EQUILIBRIUM
Quarterly Journal of Economics and Economic Policy
Volume 13 Issue 2 June 2018
p-ISSN 1689-765X, e-ISSN 2353-3293
www.economic-policy.pl

ORIGINAL PAPER

Citation: Małkowska, A., Telega, A., Głuszak, M., & Marona, B. (2018). Spatial interdependence in property taxation: the case of Polish municipalities. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *13*(2), 265–283. doi: 10.24136/eq.2018.014

Contact to corresponding author: malkowsa@uek.krakow.pl, Department of Real Estate and Investment Economics, Faculty of Economics and International Relations, Cracow University of Economics ul. Rakowicka 27, 31-510 Krakow, Poland
Received: 3 May 2017; Revised: 9 December 2017; Accepted: 3 February 2018

Agnieszka Małkowska
Cracow University of Economics, Poland

Agnieszka Telega
Cracow University of Economics, Poland

Michał Głuszak
Cracow University of Economics, Poland

Bartłomiej Marona
Cracow University of Economics, Poland

Spatial interdependence in property taxation: the case of Polish municipalities

JEL Classification: *H2; H71; R5*

Keywords: *tax competition; property taxation; tax mimicking; spatial interdependence; Poland*

Abstract
Research background: Real estate and urban economics literature are abundant in studies discussing various types of property taxes and their characteristics. A growing area of research has been focused on tax equity, tax competition, and yardstick competition, where the latter two reflect the idea of tax mimicking. Recently, due to substantial developments in spatial and regional economics, more attention has been drawn to spatial effects. Empirical results are focused on spatial interaction and diffusion effects, hierarchies of place and spatial spillovers. Property tax system in Poland differs from those utilized in the majority of developed countries. As a consequence, property tax policy at the local government level (including tax competition and tax mimicking effects) in Poland can differ substantially

from those found in previous research in the US and other European countries. There are few studies addressing the problem of tax competition and tax mimicking in Poland from an empirical perspective.
Purpose of the article: In the article, we explore spatial interdependence in property taxation. We identify clustering or dispersion of high and low values of the tax rates within major metropolitan areas in Poland. The effects can indicate the presence of tax mimicking among municipalities in given metropolitan areas.
Methods: We analyze the data from 304 municipalities in 10 metropolitan areas in Poland from the year 2007 to 2016. The data covers four property tax rates: (1) on residential buildings (2) on buildings used for business purpose (3) on land used for business purpose (4) on land for other uses. To explore the spatial distribution of rates, we used global and local spatial autocorrelation indicators (Moran's I statistic and LISA).
Findings & Value added: The results suggest the presence of spatial correlation within metropolitan areas. We also found significant differences between metropolitan areas. The results of the study fill the gap in empirical research concerning property tax interdependencies and tax mimicking in Poland.

Introduction

Property tax system in Poland differs significantly from those used in the major of developed countries. In contrary to the frame of property taxation adopted in many other European countries, tax charge in Poland is fixed on the size of an area of real estate instead of the value. A common feature of both taxation systems — in relation to the area or the property value — is the application of property tax as an instrument to support the local socio-economic development (Helms, 1985, pp. 574–582; Bartik, 1992, pp. 102–111; Wassmer, 1994, pp. 1251–1278; Buss, 2001, pp. 90–105; Nalepka & Małkowska, 2013, pp. 62–74; Małkowska & Głuszak, 2016, pp. 269–283). Such an attitude comes from the fact that, as a rule, this tax is the source of local income and is reflected by the amount and quality of public services. Furthermore, the level of the tax burden is considered as a territorial advantage or disadvantage in location competition. However, due to the structural weaknesses of existing property tax system in Poland, it is perceived as less useful both in its fiscal aspects and its effectiveness as a tool for spatial policy and local development than an ad valorem one. For these reasons, the present model of property taxation is widely discussed and criticized. At this point, it is worth noting that, as empirical research suggests, the fiscal burdens in Poland are lower than in EU—15 (Balcerzak, 2016, pp. 4–6).

Growing theoretical and empirical literature is focused on different aspects of real estate taxation. Some essential scientific and practical problems in this matter refer to tax equity (Głuszak, 2015, pp. 37–43; Kopyściańska, 2016, pp. 381–390), tax efficiency as a source of local in-

come (Małkowska, 2003, pp. 109–126; Felis, 2014, pp. 37–51) or fiscal autonomy (Sedmihradská & Bakoš, 2016, pp. 75–92). One of the current and important issues is the strategic interaction among the tax solutions set by the neighbouring municipality. The problem of spatial interdependence in public policies comes from the recognition of the significant role of geographical localization for socio-economical processes (Kopczewska, 2013, pp. 793–810).

Scholars have noticed that policies (e.g. tax policies) adopted by one jurisdiction frequently have economic effects on the others in geographically proximate neighbours. Such phenomenon refers to spatial spillovers effects and policy diffusion theory. Economic consequences of policy decisions taken by one municipality for its neighbours constitute a strategic game among local governments in which every government competes with those in their geographic proximity (Baybeck *et al.*, 2011, pp. 232–247).

