Rawska, Uniejów
PN	Błaszki, Brzeziny, Łask, Poddębice, Rawa Mazowiecka, Wieluń, Zgierz, Złoczew	Błaszki, Drzewica, Działoszyn, Głowno, Krośniewice, Łowicz, Sulejów, Tomaszów Mazowiecki, Łask, Tuszyn	Aleksandrów Łódzki, Błaszki, Działoszyn, Konstantynów Łódzki, Krośniewice, Kutno, Łęczyca, Łowicz, Ozorków Pabianice, Radomsko, Szadek, Zduńska Wola, Zelów, Żychlin
PR	Głowno, Krośniewice, Kutno, Łowicz, Stryków, Uniejów, Zduńska Wola	Koluszki, Kutno, Pabianice Radomsko, Zduńska Wola,	—
RP	Koluszki, Szadek	Aleksandrów Łódzki	Koluszki, Rzgów
RN	—	Biała Rawska	—

[a] P – industry, R – market services, N – non-market services, M – mixed.

Source: own compilation based on own calculations and data from Statistics Poland.

The industrial type of economic base occurred mainly in textile centres (Aleksandrów Łódzki, Konstantynów Łódzki, Ozorków, Pabianice, Tomaszów Mazowiecki), as well as in towns with large industrial complexes (Drzewica, Opoczno). Mixed types, PR and PN, also occurred in industrial centres, i.e. Brzeziny, Głowno, Kutno, Zgierz, which often combined industry with other sectors of the economy, such as education (Zgierz). By 2005, only 8 towns had retained the P type, while the PR type decreased to 5. However, the number of towns with the NP type increased to 10. According to the author, this increase could be related to the administrative reform of 1999; each of the PN-type towns served, at least, as a municipal capital. These towns retained their industrial character and developed the non-market services sector. In 2017, this type of economic base was most common (15 towns). Only 2 towns represented the P type.

In 1995, other than industrial types of economic base were rare. Type N was recorded only in Warta (employment in health care). Mixed types of NP, NR and RP occurred in 5 cities (Table 4). By 2005 these types of economic base appeared in 11 cities. Further development in "non-industrial" types took place until 2017. In this period, the economic base related to market or non-market services could be found in 19 towns (Table 4). In most towns (16) non-market services prevailed. As indicated by Sokołowski (2008: 260), an evolution of the economic base consisting in an increasing share of non-market services is typical of highly developed countries and should be assessed positively.

Over the period 1995-2017, only 3 towns: Warta, Wieruszów, and Błaszki retained the same type of economic base. Transformations of types of the economic base in the remaining investigated towns exhibited features typical of changes taking place in the whole economy: the number of towns with a dominant industrial sector was decreasing in favour of types with a predominance of non-market services (Table 4).

Conclusions

The relationship between population and the size of economic base is particularly important in the context of contemporary processes of suburbanisation and metropolisation of space. In fact, it is a question about the future of towns and cities, especially small and medium-sized ones, where the exogenous function is often minimal. If we assume that this dependence is strong, then an increase in population should result in an increase in the economic base and vice versa; similarly, decreases in the number of inhabitants should reduce the economic base. Decreasing the economic base means, in simple terms, minimising the development potential and, in extreme cases, even a collapse of a town.

The relationship between population and the size of economic base can be expected intuitively. Nevertheless, the strength of this relationship seems to be the most important. This assumption is confirmed by the research carried out by the author: Pearson correlation coefficient in each of the discussed time intervals

showed the existence of such a relationship.[5] For the years 1995-2005 the coefficient was 0.03 (slender dependence). In the next period, the strength of the dependence increased to 0.19 (weak dependence). Also for the years 1995-2017 the dependence was weak (0.16).

The weak dependence between analysed variables shows that the influence of demographic transformations on the economy of the examined cities was not as so obvious as was originally established.

