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Shrinking municipalities and their budgetary revenues on the example of the Warmian-Masurian Voivodeship in Poland

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Abstract

Research background: Adverse demographic changes in many local administration units around the world lead to their shrinkage. These processes are usually accompanied by economic changes. The economic consequences of shrinkage can be assessed based on the budgetary revenues of local units, which are largely dependent on the local population and the demographic structure.

Purpose of the article: The aim of this article is to evaluate the shrinkage of Polish municipalities and the effects of population change on the budgetary revenues of local administration units. The analysis was conducted in selected municipalities of the Warmian-Masurian voivodeship, which is the least economically developed region in Poland. The analysis covered the period between 2012 and 2017.

Methods: The shrinkage of municipalities was evaluated with the use of the methods proposed by the Shrinking Cities International Research Network (SCIRN). According to this methodology, a local unit shrinks when the annual decrease in population exceeds 0.15% for more than five consecutive years. The influence of demographic changes on the budgetary revenues of municipalities was evaluated with the use of linear correlation analysis (Pearson's r) as well as a survey conducted among municipal treasurers in the Warmian-Masurian voivodeship.

Findings & Value added: Symptoms of shrinkage were described in selected municipalities of the Warmian-Masurian voivodeship. The presence of correlations between different categories of budgetary revenues and demographic changes was confirmed. The results of the study and the formulated practical recommendations constitute constructive inputs to the discussion on possible

solutions to the analyzed problem. They can also be used in further research to analyze other aspects of municipal budgets (the consequences of depopulation for budgetary expenditures, municipal debt, etc.) or conduct comparisons with other regions in Poland and in the world.

Introduction

Demographic changes in local administration units around the world have been researched extensively at the turn of the 20th and 21st century. Depopulation, also referred to as shrinkage, affects mostly post-industrial zones and has both social and economic consequences.

According to the literature, the discussed phenomena are complex and multi-dimensional, and their causes and effects have not yet been fully identified (Bontje & Musterd, 2012, p. 153). It could appear that the budgets, performance, autonomy and future political strategies of local administration units are the last links in the chain of economic consequences of adverse demographic processes. Mäding (2004) observed that the influence of population change on local budgets is real, but indirect, complex and difficult to measure (compare Hoekveld, 2012, p. 179).

Most authors regard demographic factors as the key determinants of local budgets (Gornowicz & Wichowska, 2017, Bisogno *et. al.*, 2017, Wang, 2007, p. 5; Vlavec, 2005; Guziejewska & Majdzińska, 2018). Therefore, the main and direct aim of this study was to evaluate the impact of population change on the budgetary revenues of municipalities in the Warmian-Masurian voivodeship (“voivodeship” is the highest-level administrative subdivision of Poland, NUTS2). The indirect objective of the research which supported the achievement of the main goal was to evaluate the shrinkage of selected municipalities.

The municipalities of the Warmian-Masurian voivodeship were selected for this study based on adverse demographic changes in recent years as well as the accompanying economic processes. The selected municipalities were characterized by poor economic performance (high unemployment, low GDP per capita, low urbanization rate, peripheral location) and the significant role of agricultural production which had been concentrated in the State Agricultural Farms in the socialist era. Former farm employees were negatively affected by political transformations and the privatization of agriculture, which seems to be both the cause and the effect of natural population movement and migration. Unlike post-industrial cities in Poland, Western Europe and the Anglo-Saxon countries, the demographic changes in the studied region were closely linked with its agricultural character. The consequences of demographic processes, including the implications for local budgets, will probably be similar to those experienced by

post-industrial cities. Without corrective measures initiated by the local authorities, the availability and structure of municipal funds could be inadequate, and it could undermine the financial autonomy of municipalities (compare Herrmann *et al.*, 2016, p. 4).

Demographic changes were analyzed to evaluate the shrinkage of municipalities, and the relationship between budgetary revenues and the demographic status of municipalities was investigated by linear correlation analysis (Pearson's r). The results were validated during a survey conducted among municipal treasurers in the studied voivodeship.

The article consists of several parts. The first part is a review of the literature on the shrinkage of local units and its consequences. The second part describes the research methodology and presents the results of the study. In the Discussion section, attempts were made to propose effective measures for counteracting local shrinkage phenomena based on the solutions adopted in selected cities in Europe and in the world. The conclusions resulting from the study were formulated in the last section.