As mentioned above, local governments' decisions in property taxation may have an impact on attracting new capital. Thus, setting tax rates is a sort of economic competition between jurisdictions for mobile factors and residents. The next cause of spatial interactions between public entities may have a political background such as electoral accountability, political trends and vote-seeking (e.g. Besley & Case, 1995, pp. 25–45; Sole-Olle, 2003, pp. 685–713; Santolini, 2008, pp. 431–451). These interactions lead to the situation, that local policymakers consider the tax solutions of neighbouring jurisdictions when setting their own tax rates (Santolini, 2008). As Oates (1998, p. 70 quoted by Heyndels & Vuchelen, 1998, p. 90) claims "(...) *local officials tend to be painfully aware of tax rates in other jurisdictions and try to resist getting too far out of line with rates elsewhere*". Spatial interdependence of fiscal policy between municipalities, regardless of its reasons, leads to the phenomenon of tax mimicking.

First pieces of research on fiscal policy interdependence were conducted on the base of the data from the United States (e.g. Ladd, 1992, pp. 450–467; Case, 1993, pp. 136–148). Further studies have verified the existence of tax mimicking in a few European countries (e.g. Heyndels & Vuchelen, 1998, pp. 89–101; Allers & Elhorst, 2005, pp. 493–513; Santolini, 2008, pp. 431–451, Delgado & Mayor-Fernandez, 2011, pp. 149–164). In the Polish literature, there are only a few papers devoted to tax competition and tax mimicking (e.g. Walasik, 2014, pp. 200–210; Łukomska & Swianiewicz, 2015). The most comprehensive paper, written by Łukomska and Swianiewicz, discusses various circumstances affecting local tax policies. These Authors examined common local taxes and identified different factors influencing policy-making process in municipalities. They recognized a correlation between tax rates in neighbouring municipalities, which

may suggest, in their opinion, a yardstick competition phenomenon. However, current research based on the Polish data has not explored the problem of spatial interdependency in property tax policy in an exhaustive manner. Moreover, in comparison to other foreign empirical works, there is a significant difference between mechanisms appropriate to ad valorem tax and those based on the area size of the real estate. For this reason, empirical studies focused on taxation systems other than the ad valorem one are remarkable.

In order to fill the gap in empirical evidence, we examined municipalities located in major metropolitan areas in Poland in the context of property tax rates levels, from the year 2007 to 2016. We were collecting the data step-by-step from annual municipal council resolutions publicized on the official web pages of each municipality. In the end, we acquired the database which included four types of property tax rates for 304 municipalities from 10 metropolitan areas for 10 following years.

The main purpose of this research was to find out whether it is a spatial interdependence in property taxation among neighbouring municipalities within metropolitan areas or not. In order to answer this question, we have identified clustering or dispersion of high and low values of the tax rates within the analysed territories. We formulated two hypotheses: (1) there is a spatial correlation between property tax rates set by municipalities united within metropolitan areas, which can suggest property tax mimicking phenomenon; (2) there are significant differences in spatial patterns of property tax rates values between metropolitan areas.

To indicate the spatial pattern in tax rates setting due to an assumption of policy interdependence among municipalities, we used global and local spatial autocorrelation indicators (Moran's I statistic and LISA).

The paper is organized as follows: Section 2 indicates the problem of financial autonomy of Polish municipalities. Section 3 specifies the dataset and method of the research. Section 4 presents the results of the research split into two subsections: descriptive analysis and spatial research. Section 5 provides final remarks and conclusion.

Financial autonomy in Polish local governments

The autonomy of a municipality as the basic unit of the local government may be discussed from different points of view and undertaken by researchers representing various scientific fields, such as political sciences, law or economics. The attention of economists concentrates on financial autonomy, with particular regard towards the income aspect. Less attention

has been paid to expenditure aspect of financial autonomy, especially the independence in making decisions about the directions of distributing funds. The latter aspect, much less frequently discussed in both Polish and foreign literature (Oulasvirta & Turala, 2009), is not the object of this research, therefore, it will be omitted.

Income autonomy is defined, among others, by Szewczuk (2008, p. 218), who understands it as the transfer of the right to decide about public-private income to another internal public entity, and even as the total separation of the sources of central income from local income. A similar view is presented by Zawora (2008, p. 21). In her opinion, a vital criterion of determining financial autonomy of a municipality is the level of funds it can dispose freely and the designation of the proportions of individual categories of income in the structure of their total income, and in the first place the proportion of own income and other types of income. However, it should be added that the income-based perspective of understanding financial autonomy of municipalities is related not only to the possibility of possessing own funds, but also, which is particularly important, establishing and managing them (Głuszak & Marona, 2015, pp. 113–117). That is why, for example, revenues from personal income tax (PIT) and commercial income tax (CIT), which actually is own income of a municipality, should not be taken into consideration while establishing the level of financial autonomy, as it is not a manifestation of municipality tax control. Income taxation is one of the most complicated and important elements of the state tax policy (Wach, 2005; Skačkauskienė, 2013), rather than a local one. As Surówka (2004) writes, these are shares calculated as a percentage, through which one cannot directly influence the behaviour of entities located in a given area. Percentage shares in PIT and CIT are a kind of subsidy depending on the economic situation, which is offered to local governments instead of subsidies guaranteed by law. Therefore, from the perspective of municipalities' income autonomy, the most important public levy in Poland, similar to other countries worldwide (Głuszak & Marona, 2015, pp. 85–106), is property tax — usually the most important component of own income. The structure of the tax is regulated in the Act from 12 January 1991 on Local Taxes and Charges, and due to the limited framework of this paper and the fact that this structure has been already discussed many times in literature, its detailed characteristic will be omitted. However, for the purpose of further scientific inquiry, it is worth indicating three major entitlements of municipalities in tax shaping, which are a manifestation of financial autonomy. As mentioned before, income autonomy of municipalities is not determined solely by having own income, but also by the real possibility of its shaping.

