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POPULATION CHANGE AS AN ASPECT OF SUBURBANIZATION OF MAJOR CITIES IN POLAND

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ABSTRACT

Cities function in people's minds as reservoirs of opportunities and possibilities. For many people, living in a city seems an attractive and logical life choice compared to areas perceived as provincial. However, the reality of the modern city is also associated with numerous nuisances. The occurrence of these disadvantages has led to the development of mechanisms intended, at least in principle, to counteract the ills of urban life. One such mechanism is the phenomenon of suburbanization. The outpouring of urban functions beyond its boundaries occurs all over the world. However, this phenomenon also entails exacerbating transport bottlenecks, requires a lot of local investment, contributes to the deterioration of the environment, and disrupts household time budgets. This paper addresses population change as one of the demographic aspects of suburbanization. The trends characterizing the outflow of population from cities and the inflow of population to suburban areas has been examined. The study covers several of Poland's largest cities using data from the 2011 and 2021 National Censuses. The main objectives of this study are to assess the scale of suburbanization in large and medium-sized Polish cities, so as to determine whether suburbanization occurs similarly regardless of city size. To identify those urban centers where the population change in neighboring municipalities is particularly high so as to raise the awareness of decision-makers and real estate market participants in relation to the challenges posed by suburbanization. In addition, using one city as an example, an assessment of how the influx of population affects number of transactions on selected real estate market was carried out. The results of the study may be useful in analyzing investment needs for various types of infrastructure, including roads and technical infrastructure.

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1. Introduction

Suburbanization is a trend of population shift from urban to suburban areas, often driven by a desire for larger homes, more spacious living environments, and access to more green space. It has been a major trend in many countries over the past century. This trend has been widely researched in the field of geography, urban planning, sociology, and demography, and has been shown to have numerous impacts on urban and suburban real estate markets. Suburbanization is often associated with rising real estate prices, particularly in suburban areas that are close to cities and offer good access to urban job opportunities. This is because people are willing to pay a premium for access to amenities, as well as for the increased living space and better quality of life that suburban areas often provide. As a result, suburban real estate markets are often characterized by high levels of competition and bidding wars for desirable properties. Suburbanization can lead to significant changes in demographics, including changes in age, race, ethnicity, income, and family structure. Moreover, suburbanization has also been criticized for contributing to a growing divide between the rich and the poor, as suburban areas become increasingly unaffordable for many low-income families. In particular, suburbanization has been linked to a decline in the number of affordable housing options, which can result in a lack of access to basic needs such as food, healthcare and

transportation. This can lead to increased poverty and social exclusion, particularly among low-income families. Despite these challenges, suburbanization continues to be a major trend in many countries, and has been shown to have a significant impact on the demographics of both urban and suburban areas. To address these challenges, many cities have implemented policies aimed at promoting more inclusive and sustainable forms of suburbanization, such as creating more affordable housing options, improving access to public transportation, and investing in community-based programs and services. Suburbanization can also have significant environmental impacts, such as increased traffic congestion, air pollution, and loss of natural habitats. By studying suburbanization one can identify strategies to minimize these impacts and promote more sustainable forms of development. Last but not least, suburbanization has implications for real estate markets, including changes in housing prices, the availability of affordable housing, and patterns of investments. The research on suburbanization can provide insight into real estate markets and help policymakers develop strategies to promote more equitable access to housing.

Research related to the impact of suburbanization on the real estate market has been conducted for many decades, with studies emphasizing various aspects of the real estate market. Economic conditions, such as income levels and affordability, can also impact suburbanization processes. In some developing countries, suburbanization is often driven by rapid urbanization and the need for affordable housing options for low-income households (Roy, 2009; Seto & Fragkias, 2011). Some authors see suburbanization as a threat to urban retail (Zhu & Wang, 2022). Other economic factors, such as job decentralization and the growth of industries in suburban areas, lower land and housing costs or consumer preferences for larger homes and private amenities, have been the subject of scientific research for as long as 30 years (Mieszkowski & Mills, 1993). The impact of suburban growth on real estate markets, land use patterns, and property values is multifaceted and presents both challenges and opportunities.