Literature review

Urban shrinkage is a contemporary phenomenon that is widely encountered around the world. This complex and multi-dimensional process is usually accompanied by economic changes (Großmann *et al.*, 2013, p. 222), which is why the relevant analyses combine many scientific disciplines. Depending on the local conditions, various causes of shrinkage are analyzed, and possible future scenarios are predicted (Mallach *et al.* 2017, p. 103).

Globalization, namely the internationalization of production, distribution and consumption (Martinez-Fernandez *et. al.*, 2012, p. 213; Herrmann *et. al.*, 2016, pp. 1–2), increased mobility and uneven distribution of labor and capital, which are usually concentrated around urban centers (Weaver & Holtkamp, 2015, p. 293), is often identified as one of the causes of depopulation. Urban shrinkage can also be fueled by natural demographic changes, including low fertility rates and ageing of urban populations (compare Kabish & Haasem 2011, p. 251, Rients, 2009, p. 249).

The shrinkage of local administration units can have negative implications for:

- economic growth, including a decrease in entrepreneurship due to lower demand and lower supply (Coleman & Rowthorn, 2011, p. 226; Delfmann 2014, p. 1134–1135), higher unemployment, low competitiveness and innovation (Rieniets, 2009, p. 235);

- society, including the loss of the working age population, higher proportion of elderly citizens, lower fertility rates, decay of social relationships, disappearance of grassroots initiatives, knowledge and competence, which contributes to poverty, homelessness, uneven population distribution and higher inflow of international immigrants (Van Dalen *et al.*, 2011, pp. 448–449, Hollander, 2011, Martinez-Fernandez *et al.*, 2016, p. 3);
- infrastructure, including the deterioration and disappearance of utility networks, transportation networks, schools and health care facilities, lower demand for construction services and materials, decrease in real estate prices and a higher number of vacant properties, higher infrastructure maintenance costs, and the loss of favorable effects of economies of scale (Sousa & Pinho, 2015, pp. 16–17; Schetke & Haase, 2008, p. 491, Schilling & Logan, 2008, p. 453).

In the long-term perspective, the above phenomena can decrease the local tax base and budgetary revenues, which can compromise the quality of public services provided by the local authorities. The described phenomena are closely linked and characterized by feedback. These relationships are presented in Figure 1.

Own-source revenues, local taxes and fees, personal income tax, corporate income tax, incomes from municipal property, inherited estate, bequests, donations, fines, interests, transfers from the central budget in the form of general and targeted subsidies are the main sources of budgetary revenues in Polish municipalities (The Constitution of the Republic of Poland, 1997). The revenues collected from taxes are most sensitive to demographic changes. A decrease in tax revenues can increase the demand for budgetary funds to address progressive infrastructure decay and social problems. According to Coleman and Rowthorn (2011, p. 232), the local authorities can respond to the above problems by increasing taxes or decreasing spending, which can make local units more dependent on external funding. The above applies particularly to the portion of general subsidies which is paid to municipalities to level out disproportions in economic growth between regions (Mäding, 2004, Carbonaro *et al.*, 2018, p. 232, Großmann *et al.*, 2013, p. 223). It should also be noted that municipalities with low tax revenues are less affected by demographic changes.

Research methodology

The shrinkage of the municipalities in the Warmian-Masurian voivodeship was analyzed with the use of the methods proposed by the Shrinking Cities

International Research Network (SCRIN). According to this methodology, population decrease is the first symptom of urban shrinkage. A local unit shrinks when the annual decrease in population exceeds 0.15% for more than five consecutive years. Demographic changes should be accompanied by adverse economic and structural processes (Stryjakiewicz, 2013, p. 32). Therefore, changes in the population growth rate were analyzed in all selected 116 municipalities of the Warmian-Masurian voivodeship in 2012–2017.

Attempts were made to verify the research hypothesis stating that adverse demographic changes in the municipalities of the Warmian-Masurian voivodeship affect the municipalities' budgetary revenues. The research hypothesis was verified by examining the strength of the relationships between population and different categories of budgetary revenues.