What arises from Table 1 is that autonomy of municipalities in Poland with regard to the shaping of property tax is to a great extent limited by the provisions of the Act on Local Taxes and Charges and other acts, but there are some possibilities to create local tax policy independently via: (i) setting tax rates, (ii) differentiating rates, and (iii) introducing exemptions. It should be emphasised that in all cases of local tax control (not only referring to property tax but also to other taxes, including farm tax and forest tax) which is manifested, among others, in the possibility to introduce exemptions, reliefs by the municipality, or introducing lower rates than the maximum ones, municipalities take into account the reduction of current budget transfers, at the same time expecting that in a long term there will be a desired increase in the income, but mainly from other positions of income (PIT and CIT) correlated with the undertaken tax decisions (Filipiak, 2016, pp. 177–187).

Research methodology

The research on policy interdependence between neighbouring jurisdictions is present in the literature of the subject although it mostly relates to the ad-valorem tax system, and is based on the data from western Europe and the United States. In order to expand the range of existing research achievements and to fill the gap in Polish studies on tax mimicking, the Authors' goal was to verify whether it is a spatial interdependence in property tax rate setting among neighbouring municipalities within metropolitan areas in Poland, or not. We collected the data from annual municipal council resolutions on property tax rates of each of 304 municipalities in 10 metropolitan areas concentrated around the following central cities in Poland: Bydgoszcz-Toruń (*Bydgoszcz-Torun Metropolitan Area — BTOM — 27 municipalities*), Gdańsk-Gdynia-Sopot (*Tricity Metropolitan Area — TOM — 30 municipalities*), Katowice (*Upper Silesia Metropolitan Area — GOM — 14 municipalities*), Kraków (*Krakow Metropolitan Area — KOM — 30 municipalities*), Lublin (*Lublin Metropolitan Area — LUBOM — 19 municipalities*), Łódź (*Lodz Metropolitan Area — LOM — 28 municipalities*), Poznań (*Poznan Metropolitan Area — POM — 22 municipalities*), Szczecin (*Szczecin Metropolitan Area — SZOM — 13 municipalities*), Warszawa (*Warsaw Metropolitan Area — WOM — 72 municipalities*), Wrocław (*Wroclaw Metropolitan Area — WROM — 28 municipalities*). Metropolitan areas, due to its functional relationships and some common conditions and development challenges, are the subject of increasing interest to researchers (e.g. Węgrzyn & Surówka, 2011, pp. 99–108; Kotlińska &

Nowak, 2010, pp. 103–110). The geographical proximity between municipalities and the resulting developmental conditions can make territorial competition in local policy stronger than in the other regions.

The time range of data covers the period from 2007 to 2016. The substantive scope of gathered information contains four property tax rates: (1) on residential buildings (2) on buildings used for business purpose (3) on land used for business purpose (4) on land for other uses.

In order to evaluate spatial association, one can use two types of spatial autocorrelation metrics: global and local one. Global metrics include Moran I, Getis-Ord G, Geary C or joint-count, local indices of spatial autocorrelation are Local Indicators of Spatial Association (LISA) and local Geary C_i.

Analysis of policy interdependence in tax rate setting between neighbouring municipalities was conducted by global and local spatial autocorrelation metrics (Moran's I statistic and LISA).

The Global Moran's I tool measures spatial autocorrelation based on both jurisdictions' geographical locations and the values of features simultaneously. Moran's I can give three possible states: positive, negative and no spatial autocorrelation. However, the global metrics yields only one statistic to summarize the whole examined territory. Thus, it is useful to verify the spatial patterns by means of a local matrix (LISA), especially if there is no global spatial autocorrelation.

Results

Descriptive analysis

We investigated the dynamics of major tax rates on land and buildings set by municipalities in 10 metropolitan areas from 2007 to 2016. To account for autonomy and to compare different rates, we calculated relative tax rates. We define relative tax rate based on the ratio between actual tax rate set by a municipality and maximum allowable tax rate announced by Ministry of Finance in a given year. To analyse the changes in the distribution of relative tax rates within metropolitan areas, we calculated descriptive statistics. A brief summary of the results is presented in Table 2.

The results reveal differences in mean tax rates on land and buildings between municipalities in selected metropolitan areas. In the case of tax on land and buildings used for business purpose, relative rates were quite high (close to the maximum annual levels set by the Ministry of Finance). In 2016, the average relative tax rates on land used for business purpose were the highest in Wroclaw Metropolitan Area (WROM), where it reached 98%

of the maximum rate, and the lowest in Lublin Metropolitan Area (LUBOM) and Krakow Metropolitan Area (KOM). In the latter two, it averaged approximately 86% of maximum rate. On average, lower relative tax rates and significantly larger differences (higher standard deviations) were observed in the case of tax rates for other land. In 2016, the average relative rates for other land ranged from 56% (KOM) to 89% (WROM). The tax rates for building were more uniform, with the exception of LUBOM and KOM, were the average values were lower than in other metropolitan areas. The distribution of relative tax rates on buildings in metropolitan areas during the study period is presented in more detail in the figures (Figure 1 and 2).