Suburbanization can also lead to the disadvantageous phenomenon of urban sprawl, which refers to the uncontrolled, outward expansion of urban areas into the surrounding rural land, often characterized by low-density, car-dependent development patterns. Various aspects of this phenomenon were studied by many researchers (see Lityński & Hołuj, 2020; Taranu & Verbeeck, 2022; Vermeiren et al., 2022). In the context of suburbanization there is also the issue of sustainable urban development addressed among others by Pacione (2017). The author states that decision makers need to balance growth and development with environmental, social, and economic sustainability and to promote compact, resource-efficient land use patterns. Urbanization of peri-urban areas also raises many transport issues, both private and public (Galiano et al., 2021).Society worldwide is undergoing many significant changes. One of these is the problem of an ageing population. Suburbanization as a phenomenon adapts to, but can also contribute to, demographic processes (Guest & Brown, 2019; Tammaru et al., 2013). In their study, Lichter et al. (2015) examined population growth and migration patterns in suburban areas of the United States. They found that suburbanization was driven by both domestic and international migration, with suburban areas experiencing faster population growth than urban centers. Population migration affects property prices (Lin et al., 2018). The relocation of married couples with children outside of cities is causing problems with funding schools (Figlio & Fletcher, 2012). When it comes to demographic and social issues, it is impossible not to refer to one of the most important phenomena of recent years, the COVID-19 pandemic. The pandemic has affected many areas of life. It has also left its mark on the property market, including suburbanization (Tsai et al., 2022). Bereitschaft and Scheller (2020) discuss how cities are currently responding to the public health threat posed by COVID-19, and how they might use planning and design strategies to improve resilience in the face of future pandemics. Chances for repairing Polish cities during the pandemic were examined by Majewska et al. (2022). The authors presented proposals and guidelines for creating sustainable pandemic resilient cities. The pandemic has also boosted interest in remote work (Bergeaud et al., 2023). Other researchers emphasize the need to design cities to accommodate pandemic-control measures while attending to people's daily needs, including access to outdoor spaces for physical, social, and mental well-being (Alawadi et al., 2022). The relationship between suburbanization and demography involves various aspects, such as population growth and migration patterns, age structure, and social diversity and

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inequality. Understanding these demographic dimensions is crucial for policymakers and planners to address the challenges and opportunities associated with suburban development.

Suburbanization processes in specific countries or regions may be similar in many ways, but there can also be some significant differences. These differences are due to various reasons, one of them being political factors. Political systems and land use policies play a significant role in shaping suburbanization patterns. In some countries, such as the United States and Australia, the lack of strong land use regulations has allowed for more extensive suburban sprawl (Fulton, 1996; Gleeson, 2006). In contrast, countries like Germany and the United Kingdom have implemented more stringent planning policies that limit urban expansion and promote higher-density development (Hall, 2002). The physical geography of a region can also influence the nature and pace of suburbanization. For instance, coastal cities with limited available land may experience more constrained suburban growth, while cities with extensive surrounding land may undergo more rapid and extensive suburbanization (Fujita & Thisse, 2013). Research on the phenomenon of suburbanization has also been carried out in Central-Eastern Europe, including Poland. Moreover, studies focused on the topic looked at countries such as Germany (Gnaedinger et al., 2019), Slovenia (Pichler-Milanovic, 2014), Estonia (Tammaru et al., 2013), Bulgaria and Serbia (Slaev et al., 2018), and the Czech Republic (Kubeš & Ouředníček, 2022). Studies conducted in Poland have looked at various aspects of suburbanization. The problem of depopulation was studied by Spórna (2018). Research on population change caused by suburbanization was dealt with by Szymańska and Michalski (2019) in their study, as well as Gnat and Bas (2013). The social and spatial changes brought about by the collapse of socialism were studied by Marcińczak et al. (2013). Municipal finance issues related to suburbanization are addressed in the work of the Smutek (2017). Changes in village morphology, on the other hand, were of interest to Szmytkie (2020). The interesting issue of spatial chaos influencing suburbanization caused by airport proximity in one of the Polish cities was investigated by Wojewnik-Filipkowska and Koszarek-Cyra (2022). Suburbanization has been a global phenomenon with some similarities across countries, such as the role of economic growth and housing preferences in driving population shifts to suburban areas. However, differences exist in the patterns and consequences of suburbanization due to varying urban planning policies, cultural factors and historical contexts.

It is important to constantly observe and study various phenomena related to suburbanization. By understanding the factors driving suburbanization, policymakers and planners can develop strategies to address the challenges and opportunities associated with this trend, such as promoting more sustainable and inclusive forms of development. Suburbanization is a complex and multifaceted process that has the potential to bring about both positive and negative changes in demographics.

The main objectives of this study are to assess the scale of suburbanization in large and medium-sized Polish cities, in order to determine whether suburbanization occurs similarly regardless of city size, and to identify those urban centers where the population change in neighboring municipalities is particularly large so as to increase the awareness of decision-makers and real estate market participants of the challenges posed by suburbanization. In addition, using one city as an example, the study aimed to assess how the influx of population affects the number of transactions on the real estate market. The results of the study may be useful in analyzing investment needs for various types of infrastructure, including roads and technical infrastructure.