The strength of the relationships between revenue variables and three demographic variables, i.e. population, net internal migration per 1,000 population and natural population increase (decrease) per 1,000 population, were analyzed by linear correlation analysis (Pearson's r). The resulting correlation coefficients were tested at a significance level of $\alpha < 0.05$. Demographic variables were selected in view of the observation made by Mäding (2004) who argued that demographic changes in local administration units can be evaluated in three areas: population (including natural population movement and internal migration), demographic structure (age, gender, origin) and international migration. Changes in population were analyzed in the first area.

The impact of demographic factors on different categories of budgetary revenues in the municipalities of the Warmian-Masurian voivodeship was also evaluated based on the results of a survey. The survey was conducted by post from May to July 2016 among 75 out of 116 (65%) municipal treasurers in the analyzed voivodeship.

Results

The demographic structure of the Warmian-Masurian voivodeship was unfavorable in the analyzed period. Population decreased in 95 out of 116 municipalities (approx. 82%) between 2012 and 2017. The above could be attributed to a negative net migration rate in the analyzed period as well as natural population decrease in the last three years of the studied period. Demographic data, including average changes in population, natural population increase (decrease) and net migration rate per 1,000 population, are presented in Figure 2.

The progressively negative net migration rate gives particular cause for concern. According to the official documents of the Provincial Assembly of the Warmian-Masurian Voivodeship (*Provincial Assembly...* 2013, pp. 20–21), the negative net migration rate can be attributed mainly to the absence of a large urban center in the region. The Assembly also noted that migration rates were particularly high in the northern part of the voivodeship and in areas bordering other Polish voivodeships. It should also be emphasized that several municipalities in the analyzed voivodeship (including Banie Mazurskie, Budry, Pieniężno and Ryn) were characterized by the most rapidly shrinking populations on the national scale.

Based on the SCIRN method, symptoms of urban shrinkage were observed in 28 out of 116 municipalities (24%) in the studied voivodeship. In these municipalities, annual population decline exceeded 0.15% between 2012 and 2017. Of those, 5 were urban municipalities, 10 were rural municipalities and 13 were urban-rural municipalities. The average annual rate of population decline was determined at 0.77%. Average population decrease was the highest in the urban municipality of Górowo Iławeckie (1.49%) and the lowest in the urban municipality of Morąg (0.40%). In the analyzed period, annual population decline was observed in 51 municipalities (44% of all municipalities in the voivodeship), but the noted decrease did not exceed 0.15%. In the evaluated period, the average annual population decline in all municipalities of the studied voivodeship reached 0.26%.

Attempts were made to verify the research hypothesis stating that adverse demographic changes in the municipalities of the Warmian-Masurian voivodeship influence the municipalities' budgetary revenues. However, this relationship is not direct, and it is difficult to capture. An analysis of the budgetary revenues of the examined municipalities revealed an increase in the average value of all categories of budgetary revenues. The said increase was also observed in shrinking municipalities. However, the values of r in linear correlation analysis suggest the presence of correlations between demographic variables and revenue variables (Table 1). All of the identified correlations were statistically significant. The relatively low level of Pearson's correlation coefficients could have resulted from the impact of other factors, for example: economic, political, infrastructural.

The data presented in Table 1 indicate that population was bound by the strongest correlation with own-source revenues ($r=0.35$) and a weaker negative correlation with targeted and general subsidies. These findings are consistent with published data. The net internal migration rate per 1,000 population was bound by the strongest correlation with own-source revenues per capita ($r=0.46$), a weaker negative correlation with general subsidies ($r=-0.41$) and a weak negative correlation with targeted subsidies ($r=-$

0.23). A weak, but significant, correlation was also observed between revenue variables and natural population increase (decrease). It was the least correlated with own-source revenues ($r=0.08$), and it was bound by negative correlations with targeted subsidies ($r=-0.17$) and general subsidies per capita ($r=-0.19$).

The aim of the conducted survey was to identify the determinants of budgetary revenues in the municipalities of the Warmian-Masurian voivodeship. Demographic variables played a significant role in the respondents' opinion. The surveyed subjects selected population as the key demographic factor that affects all three categories of budgetary revenues. According to 67% of the respondents, population influences the share of income taxes received by municipalities. Local taxes were also recognized as a significant determinant of own-source revenues (64% of indications). According to the surveyed treasurers, population is somewhat less likely to influence general subsidies (59%), and it plays an even less important role in revenues generated from local fees and targeted subsidies.