The analysis reveals the presence of outliers — municipalities where relative tax rates differed from typically set in given metropolitan area. Examples include Bydgoszcz-Torun Metropolitan Area (BTOM), Poznan Metropolitan Area (POM), Szczecin Metropolitan Area (SZOM) and Warsaw Metropolitan Area (WOM). There were differences in variance of the rates observed in selected metropolitan areas — the graph reveals a huge disparity in LUBOM, WOM or KOM and low dispersion in Upper Silesia Metropolitan Area (GOM), TOM or WROM — the latter finding confirmed by standard deviations reported previously (Table 2).

We observed differences in tax rates on buildings used for a business purpose between metropolitan areas. Huge variation of tax rates was observed within WOM, KOM, and LUBOM. As in case of relative tax rates on residential buildings, the variance of relative tax rates on buildings used for a business purpose was the lowest in GOM and WROM.

Spatial analysis

We examined spatial autocorrelation for four different real estate tax rates in ten metropolitan areas during ten years' period. The adjacency matrix used for calculations was based on the contiguity criterion, which means that a unit (municipality) which shares a border, or even one corner with another entity, is considered as a "neighbour". We used first and second order contiguity matrixes, which means that in the second order matrix we took into consideration neighbour's neighbours of municipalities. Spatial computations were performed in GeoDa (version 1.8.16.4) software (Anselin, 2006). Table 3 presents Moran I spatial autocorrelation measures for four types of taxes from 2007 to 2016.

The results show that the highest Moran I measure, which indicate the occurrence of low or high value clusters, were calculated for tax on buildings for business purposes (Moran I from 0.27 to 0.37). In turn, the lowest

Moran I statistics for tax on lands used for other purposes (Moran I from 0.02 to 0.1), indicates no spatial autocorrelation. Global statistics for tax on residential buildings and on land used for business purposes were on average — about 0.25. We also tested higher-order neighbourhood matrixes and the results show, as we expected, that with increasing distance, the strength of the interdependence decreases. It is worth noting that despite constant tendencies to clustering, during the analysed period, several exceptions occurred. For example, tax on building for business purposes with strong autocorrelation, in 2014 had very low Moran I statistic. In turn, tax rates for other lands, which didn't indicate any clustering trend, for 2009, 2013 and 2015 global statistic raised on average to 0.25. Certainly, this requires further analysis, and political factors should be considered, as an initiator of changes in tax rate policy.

Further analysis consisted of a calculation of local measures, to test whether municipalities within metropolitan areas create “hot” and “cold” clusters or not. Subsequently, we generated LISA cluster map to depict statistical significant locations by the type of association, and the graphical results indicate noticeable geographic tendencies. Local statistics is not statistically significant in only three out of ten metropolitan areas (SZOM, LOM, and BTOM), taking into consideration given four tax rates during the whole analysed period.

Figures 3 and 4 present the most interesting cases, which are three metropolitan units (KOM, WOM, and WROM), and their results of spatial interdependence in two tax rates (for residential buildings, and buildings used for business purposes) during selected years (2007, 2011 and 2016). Colours on the map present the following relationships: (1) the dark red locations indicate high-value tax rates surrounded by similar high-value tax rates; (2) the dark blue locations show low-value tax rates surrounded by low-value ones. Spatial outliers are marked with lighter colours as follows: (1) municipalities marked with light red are those where one finds high-value tax rates surrounded by low-value tax rates; (2) light blue covers locations of low-values tax rates surrounded by high-value ones, (3) light grey depicts statistical insignificant areas, and finally (4) dark grey is used for locations with no data available.

In case of tax rates for residential buildings and buildings used for business purposes, one can see the tendencies to clustering of high tax rates values in the western parts of metropolitan areas, whereas the cluster of low tax rates values was found in their eastern parts. In KOM, during the following years, low values of tax rates were concentrated in the eastern part of the area, while in the centre "outliers' units" appeared (area with high-values of tax rates, surrounded by low tax rates values). In WOM area basi-

cally no clear trend stood out, but in WROM we observed strong clustering of high-value tax rates.

Figure 4 presents LISA Cluster Map of tax rates on buildings used for business purposes for three metropolitan areas (KOM, WOM, WROM) in 2007, 2011 and 2016.

The analysis reveals that Moran I statistics calculated for the tax rate on buildings used for business purposes was the highest. LISA statistics indicate that clusters of high values appear in WROM, TOM and GOM areas, and low-value clusters — in KOM and LUBOM, and clustering process weakens over time. The local statistic for WOM seems to be an interesting case, because of its randomness at first sight, and a slight tendency to clustering in the centre of the area. The reason for that may be related to the investment activity of municipalities, which is located mostly in the centres of the area, which are supposed to have the highest economic potential.

Conclusions

In the article, we investigated the problem of spatial interdependence in municipalities' property tax policy due to the framework of fiscal autonomy level of local governments in Poland. The main goal of this research was to discover if there was a spatial interdependence in property taxation among units, taking into consideration four main tax rates. In order to achieve this, we explored the data gathered from 304 municipalities located within ten metropolitan areas in Poland. The time range covers the period 2007–2016. The results suggest that many municipalities used maximum allowable rates set by the Ministry of Finance, thus the level of effective autonomy is partially reduced by existing caps. Furthermore, in reference to our research hypothesis, using first and second order contiguity matrixes we observed the presence of spatial correlation, especially in tax rates for residential buildings and land and buildings used for business purposes as well as significant differences in property tax policies between metropolitan areas. We found that municipalities form spatial clusters in relation to tax rates used. This clusters tend to be relatively stable over time. We also identified presence of spatial outliers — municipalities that used different rates than neighbour counterparts. Our results show solely spatial correlation, and allow us to identify the spatial patterns in property taxation which suggest mimicking phenomenon. This research fills the existing gap in the literature of tax mimicking in Poland by delivering outcomes showing spatial interdependence in property tax policy within metropolitan areas. In order to

prove the existence of tax mimicking and indicate the roots of it, one needs further research based upon spatial econometric estimation methods.