2. Material and methods

A study of the demographic aspects of suburbanization in Poland in the years 2011 and 2021 was carried out using data from the Central Statistical Office and data on transactions of undeveloped plots of land obtained, among others, from real estate price registers. 2011 and 2021 were the years in which a census was conducted in Poland. As a result, the Central Statistical Office published accurate data on, among other things, the number of people actually living in the given area. Other sources of population data are not as accurate as census data. The use of census data allowed the change in population in the analyzed areas to be accurately determined. The analysis of population change was broken down into two types of cities. The first group consisted of cities with a population of over 200,000 in 2021. These are the largest cities in Poland. Katowice was excluded from this group, as well as from the entire study. The reason behind this decision was that this city forms a special kind of urban organism together with neighboring smaller cities, and it is very difficult to define an area which can be assessed in terms of the

suburbanization phenomenon in their case. In particular, it is difficult to determine which area is a major urban center and which is a potential reservoir for suburbanization. The second group of cities consisted of cities with between 100,000 and 200,000 inhabitants in 2021. These are smaller urban centers, but some of them are provincial capitals and, therefore, represent the most important local urban centers. A division of the analyzed cities was carried out in order to assess whether the phenomenon of population growth in the areas immediately surrounding the cities varies according to the size of the city. In both groups of cities, the municipalities directly adjacent to them were specified. These areas were surveyed for population change. The article presents the following information as a result of the study:

- How the population has changed in all the analyzed cities.
- How the population changed in the municipalities directly adjacent to the analyzed cities.
- Whether population changes in both the cities and their neighborhoods were similar in both groups of analyzed cities.
- Whether there is a correlation between population changes in the cities and their immediate neighborhoods.
- How the population changes in the analyzed areas compare to the population changes in Poland as a whole.

An extension of the study of demographic change was to take into account the real estate market context. For one of the cities analyzed, data were obtained on the number of transactions of undeveloped residential land plots located in the municipalities immediately surrounding the main urban center. These data have been compared to population changes in the municipalities.

The choice of variables analyzed in the study was dictated by the following thinking - it was considered that the change in population as a measure of progressive suburbanization was a good choice. With an increasing number of deaths, a decreasing number of births and, consequently, a declining population, population growth in the study areas is largely the result of the influx of new inhabitants. Second, one of the motives behind suburbanization is the desire to own a single-family home. It was considered that, in order to speak of suburbanization, there should be a simultaneous increase in population and an increase in the number of land parcels purchased for single-family housing. Transactions of single-family homes and other residential real estate represent only the exchange of residents and do not account for growing suburbanization.

3. Results

As described in the previous section, the population change data were compiled in two subsets. The first concerns the largest Polish cities - those with more than 200,000 residents. For each of these cities, municipalities in close proximity to these cities - municipalities sharing a common border with the metropolis - were specified. Figure 1 shows a map of these cities and neighboring municipalities. This map shows, in two colors, the changes in the population of each municipality. The green color indicates an increase in population in 2021 compared to 2011. The red color indicates municipalities where a decrease in the population was observed in the analyzed years. A visual analysis of this map suggests that the predominant situation was population growth in municipalities neighboring Poland's largest cities. Such a situation has indeed occurred. Out of a total of 120 municipalities adjacent to the analyzed major cities, 107 of them exhibited a population growth. In the case of 6 of the 12 largest metropolises, all neighboring municipalities experienced population growth. For 2 cities, there was one neighboring municipality with a decrease in population. Two or more municipalities with population declines were recorded in the neighborhoods of 4 major cities.

This vast majority of municipalities characterized by population growth translated quite unambiguously into total population changes in the areas surrounding Poland's largest agglomerations. Table 1 shows the population changes in these areas. In all 12 cases, population growth was recorded. However, this growth was very diverse. Starting with the city of Częstochowa, where the neighborhood gained only 15 residents between the 2011 and 2021 censuses, and ending with Wrocław, whose neighborhood gained more than 60 thousand residents, which accounted for more than 47% of the 2011 population. In absolute terms, the neighborhood of Poland's capital city of Warsaw saw the largest population increase. The increase amounted to nearly 110 thousand people. The average population growth in the neighborhoods of the largest cities was 20%.

It is impossible to assess the phenomenon of population growth in the neighborhoods of large

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cities without determining how the population in the cities themselves has changed. Table 2 shows population changes in cities with populations of over 200,000 in 2021. In 8 of them, the population declined or did not change. Only in the case of Warsaw, Krakow, the Tricity and Wroclaw did the population increase. This increase ranged from 2.2% to 9.4%. In both absolute and relative terms, Warsaw gained the most population. In contrast, Łódź was a particularly depopulating city, which lost nearly 60,000 residents over 10 years. Summarizing the population changes in Poland's largest cities and their surrounding municipalities, the total population in these cities increased from 6,995,291 to 7,093,035, an increase of nearly 100 thousand. The population in the municipalities neighboring these cities increased even more, from 2,174,765 to 2,660,966, an increase of nearly half a million people.