The analyzed demographic variables also included the net internal migration rate. In the respondents' opinion, this variable had the greatest influence on the share of income taxes received by municipalities (33%), followed by local taxes (21%), own-source revenues (17%), general subsidies (16%) and local fees (15%). The net internal migration rate was the least significant determinant of targeted subsidies (11%), property-related revenues (8%) and other revenues (1%).

According to the surveyed treasurers, natural population growth was the most important determinant of general subsidies (39%) and targeted subsidies (28%). This variable was less likely to affect own-source revenues (19%), and it exerted a nearly identical influence on local taxes and fees, and the share of income taxes received by municipalities (>10% each).

The respondents were also asked to indicate demographic factors which will play the most important role in budgetary revenues in the following 10 years. Nearly 75% of the surveyed treasurers agreed that population will have the decisive impact on the municipalities' budgetary revenues in the future. In their opinion, the net internal migration rate and natural population growth will be less important determinations of budgetary revenues (16% and 27%, respectively). The results of the survey are presented in Figure 3.

The results of this study suggest that many municipalities in the Warmian-Masurian voivodeship were faced with challenges relating to shrinkage and adverse demographic changes. Demographic variables were significantly correlated with budgetary revenues in the examined period. These

correlations were confirmed by the results of the survey. Therefore, the research hypothesis was validated.

Discussion

The greatest challenge facing municipalities with negative population growth is the implementation of programs that will prevent, or at least minimize, the consequences of population decline. According to the literature, the severity of those consequences is determined mainly by the specific characteristics of the affected unit (Martinez-Fernandez *et al.*, 2016, pp. 2–3, Wiechmann & Bontje, 2013, p. 9). For this reason, these unique features should be taken into account in remedy programs. As noted by Großmann *et al.* (2013, p. 223), own-source revenues are most sensitive to adverse demographic changes, which could increase municipalities' dependence on state subsidies in the future. The results of the survey presented in this article validate the above observation. As a result, municipal spending will be increasingly controlled by the state, and it will not be fully coordinated with local policy. To minimize this risk, greater emphasis should be placed on local initiatives.

The present and future rate of population decline, the accompanying economic processes and their consequences should be evaluated in the first stage of planning recovery measures. The experiences of other local units in Poland, Europe and the world could provide valuable inputs in the planning process. Various measures with potential applications in different environments have also been described in the literature (compare Martinez-Fernandez *et al.*, 2012, Martinez-Fernandez *et al.*, 2016, Wiechmann & Pallagst, 2012).

The results of this study indicate that long-term programs to improve the demographic and financial status of shrinking municipalities in the Warmian-Masurian voivodeship should focus primarily on curbing internal migration and increasing natural population growth. However, the relevant measures have to account for the region's agricultural character and its historical context.

Spatial planning and urban revitalization played an important role in the local policy of post-industrial cities in Germany and the United States (Wiechmann & Pallagst, 2012, pp. 76–77, Dubeaux & Sabot, 2018). In contrast, the Warmian-Masurian voivodeship has a low rate of urbanization, and measures aiming to improve entrepreneurship and increase local employment should play the key role in local policy. The first goal could be difficult to achieve because the analyzed municipalities are not highly at-

tractive for investors on account of their declining population (compare Sousa & Pinho, 2015, p. 20) and weakly developed infrastructure. The local authorities should launch marketing campaigns (Hospers, 2011, p. 371) to promote the region's strengths, including its high natural value which could contribute to the development of agritourism and organic farming.

The local authorities should develop training programs to increase employment, in particular among elderly citizens and women who raise children, which could increase budgetary revenues in the future (Muenz, 2007, p. 8). The examples of other countries could offer valuable insights. The German government has introduced a host of family-friendly measures to tackle the demographic deficit (Mäding, 2004). A similar strategy should be adopted by the municipalities in the Warmian-Masurian voivodeship to promote the construction of housing, improve local infrastructure, organize cultural and sports events, and make effective use of natural resources.

The proposed measures require additional funding; therefore, programs aiming to raise funds from external sources, including the EU Structural Funds, should be a part of municipal strategies.