The main limitation of such analysis is the lack of public data covering the levels of property tax rates for Polish municipalities. Thus the hitherto research is restricted to the defined territory of the country. Nevertheless, it would be valuable to expand similar research to all local governments in Poland, as well as verify the existence of property tax mimicking behaviour with the explanation its causes, according to strategic or yardstick competition theory.

References

Allers, M. A., & Elhorst J. P. (2005). Tax mimicking and yardstick competition among local governments in the Netherlands. *International Tax and Public Finance, 12*. doi: 10.1007/s10797-005-1500-x.

Anselin, L., Syabri, I., & Kho, Y. (2006). GeoDa: an introduction to spatial data analysis. *Geoegraphical Analysis, 38.* doi: 10.1111/j.0016-7363.2005.00671.x.

Balcerzak, A. P. (2016). Fiscal burden in the European Union member states. *Economic Annals-XXI, 161*(9-10). doi: 10.21003/ea.V161-01.

Bartik, T. J. (1992). The effects of state and local taxes on economic development: a review of recent research. *Economic Development Quarterly, 6*. doi: 10.1177/089124249200600110.

Baybeck, B., Berry, W. D., & Siegel, D. A. (2011). A strategic theory of policy diffusion via intergovernmental competition. *Journal of Politics, 73*(1). doi: http: 10.1017/S0022381610000988.

Besley, T., & Case, A. (1995). Incumbent behaviour. vote-seeking, tax-setting, and yardstick competition. *American Economic Review, 85*.

Buss, T. F. (2001). The effect of state tax incentives on economic growth and firm location decisions: an overview of the literature. *Economic Development Quarterly, 15*(1). doi: 10.1177/089124240101500108.

Case, A. C. (1993). Interstate tax competition after TRA86. *Journal of Policy Analysis and Management, 12*(1). doi: 10.2307/3325468.

Delgado, F. J., & Mayor, M. (2011). Tax mimicking among local governments: some evidence from Spanish municipalities. *Portuguese Economic Journal, 10*(2). doi: 10.1007/s10258-010-0067-3.

Felis, P. (2014). The impact of local governments on the effectiveness of selected own revenue sources as exemplified by communes in Poland. *Finanse i Prawo Finansowe, 1*(4).

Filipiak, B. F. (2016). The effects of granting tax credit, remission and redundancies by the tax authorities of municipalities, *Ubezpieczenia, 5*(83).

Głuszak, M., & Marona, B. (2015). *Cadastral tax. The economic determinants of of property taxation reform.* Warsaw: Poltext.

Głuszak, M. (2015). On the equity of the area-based property tax system in Poland. *World of Real Estate Journal*, *4*(94). doi: 10.14659/worej.2015.94.06.

Helms, L. J. (1985). The effect of state and local taxes on growth. *Review of Economics and Statistics*, *67*.

Heyndels, B., & Vuchelen, J. (1998). Tax mimicking among Belgian municipalities. *National Tax Journal*, *51*(1).

Kopczewska, K. (2013). The spatial range of local governments: does geographical distance affect governance and public service? *Annals of Regional Science*, *51*(3). doi: 10.1007/s00168-013-0567-z.

Kopyściańska, K. (2016). Cadastral tax in the context of the constitutional principle of tax justice. *Oeconomia*, *50*(1). doi: 10.17951/h.2016.50.1.381.

Kotlińska, J., & Nowak, M. J. (2010). Property tax in the external zones of the metropolitan areas in Western Poland. *Problemy Rozwoju Miast*, *7*(4).

Ladd, H. (1992). Mimicking of local tax burdens among neighboring counties. *Public Finance Quarterly*, *20*(4). doi: 10.1177/109114219202000404.

Łukomska, J., & Swianiewicz, P. (2015). *Local tax policy in Poland*. Municipium. doi: 10.13140/RG.2.1.1928.0089.

Małkowska, A., & Głuszak, M. (2016). Pro-investment local policies in the area of real estate economics – similarities and differences in the strategies used by communes. *Oeconomia Copernicana*, *7*(2). doi: 10.12775/OeC.2016.016.

Małkowska, A. (2003). The role of property tax in gmina revenues: the case of Krakow. *Zeszyty Naukowe Akademia Ekonomiczna w Krakowie*, *636*.

Nalepka, A., & Małkowska, A. (2013). Real property management instruments in the stimulation of the economic development of municipalities using the example of the Malopolska voivodship. *Samorząd Terytorialny*, *5*.

Oates, W. E. (1988). On the nature and measurement of fiscal illusion: a survey. In G. Brennan, B. S. Grewal & P. Groenewegen (Ed.). *Taxation and fiscal federalism: essays in honour of Russell Mathews.* Sydney: Australian National University Press.