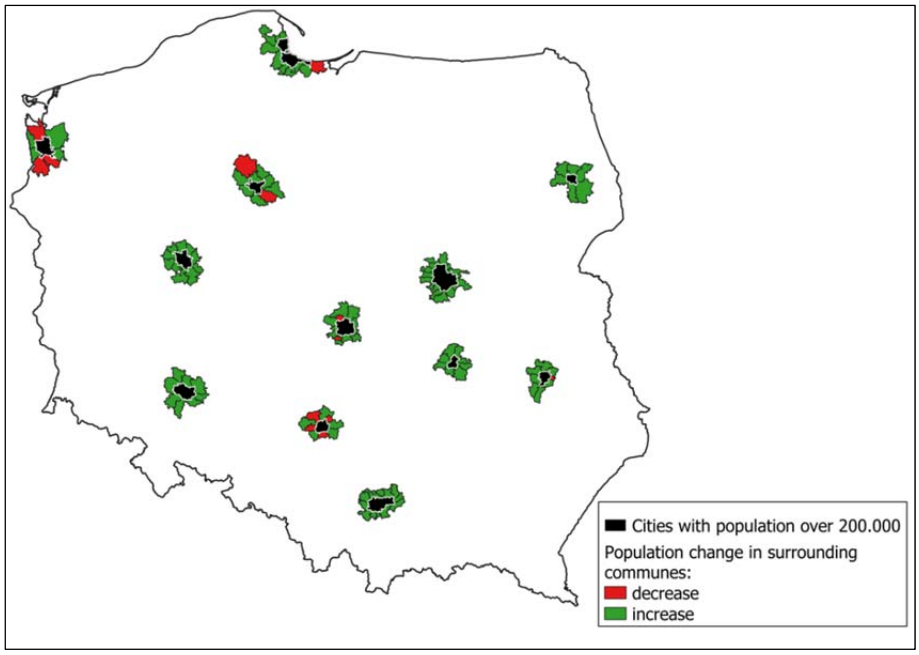


Fig. 1. Population growth/decrease in municipalities in the vicinity of cities with over 200k inhabitants. *Source*: Own elaboration.

Table 1

Population changes in municipalities in the vicinity of cities with over 200k inhabitants

Vicinity of city	Population in 2011	Population in 2021	Absolute population change	Relative population change
Białystok	74342	90979	16637	22.4%
Bydgoszcz	118976	138032	19056	16.0%
Częstochowa	117920	117935	15	0.0%
Kraków	251041	305057	54016	21.5%
Lublin	122238	137136	14898	12.2%
Łódź	245052	254100	9048	3.7%
Poznań	243919	336913	92994	38.1%
Radom	87038	94350	7312	8.4%
Szczecin	145074	158992	13918	9.6%
Tricity	233413	319501	86088	36.9%
Warszawa	403486	513013	109527	27.1%
Wrocław	132266	194958	62692	47.4%

Source: own study.

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Table 2

Population changes in cities with over 200k inhabitants

City	Population in 2011	Population in 2021	Absolute population change	Relative population change
Białystok	294001	294242	241	0.1%
Bydgoszcz	363926	337666	-26260	-7.2%
Częstochowa	236796	213107	-23689	-10.0%
Kraków	757611	800653	43042	5.7%
Lublin	349103	334681	-14422	-4.1%
Łódź	728892	670642	-58250	-8.0%
Poznań	554696	546859	-7837	-1.4%
Radom	221287	201601	-19686	-8.9%
Szczecin	410131	396168	-13963	-3.4%
Tricity	748105	764206	16101	2.2%
Warszawa	1700612	1860281	159669	9.4%
Wrocław	630131	672929	42798	6.8%

Source: own study.

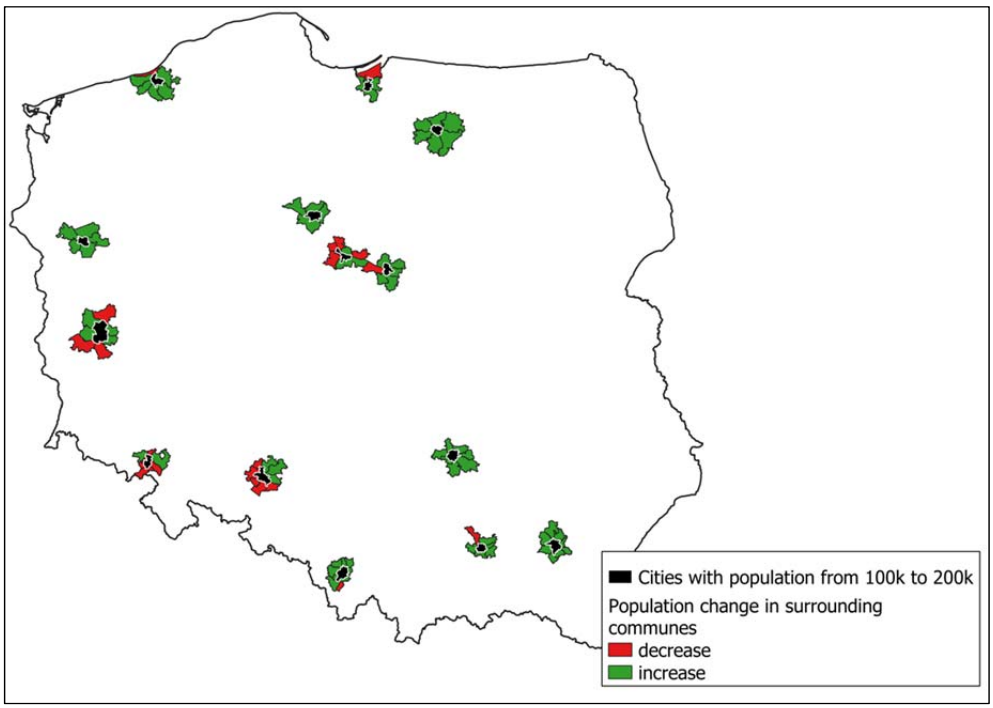


Fig. 2. Population growth/decrease in municipalities in the vicinity of cities with 100k to 200k inhabitants. *Source*: Own elaboration.