Conclusions

The shrinkage of local administration units poses one of the greatest challenges in the contemporary world. As shown by the present study, this adverse phenomenon has also been observed in recent years in selected municipalities of the Warmian-Masurian voivodeship, in particular in urban centers. However, the causes of shrinkage are somewhat different than in large European cities. In the studied voivodeship, the dominant role of agriculture was undoubtedly one of the main causes of depopulation and delays in regional development.

The shrinkage of local administration units can have negative consequences for their economies. It affects the budgetary revenues of municipalities and decreases the local tax base which is directly dependent on population and influences budgetary revenues, in particular those collected from local taxes and the share of income taxes received by the municipalities. Local shrinkage can also increase municipalities' dependence on external sources of funding, such as general and targeted subsidies, thus decreasing their autonomy.

The surveyed treasurers in the municipalities of the Warmian-Masurian voivodeship were of the opinion that budgetary revenues were linked with demographic factors. They recognized the negative consequences of population decline in municipalities, and they pointed out that demographic

factors would have a decisive influence on budgetary revenues in the following decade.

An analysis of the most effective methods for coping with depopulation has revealed that municipalities should focus on stimulating entrepreneurship, increasing employment and improving infrastructure. However, these measures require additional funds which could be obtained from various sources, including the EU.

One of the limitations of the presented research was their territorial scope and lack of comparative perspective to other countries. The extension of research could be another research challenge. The effects of municipal shrinkage on budgetary expenditures, debt and fund raising from external sources could be explored in the future. This article analyzes only changes in population, including internal migration and natural population growth, whereas additional demographic factors such as population ageing and international migration could be incorporated into the analysis in future research.

References

- Bisogno, M., Cuadrado-Ballesteros, B., & García-Sánchez, I. M. (2017). *Financial sustainability in local governments: definition, measurement and determinants. Financial sustainability in public administrations. Exploring the Concept of Financial Health*. Cham: Palgrave Macmillan.
- Bontje, M., & Musterd, S. (2012). Understanding shrinkage in European regions. *Built Environment*, 38(2). doi: 10.2148/benv.38.2.153.
- Carbonaro, G., Leanza, E., McCann, P., & Medda, F. (2018). Demographic decline, population aging, and modern financial approaches to urban policy. *International Regional Science Review*, 41(2). doi: 10.1177/0160017616675916.
- Coleman, D., & Rowthorn, R. (2011). Who's afraid of population decline? A critical examination of its consequences. *Population and Development Review*, 37(1). doi: 10.1111/j.1728-4457.2011.00385.x.
- Delfmann, H., Koster, S., McCann, P., & Van Dijk, J. (2014). Population change and new firm formation in urban and rural regions. *Regional Studies*, 48(6). doi: 10.1080/00343404.2013.867430.
- Dubeaux, S., & Sabot, E. C. (2018). Maximizing the potential of vacant spaces within shrinking cities, a German approach. *Cities*, 75. doi: 10.1016/j.cities.2017.06.015.
- Gornowicz, M., & Wichowska, A. (2017). Demographic structure and incomes of municipalities of Warmia and Mazury in 2010–2014. *Society and Economics* 1(7). doi: 10.15611/sie.2017.1.05.
- Großmann, K., Bontje, M., Haase, A., & Mykhnenko, V. (2013). Shrinking cities: notes for the further research agenda. *Cities*, 35. doi: 10.1016/j.cities.2013.07.007.