Oulasvirta, L., & Turala, M. (2009). Financial autonomy and consistency of central government policy towards local governments. *International Review of Administrative Sciences*, *75*. doi: 10.1177/0020852309104178.

Santolini, R. (2008). A spatial cross-sectional analysis of political trends in Italian municipalities. *Papers in Regional Science, 87*. doi: 10.1111/j.1435-5957.2008.00201.x.

Skačkauskienė, I. (2013). Peculiarities of labour income taxation in the Baltic States. *Entrepreneurial Business and Economics Review*, *1*(4). doi: 10.15678/EBER.2013.010405.

Sedmihradská, L., & Bakoš, E. (2016). Municipal tax autonomy and tax mimicking in Czech municipalities. *Lex Localis*, *14*(1). doi: 10.4335/14.1.75-92.

Sole-Olle, A. (2003). Electoral accountability and tax mimicking: the effects of electoral margins, coalition government, and ideology. *European Journal of Political Economy*, *19*(4).

Surówka, K. (2004). System of payment in the budgets of self-government units and changes. *Zeszyty Naukowe Wyższej Szkoły Ekonomicznej w Bochni*, *2*.

Szewczuk, A. (2008). Measuring financial independence of local self-government units. In L. Patrzalek (Ed.). *Selected problems of local government finance*, Poznan: Poznan School of Banking Press.

Wach, K. (2005). *Tax systems of European Union member states.* Kraków: Oficyna Ekonomiczna.

Walasik, A. (2014). The scope and methods of local finance competition. *Studia Ekonomiczne. Finanse-problemy-decyzje, University of Economics in Katowice*, *198*(1).

Wassmer, R. W. (1994). Can local incentives alter a metropolitan city's economic development? *Urban Studies*, *31*(8). doi: 10.1080/00420989420081151.

Węgrzyn, J., & Surówka, M. (2011). Conditions and directions of municipal investments in Cracow suburban area. In A. Nalepka (Ed.). *Investments and real estate — the challenges of the 21st century.* Krakow: The Cracow University of Economics Foundation.

Zawora, J. (2008). *Financial independence of municipalities*. Rzeszow: UR Publishing House, University of Rzeszow.

Acknowledgements

Authors acknowledge financial support from the funds allocated to development of research potential of the Faculty of Economics and International Relations of the Cracow University of Economics for 2018.

Annex

Table 1. Property tax autonomy in Polish local government

Entitlements of a municipality		Explanation
1.	Rates	Tax rates are defined by the municipality council, and their amount cannot exceed maximum rates indexed annually by the Minister of Finance and announced by him.
2.	Differentiation of rates	The act provides a possibility to differentiate tax rates by municipalities for individual types of real estate. In this case, the legislator uses the objective criterion of an open character, which means that statutory examples are not exhaustive.
3.	Tax exemptions	Tax exemptions are of different nature, they may arise directly from the Act on Local Taxes and Charges, other acts or be a consequence of a resolution of the municipality council. In this last case there is a lot of freedom in granting exemptions, but exemptions may be only of objective character.

Source: own study based on Głuszak and Marona (2015, pp. 118–125).

Table 2. Relative major tax rates on land and buildings in selected metropolitan areas in Poland from 2007 to 2016

Tax rates / Metropolitan Areas		2007		2010		2013		2016	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Residential buildings	BTOM	0.86	0.12	0.90	0.09	0.87	0.12	0.88	0.13
	GOM	0.96	0.03	0.94	0.05	0.95	0.05	0.94	0.05
	KOM	0.75	0.16	0.76	0.17	0.77	0.19	0.77	0.19
	LOM	0.83	0.09	0.83	0.08	0.84	0.09	0.85	0.08
	LUBOM	0.72	0.19	0.70	0.23	0.72	0.23	0.75	0.23
	POM	0.91	0.09	0.91	0.11	0.92	0.11	0.92	0.10
	SZOM	0.87	0.10	0.86	0.12	0.90	0.09	0.92	0.07
	TOM	0.94	0.05	0.94	0.06	0.95	0.05	0.95	0.05
	WOM	0.90	0.12	0.86	0.13	0.87	0.13	0.88	0.13
	WROM	0.95	0.06	0.94	0.07	0.96	0.04	0.96	0.04
Buildings used for business purpose	BTOM	0.85	0.07	0.87	0.08	0.88	0.07	0.89	0.07
	GOM	0.97	0.02	0.96	0.04	0.97	0.03	0.98	0.03
	KOM	0.79	0.15	0.81	0.10	0.82	0.10	0.83	0.12
	LOM	0.85	0.08	0.85	0.07	0.85	0.07	0.88	0.07
	LUBOM	0.83	0.09	0.83	0.08	0.83	0.07	0.86	0.08
	POM	0.89	0.09	0.89	0.09	0.89	0.10	0.91	0.10
	SZOM	0.90	0.07	0.88	0.09	0.89	0.09	0.92	0.08
	TOM	0.89	0.09	0.89	0.08	0.90	0.08	0.92	0.08
	WOM	0.92	0.07	0.90	0.08	0.90	0.07	0.91	0.07
	WROM	0.96	0.04	0.95	0.05	0.95	0.05	0.97	0.04