Analogous summaries of population changes were made for the second group - smaller cities with populations between 100,000 and 200,000 in 2021. Figure 2 shows a map, similar to Figure 1, of the cities and their neighboring municipalities. Again, visual analysis suggests that municipalities in the immediate vicinity of cities tend to be characterized by population growth. This was indeed the case, but the phenomenon of population change was not as clear-cut as in the case of Poland's largest cities. The number of municipalities that are adjacent to cities in the second analyzed group amounted to 88. Of this

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number, there was a positive population growth in 65 cases. In 23 municipalities, the population declined. This differs quite significantly from the proportion recorded in the largest cities. In the case of 5 of the 14 cities comprising the second analyzed group, there was an increase in population in all neighboring municipalities. For 5 cities, there was one neighboring municipality with a decrease in population. In the case of 4 cities, more than one municipality with a population decrease was recorded.

Analyzing population changes in the neighborhoods of cities in the group of 100,000 to 200,000 inhabitants, several facts were noted. In five cases, the population declined. The decline ranged from less than 1% to more than 10%. The largest decline, both in relative and absolute terms, was recorded in municipalities neighboring the city of Opole. In the neighborhoods of the other nine cities, the overall population increased. The largest increase was observed in the case of Olsztyn - by nearly 25%, which meant an increase in the number of people of more than 13,000. Table 3 shows population changes in the municipalities directly adjacent to the cities belonging to the second analyzed group.

Table 4 shows population changes in cities in the group of 100,000 to 200,000 residents. Only 3 of them saw an increase in population between 2011 and 2021, which totaled 9%. The group of 11 cities characterized by a population decline lost a total of more than 95 thousand residents, which accounted for 6.4% of their population in 2011. In absolute terms, the largest population decline was recorded in Walbrzych, which was also the largest relative decline (13.5%). The largest positive population growth occurred in Zielona Góra and amounted to 21,000 people, giving an increase of 17.7%.

Table 3

Population changes in municipalities in the vicinity of cities with 100k to 200k inhabitants

Vicinity of city	Population in 2011	Population in 2021	Absolute population change	Relative population change
Bielsko-Biała	141925	150648	8723	6.1%
Elbląg	17188	17050	-138	-0.8%
Gorzów Wielkopolski	37755	42374	4619	12.2%
Kielce	88022	97183	9161	10.4%
Koszalin	46448	49658	3210	6.9%
Olsztyn	54786	68059	13273	24.2%
Opole	80182	71616	-8566	-10.7%
Płock	45778	49940	4162	9.1%
Rzeszów	107978	118393	10415	9.6%
Tarnów	81895	84978	3083	3.8%
Toruń	44812	52132	7320	16.3%
Wałbrzych	84646	80752	-3894	-4.6%
Włocławek	43765	43256	-509	-1.2%
Zielona Góra	79047	79029	-18	0.0%

Source: own study.

Table 4

Population changes in cities with 100k to 200k inhabitants

City	Population in 2011	Population in 2021	Absolute population change	Relative population change
Bielsko-Biała	174534	169089	-5445	-3.1%
Elbląg	124668	115220	-9448	-7.6%

City	Population in 2011	Population in 2021	Absolute population change	Relative population change
Gorzów Wielkopolski	124534	119964	-4570	-3.7%
Kielce	202196	186894	-15302	-7.6%
Koszalin	109248	105883	-3365	-3.1%
Olsztyn	174645	170225	-4420	-2.5%
Opole	122625	127387	4762	3.9%
Płock	124553	114594	-9959	-8.0%
Rzeszów	179386	195871	16485	9.2%
Tarnów	114053	106259	-7794	-6.8%
Toruń	204954	198273	-6681	-3.3%
Wałbrzych	120715	104401	-16314	-13.5%
Włocławek	116783	104705	-12078	-10.3%
Zielona Góra	118982	140002	21020	17.7%

Source: own study.

Summarizing the population changes in cities with 100,000 to 200,000 residents and their surrounding municipalities, it can be seen that the total population in these cities fell from 2,011,876 to 1,958,767, a decrease of more than 50,000 people, whereas the population in the municipalities neighboring these cities increased from 954,227 to 1,005,068, an increase of about 50 thousand.

The data presented so far show some differences between the population changes in the analyzed groups of cities and their surrounding municipalities. In the next stage of the study, the results obtained so far were compiled to statistically summarize the differences and similarities found in the two groups in the context of suburbanization. Figure 3 presents box plots showing the relative population changes in municipalities surrounding medium-sized cities (purple boxplot) and the largest cities (blue boxplot). In this case, population changes referred to the sum of the inhabitants of all neighboring municipalities. It is clear that population growth was significantly greater in municipalities surrounding the largest agglomerations. In the largest cities, there was no decrease in population when viewed through the lens of the entire surrounding area. In the smaller cities, the first quartile of population change was negative, meaning that for ¼ of the cities, the population in the neighboring municipalities (combined) decreased. The median relative population change was 18.8% for municipalities around the analyzed large cities and 6.5% for municipalities adjacent to the smaller cities. It is also worth noting that population changes in areas around the largest cities were greater not only in relative terms, but also in absolute terms.