- Guziejewska, B., & Majdzińska, A. (2018). The model of municipal education expenditures in Poland. Policy, budget and demography. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 13(3). doi: 10.24136/eq.2018.026.
- Herrmann, D. L., Shuster, W. D., Mayer, A. L., & Garmestani, A. S. (2016). Sustainability for shrinking cities. *Sustainability*, 8(9). doi: 10.3390/su8090911.
- Hoekveld, J. (2012). Time-space relations and the differences between shrinking regions. *Built Environment*, 38(2). doi: 10.2148/benv.38.2.179.
- Hollander, J. B. (2011). Can a city successfully shrink? Evidence from survey data on neighborhood quality. *Urban Affairs Review*, 47(1). doi: 10.1177/1078087410379099.
- Hospers, G. J. (2011). Place marketing in shrinking Europe: some geographical notes. *Tijdschrift voor economische en sociale geografie*, 102(3). doi: 10.1111/j.1467-9663.2011.00672.x.
- Kabisch, N., & Haase, D. (2011). Diversifying European agglomerations: evidence of urban population trends for the 21st century. *Population, Space and Place*, 17(3). doi: 10.1002/psp.600.
- Local Data Bank (2018). Retrieved from <https://bdl.stat.gov.pl/BDL/start> (1.12.2018).
- Mäding, H. (2004). Demographic change and local government finance – trends and expectations. *German Journal of Urban Studies*, 44(1).
- Mallach, A., Haase, A., & Hattori, K. (2017). The shrinking city in comperative perspective: contrasting dynamics and responses to urban shrinkage. *Cities*, 69. doi: 10.1016/j.cities.2016.09.008.
- Martinez-Fernandez, C., Audirac, I., Fol, S., & Counningham-Sabot, E. (2012). Shrinking cities: urban challanges of globalization. *International Journal of Urban and Regional Research*, 36(2). doi: 10.1111/j.1468-2427.2011.01092.x.
- Martinez-Fernandez, C., Martinez-Fernandez, C., Kubo, N., Noya, A., & Weyman, T. (2012). *Demographic change and local development: Shrinkage, regeneration and social dynamics*. Paris: OECD publishing.
- Martinez-Fernandez, C., Weyman, T., Fol, S., Audirac, I., Cunningham-Sabot, E., Wiechmann, T., & Yahagi, H. (2016). Shrinking cities in Australia, Japan, Europe and the USA: from a global process to local policy responses. *Progress in Planning*, 105. doi: 10.1016/j.progress.2014.10.001.
- Muenz, R. (2007). Aging and demographic change in European societies: main trends and alternative policy options. *World Bank SP Discussion Paper*, 703.
- Provincial Assembly of the Warmian-Masurian Voivodeship (2013). Strategy for the socio-economic development of the Warmian-Masurian Voivodeship until 2025. Retrieved form http://strategia2025.warmia.mazury.pl/site/showFile/194.html?id_menu=72. (1.12.2018).
- Rieniets, T. (2009). Shrinking cities: causes and effects of urban population losses in the twentieth century. *Nature and Culture*, 13(3). doi: 10.3167/nc.2009.040302.

- Schetke, S., & Hasse, D. (2008). Multi-criteria assessment of socio-environmental aspects in shrinking cities. Experiences from eastern Germany. *Environmental Impact Assessment Review*, 28(7). doi: 10.1016/j.eiar.2007.09.004.
- Schilling, J., & Logan, J. (2008). Greening the rust belt: a green infrastructure model for right sizing America's shrinking cities. *Journal of the American Planning Association*, 74. doi: 10.1080/01944360802354956.
- Sousa, S., & Pinho, P. (2015). Planning for shrinkage: paradox or paradigm. *European Planning Studies*, 23(1). doi: 10.1080/09654313.2013.820082.
- Stryjakiewicz, T. (2013). The process of urban shrinkage and its consequences. *Romanian Journal*, 15.
- The Constitution of the Republic of Poland of 2 April 1997 (Journal of Laws, 1997, No.78, item 483, as amended).
- Van Dalen, H. P., & Henkens, K. (2011). Who fears and who welcomes population decline? *Demographic Research*, 25. doi: 10.4054/DemRes.2011.25.13.
- Vladeck, B. C. (2005). Economic and policy implications of improving longevity. *Journal of the American Geriatrics Society*, 53(9). doi: 10.1111/j.1532-5415.2005.53495.x.
- Wang, X., Dennis, L., & Tu, Y. S. (2007). Measuring financial condition: a study of US states. *Public Budgeting & Finance*, 27(2). doi: 10.1111/j.1540-5850.2007.00872.x.
- Weaver, R., & Holtkamp, Ch. (2015). Geographical approaches to understanding urban decline: from evolutionary theory to political economy... and back? *Geography Compass*, 9(5). doi: 10.1111/gec3.12211.
- Wiechmann, T., & Bontje, M. (2013). Responding to tough times: policy and planning strategies in shrinking cities. *European Planning Studies*, 23(1). doi: 10.1080/09654313.2013.820077.
- Wiechmann, T., & Pallagst, K. M. (2012). Urban shrinkage in Germany and the USA: a comparison of transformation patterns and local strategies. *International Journal of Urban and Regional Research*, 36(2). doi: 10.1111/j.1468-2427.2011.01095.x.