Table 2. Continued

Tax rates / Metropolitan Areas		2007		2010		2013		2016	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Land used for business purpose	BTOM	0.87	0.10	0.89	0.09	0.88	0.08	0.90	0.08
	GOM	0.96	0.03	0.95	0.04	0.95	0.05	0.95	0.05
	KOM	0.83	0.13	0.84	0.12	0.84	0.12	0.86	0.12
	LOM	0.89	0.08	0.89	0.07	0.89	0.07	0.91	0.07
	LUBOM	0.80	0.14	0.81	0.14	0.82	0.14	0.86	0.13
	POM	0.93	0.06	0.93	0.07	0.94	0.08	0.95	0.07
	SZOM	0.90	0.10	0.89	0.10	0.91	0.08	0.94	0.07
	TOM	0.94	0.05	0.95	0.05	0.95	0.05	0.96	0.04
	WOM	0.92	0.07	0.91	0.07	0.90	0.08	0.91	0.07
	WROM	0.95	0.05	0.95	0.06	0.96	0.04	0.98	0.03
Other land	BTOM	0.46	0.21	0.57	0.23	0.65	0.21	0.68	0.21
	GOM	0.71	0.17	0.81	0.15	0.88	0.13	0.87	0.15
	KOM	0.47	0.24	0.49	0.24	0.55	0.22	0.56	0.24
	LOM	0.53	0.25	0.58	0.22	0.59	0.22	0.61	0.20
	LUBOM	0.56	0.30	0.63	0.28	0.70	0.28	0.73	0.25
	POM	0.61	0.21	0.69	0.18	0.76	0.20	0.77	0.19
	SZOM	0.52	0.25	0.65	0.24	0.74	0.17	0.79	0.20
	TOM	0.68	0.18	0.76	0.16	0.80	0.16	0.85	0.16
	WOM	0.63	0.20	0.68	0.19	0.73	0.19	0.74	0.19
	WROM	0.72	0.16	0.79	0.18	0.89	0.13	0.89	0.13

Table 3. Moran I statistics, 1st and 2nd order contiguity matrix

Tax rate type	Matrix order	Year									
		2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Residential buildings	1st	0.30***	0.28***	0.28***	0.29***	0.29***	0.29***	0.28***	0.29***	0.28***	0.27***
		(3.699)	(3.937)	(3.709)	(4.829)	(5.333)	(6.537)	(6.416)	(6.609)	(6.216)	(6.094)
	2nd	0.26***	0.22***	0.22***	0.22***	0.23***	0.22***	0.22***	0.21***	0.21***	0.19***
		(4.698)	(3.794)	(3.844)	(5.119)	(5.903)	(7.322)	(6.775)	(6.330)	(6.354)	(5.729)
Buildings used for business purpose	1st	0.37***	0.37***	0.34**	0.35***	0.36***	0.27***	0.34***	0.05**	0.31***	0.30***
		(3.837)	(3.661)	(2.882)	(3.854)	(4.621)	(6.111)	(6.409)	(1.737)	(6.046)	(5.830)
	2nd	0.20**	0.20**	0.23**	0.22**	0.25***	0.23***	0.24***	0.05**	0.19***	0.20***
		(3.099)	(2.395)	(2.888)	(3.318)	(4.389)	(6.694)	(6.286)	(2.549)	(5.197)	(5.306)
Land used for business purpose	1st	0.25*	0.25*	0.25*	0.24**	0.25**	0.24***	0.24***	0.24***	0.19***	0.22***
		(1.991)	(1.991)	(2.229)	(2.827)	(4.172)	(5.291)	(4.959)	(4.921)	(3.799)	(4.222)
	2nd	0.23**	0.22**	0.22**	0.22**	0.22***	0.21***	0.22***	0.22***	0.17***	0.19***
		(2.833)	(2.375)	(2.287)	(3.367)	(4.271)	(5.700)	(5.459)	(5.459)	(4.526)	(4.888)
Other land	1st	0.08***	0.10***	0.28***	0.03*	0.03*	0.03*	0.26***	0.02*	0.26***	0.06**
		(4.194)	(3.960)	(5.919)	(1.606)	(1.548)	(1.506)	(6.549)	(1.634)	(6.108)	(2.705)
	2nd	0.01†	0.07***	0.17***	-0.03*	-0.03*	-0.02†	0.20	-0.01	0.18***	0.05***
		(1.067)	(3.885)	(4.827)	(-1.643)	(-2.133)	(-1.257)	(6.347)	-0.033	5.662	3.024

Note: Z-values are in parentheses, †p<0.1, *p<0.05, **p<0.01, ***p<0.001

Figure 1. The tax rate on residential buildings from 2007 to 2016 (relative to annual Maximum Rate set by Ministry of Finance, in %)