The study of changes in population size in cities and their neighborhoods also made it possible to determine the correlations of relative population changes. Figure 4 shows the relationship between population changes in cities and their surrounding municipalities. For the smaller cities under analysis, there is no clear correlation. The Pearson correlation coefficient in this case was -0.03 (p-value = 0.93), which means no statistical significance. Among the largest cities, the correlation coefficient was 0.76 (p-value = 0.004). The correlation in population change was strong and positive. Both of these results are quite interesting. Suburbanization in the strict sense can be spoken of when the population in the areas surrounding cities increases at the expense of the population within the city. Such a situation would imply a negative correlation. The correlation was not found to be negative for neither the largest cities nor for those with a population of 100,000 to 200,000. Admittedly, in the case of smaller cities, the aggregate population changes are very close to each other (around 50 thousand), but for individual cities, they are no longer similar. On the other hand, in the case of the largest cities, situations were recorded where the population increased, both in the city and in the neighboring municipalities (combined).

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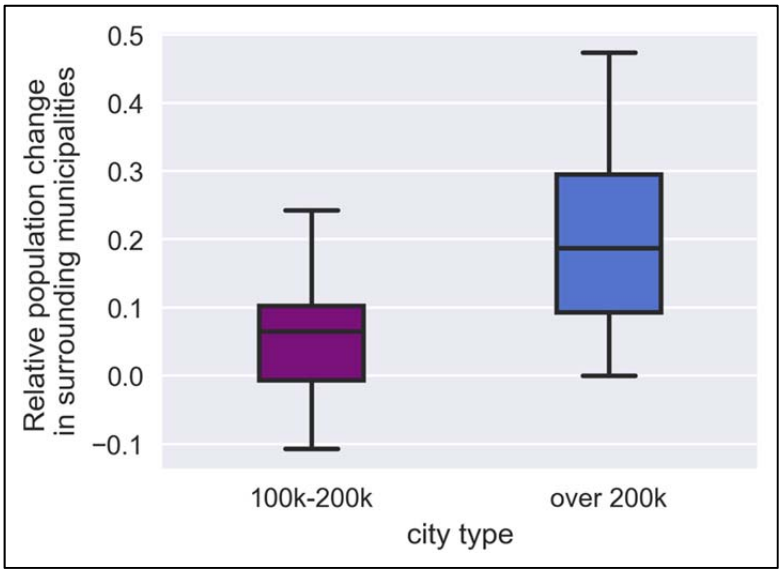


Fig. 3. Box charts of relative population changes in municipalities neighboring the analyzed cities. *Source*: Own elaboration.

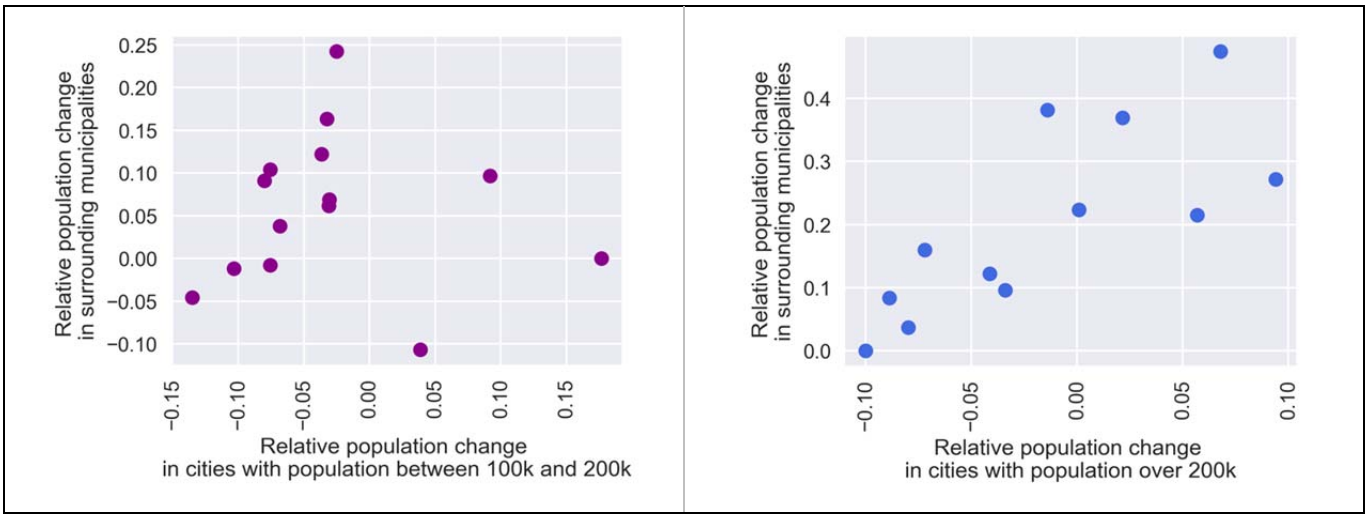


Fig. 4. Relationship of relative population changes in urban neighborhoods and population changes in analyzed cities. *Source*: Own elaboration.