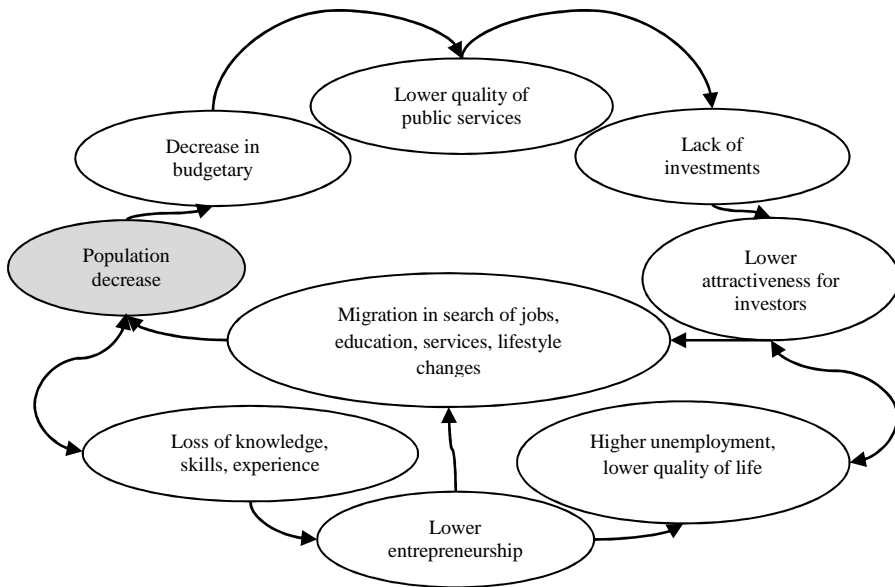
Annex

Table 1. Values of r in analyses of linear correlations between demographic variables and revenue variables in the municipalities of the Warmian-Masurian voivodeship in 2012-2017

Revenue per capita	Population growth rate	Net internal migration rate per 1,000 population	Natural population increase (decrease) per 1,000 population
Own-source revenues	0.35	0.46	0.08
Targeted subsidies	-0.10	-0.23	-0.17
General subsidies	-0.17	-0.41	-0.19

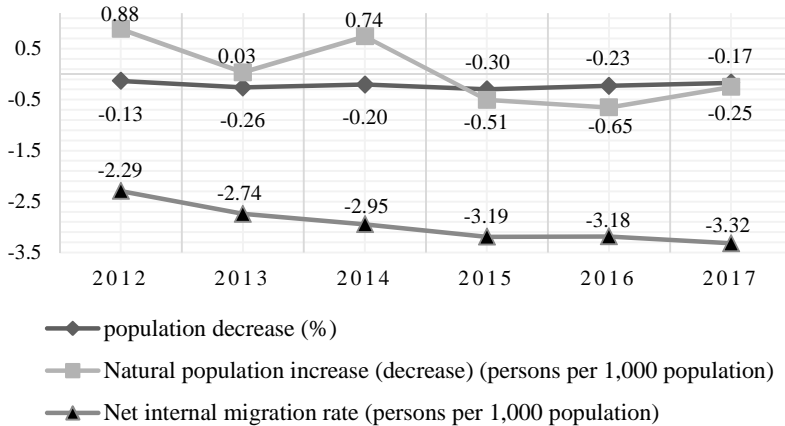
Source: own calculation based on the Local Data Bank (2018).

Figure 1. The relationships between the causes and effects of urban shrinkage



Source: own study based on the cited references and Martinez-Fernandez *et al.* (2012, p. 61).

Figure 2. Average (%) population decrease, average natural population increase (decrease) per 1,000 population and average net migration rate per 1,000 population in the municipalities of the Warmian-Masurian voivodeship in 2012-2017



Source: own calculation based on Local Data Bank (2018).

Figure 3. Demographic factors affecting the budgetary revenues of the municipalities in the Warmian-Masurian voivodeship based on the results of the survey of municipal treasurers (% of answers)