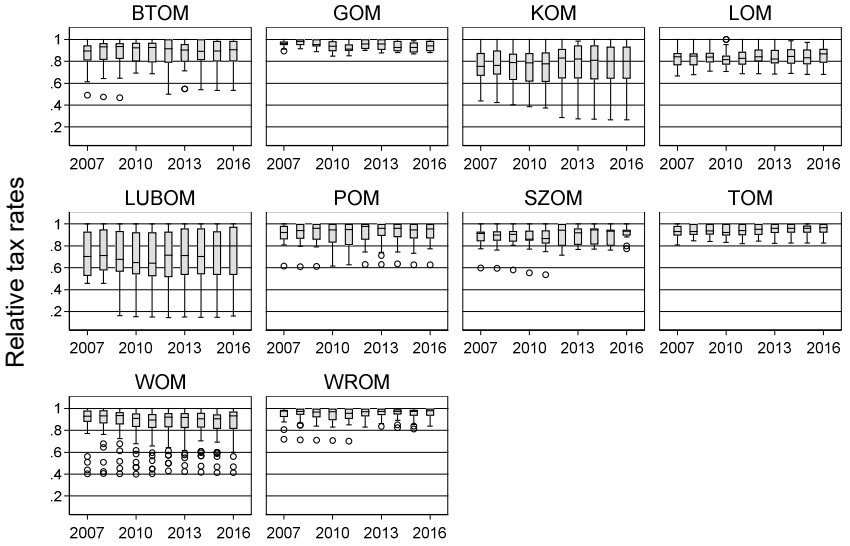

Figure 2. The tax rate on buildings used for business purpose from 2007 to 2016 (relative to Maximum Rate set by Ministry of Finance, in %)

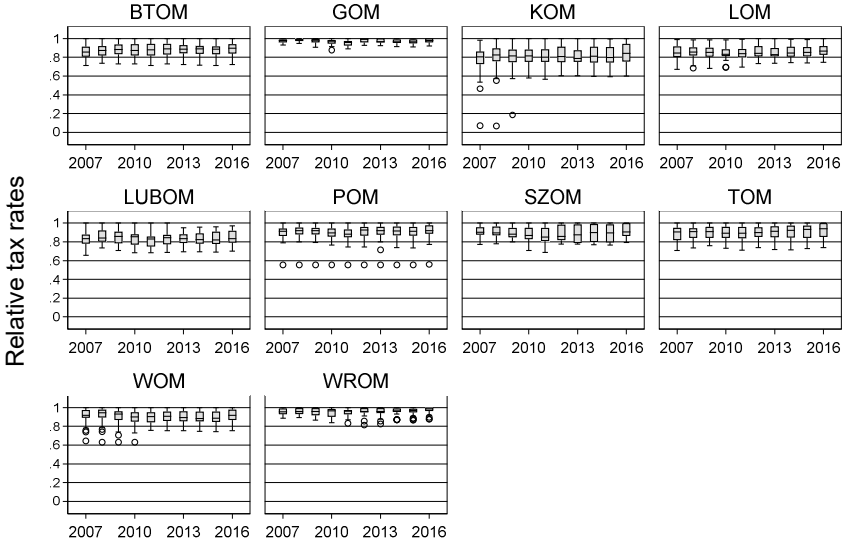

Figure 3. LISA Cluster Map of tax rates on residential buildings

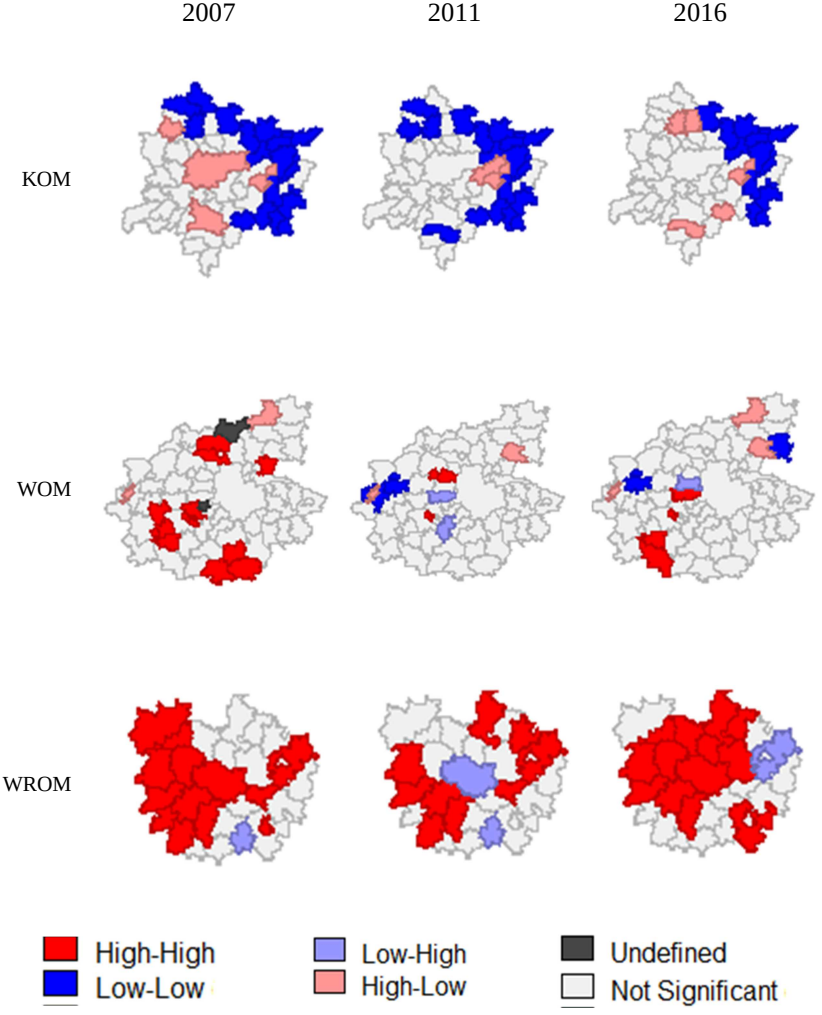

Figure 4. LISA Cluster Map of tax rates on building used for business purpose