Table 5

Population changes in municipalities in the vicinity of Szczecin

Municipality (gmina)	Population in 2011	Population in 2021	Absolute population change	Relative population change
Dobra (Szczecińska)	16778	27368	10590	63%
Goleniów	34967	36994	2027	6%
Gryfino	32138	30755	-1383	-4%
Kobylanka	4475	6109	1634	37%
Kołbaskowo	10809	14362	3553	33%
Police	42057	39698	-2359	-6%
Stare Czarnowo	3850	3706	-144	-4%

Source: own study.



Fig. 5. The city of Szczecin together with the surrounding municipalities. *Source*: Own elaboration.

In the final stage of the study, attention was directed to one of the analyzed cities - Szczecin. This city borders 7 municipalities (see Figure 5). The population in these municipalities was nearly 14,000 higher in 2021 as compared to 2011. This represented an increase of nearly ten percent. Table 5 shows population changes by municipality. The data shows that the aforementioned population growth of the Szczecin neighborhood is primarily due to the Municipality of Dobra, the population growth of which amounted to more than 60%. To a lesser, though also high degree, the population increased in the municipalities of Kobylanka and Goleniow. In the case of the latter, the large absolute change did not translate into a large relative change due to this municipality's large population - specifically, in the city of Goleniow itself. The main settlement processes of the new population concerned the village of Pucice, which borders Szczecin directly. Three municipalities experienced a decrease in population. The largest was noted in the municipality of Police, within the borders of which lies the city of the same name.

Figure 6 shows how the number of transactions of undeveloped land plots in municipalities neighboring Szczecin evolved between 2011 and 2021. This particular type of property was chosen to assess how suburbanization processes affect the real estate market. Such a decision was dictated by the fact that moving outside city limits is associated with aspirations to own a single-family home, and if these aspirations are to lead to population growth in the vicinity of a large city, then the fact of living in a neighboring locality should be equated with new investments in single-family housing. In two (Dobra, Goleniów) of the three municipalities with the highest absolute population growth, the most transactions of undeveloped land plots were also made each year. In the case of the Kołbaskowo municipality, the number of transactions made was not so high, but this is due to the slightly different nature of the housing market in this municipality. Large investments in multi-family housing have been carried out on its territory, hence the increase in population, which was not accompanied by such a large number of transactions as in the case of the previously mentioned municipalities.

4. Discussion

The results obtained during the study indicate that progressive suburbanization is taking place. However, it is not happening in the classic way, but rather on a national than local level. Large cities are attracting more and more residents. Growing populations have been recorded not only in neighborhoods, but also in the largest cities. The strong positive correlation between population changes in the largest cities and their adjacent areas is shown in Figure 4.

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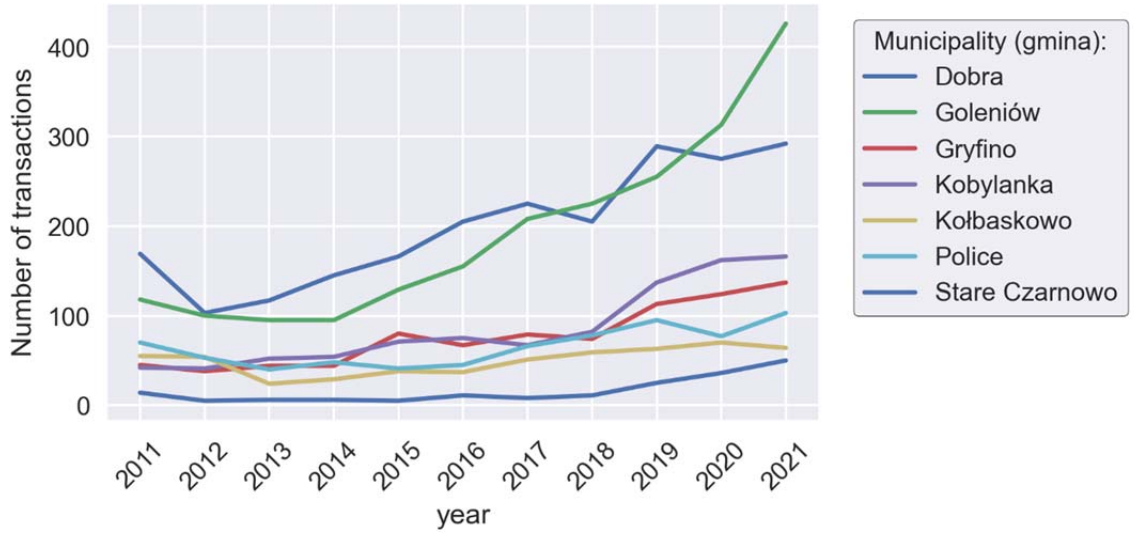


Fig. 6. Number of transactions of undeveloped land plots in municipalities in the vicinity of Szczecin. *Source*: Own elaboration.