A detailed indicators analysis and research on correlations between the value of the economic base of cities and individual groups of indicators identifying the demographic situation, confirmed it. Generalizing, it is possible to assume that H1 and H2 hypotheses were confirmed, there were no bases to reject them. However, it is worthwhile paying attention to the fact that the strength of the established correlations increased along with the size of the city and by analogy – diminished with reference to smaller ones. This phenomenon is so noticeable that the H1 and H2 hypotheses should be rejected in the group of the smallest small towns. These conclusions result from the analysis of the results of the correlation between indicators of the economic base and the demographic situation of these cities.

In the group of the smallest small towns, as many as 7 (out of 13) recorded the opposite occurrence than expected. In this group, local factors were the most important. Stryków can serve as an example, where in the years 1995-2017 the size of the economic base increased by 479%, while the population dynamics amounted to -4%. This was an effect of the creation of logistics centres in Stryków connected with the junction of the A1 and A2 motorways built here. Another example is Uniejów. The growth of the economic base was not as big as in the case of Stryków, it amounted to 42%, and the decrease in the population was -2%. Here the main "culprit" of the increase in the economic base was Uniejów Thermal Baths, which, on the one hand, became a large employer and, on the other hand, gave an impulse to the local market. In the category of small towns only in Pajęczno an increase in the residual indicator with simultaneous depopulation was observed. Pajęczno is a county town and a fairly well-developed centre of food industry, which contributes to the growth of the economic base. In

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[5] R-Pearson coefficient of correlation (r-P) is applied for examining the relation (of direction and strength of the association) between quantitative variables. The coefficient value is extending in the period $\langle -1;1 \rangle$. At value 0 – lack of the relation. If the coefficient value is positive – with the height of one variable, a value of the second variable grows. If the coefficient value is negative – with the height of one variable, the value of the second variable is diminishing. The rate is measuring bilateral relations (Larose 2008: 48-49). There are, in the literature on the subject, no clear-cut ranges of the measure of power of the link between variables and exist (subtle) differences of interpretation of appearing ranges of correlation. At this work they accepted, that at r-Pearsona coefficient values to +/- 0.30 the relation is weak, +/- 0.31-0.50 – average, +/- 0.51-0.70 strong and above +/- 0.70 – very strong. It is possible to apply the r-Pearson coefficient of correlation already from 7 cases (Bedyńska, Brzezicka 2007: 96-97). In the article, a Pearson coefficient of correlation was calculated between the population growth and the employment surplus indicator (e.g. the population growth for 1995-2005 years Employment surplus indicator for 2005). Only in the period of 2005-2017 the relationship was statistically significant.

another distinguished group of larger small towns, in 3 towns, Brzeziny, Ozorków and Rawa Mazowiecka, a decrease in the population was observed with a simultaneous increase in the exogenous employment. All these units were significant industrial centres during the times of the People's Republic of Poland and restructuring caused their economic decline. By 2017 they had already rebuilt their economic potential and again became centres of exogenous employment. The situation was similar in the case of smaller medium-sized towns. In Opoczno, Kutno, and Radomsko, depopulation did not result in any decrease in the exogenous employment. An exception in this group, as well as in the whole surveyed population of towns, was Skierniewice, where the number of residents increased (by 1%), while the size of the economic base decreased quite significantly (-17%). This may be related to the location and good connection of Skierniewice with Warsaw, which is a more attractive labour market for the inhabitants of the city. Among the largest of the surveyed centres, also in 2 of them, Bełchatów and Tomaszów Mazowiecki, the assumed regularity was not observed. In these towns, due to their size, a suburban zone was created, but they themselves remained large labour markets (Guz 2018).

The aim of the research was to identify the influence of demographic transformations on the economy of cities, evaluated for the height or the decline in the value of their economic base. This aim was achieved. However, due to the participation in the research of relatively small cities, correlations of individual indicators were inconvenient. Correlation in the case of the small cities did not appear. In all types of cities beyond the smallest ones, correlations assumed in the hypotheses are occurring. Firstly, the beneficial change of the demographic situation of cities triggers the growth of their economic base, and secondly – worsening the demographic situation directly determines a decline in the value of their economic base.

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