These regions, so to speak, suck in the population from the rest of the country, increasing the concentration of the population in metropolitan areas. Areas far from urban centers are losing residents at a rapid pace. The growing concentration of the population will give rise to some repercussions, so population movements should continue to be monitored. The process may continue as described in the study, but it may also undergo changes in the future. Predictions for the future of suburbanization are varied and depend on several factors, such as demographic changes, technological advancements, economic conditions, and public policies. As the demographic makeup of suburban areas continues to evolve, it is expected that suburbs will become more diverse in terms of age, race, and socio-economic status (Frey, 2018). This diversification may result in a wider range of housing options, mixed-use development, and an increased focus on creating inclusive, walkable communities. Another thing to consider is climate change. As concerns about it and resource depletion continue to grow, there is likely to be a greater emphasis on sustainable suburban development. This may include the promotion of energy-efficient buildings, green spaces, and public transportation options (Jabareen, 2013). Also, technological advancements are something to be aware of. Advancements in technology, such as autonomous vehicles and remote work, have the potential to reshape suburban living. While some researchers argue that these advancements may lead to further suburban sprawl, others believe they could foster more compact, transit-oriented development (NACTO, 2017). From a demographic standpoint, suburbanization can be affected by the aging population. As this process continues, there will be a growing demand for age-friendly housing and community designs in suburban areas. This may lead to an increased focus on creating communities that are accessible, walkable, and provide services and amenities for older adults (Hanson & Emlet, 2006). Another important demographic aspect that can influence the future of suburbanization are generational preferences. As millennials and younger generations enter the housing market, their preferences may influence the future of suburbanization. Some studies suggest that younger generations prefer urban living and are more likely to choose transit-oriented, walkable communities (Loo, 2021). This could lead to a greater emphasis on developing denser, more urbanized suburban areas. The future, as always, is clouded by uncertainty. Recent events, such as the COVID-19 pandemic, the war in Ukraine, inflation and rising interest rates bring about further uncertainties and may affect social, economic and other processes, including suburbanization and its demographic aspects.

5. Conclusions

This paper presents the results of a study on population changes in the areas directly bordering Poland's largest cities and in the cities themselves. The calculations were based on data from the National Censuses conducted in 2011 and 2021. The study provided answers to the 5 research questions posed:

- In most of the analyzed cities (except for the largest urban centers), the population has decreased.

- The population in municipalities directly bordering the analyzed cities increased in the vast majority of cases.
- The process of population growth around the analyzed cities did not proceed evenly. Significant differences in population growth were recorded between individual cities. Higher population growth clearly concerned the largest cities, with more than 200,000 inhabitants.
- Contrary to what might be expected from population changes in the suburbanization process, no negative correlation between population changes in cities and neighboring areas was recorded. Moreover, in the group of the largest cities, the correlation was clearly positive. This means that, in the case of such cities, we are not dealing with classic suburbanization, but with population concentration in the largest agglomerations.
- To elaborate on the previous point, population changes in the cities analyzed were set in the context of changes in the country as a whole. Between 2011 and 2021, the population in Poland fell by nearly half a million, while the total population of the entire analyzed area, i.e. the largest cities and their neighborhoods, increased by almost 600,000. This means that the population in the rest of the country has decreased by more than one million.

The article also analyzes the development of the number of transactions of undeveloped land plots in municipalities neighboring one of the largest cities. A systematic increase in the number of such transactions was noted, and was particularly large in those municipalities where the population increased the most. This confirms that suburbanization in these areas is related to the construction of single-family houses.

In conclusion, it should be noted that demographic changes in Poland are significant. There is has been a large population increase in the largest agglomerations and their neighborhoods. On the other hand, the rest of the country is becoming depopulated. These two phenomena have a number of consequences that affect the real estate market, but also extend far beyond it. These consequences relate to the declining supply of land in the most attractive areas, and thus large price rises that can lead to ever-increasing difficulties for people with average (not to mention low) incomes to acquire property. The influx of population increases the pressure on local authorities in terms of various types of investments in infrastructure. On the other hand, the exodus of population from many places will lead to a decrease in tax revenue in these municipalities, which will consequently lead to the gradual degradation of infrastructure. Such a situation discourages and will discourage developers from investing in areas where the population is declining. Population flows have a significant positive as well as negative impact on the property market. It is therefore very important to follow the demographic changes in juxtaposition with the development of the real estate market in order to make market participants and local and national authorities aware of the emerging opportunities and threats. Understanding the relationship between suburbanization and demographic factors is crucial for developing effective policy interventions to address the challenges and opportunities arising from changing population patterns in suburban areas. By considering the demographic context, planners and policymakers can better anticipate the needs of suburban residents, promote inclusivity, and foster sustainable communities.

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