Financial Law Review

No. 28 (4)/2022

UNIVERSITY OF GDAŃSK • MASARYK UNIVERSITY • PAVOL JOZEF ŠAFÁRIK UNIVERSITY
http://www.ejournals.eu/FLR

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DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF POPULATION AS DETERMINANTS OF THE REVENUE FROM THE REAL PROPERTY TAX IN THE SLOVAK REPUBLIC[1]

Abstract

This paper examines how the demographic and economic structure of the municipalities´ population relates to the share of real property tax on local tax revenue in the Slovak republic. Shares of the productive population, unemployed population pupils, the population aged less than 14 years, and the population aged over 65 years in the total municipal population are involved in the regression analysis based on the panel data. The research covers 2,926 municipalities in the period 2005-2020. Estimation results show a positive relationship between the dependent variable and variables referring to the productive population, unemployed population, and population aged less than 14 years. A negative relationship is observed in the case of variables referring to pupils and the population aged over 65 years.

Key words: local government, local taxes, real property tax, panel data.

JEL Classification: H71, H72

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[1] The paper is published within the project VEGA 1/0873/21 and VEGA 1/0681/22.

1. Introduction

The importance of real property taxes in local budgets is undeniable and justified by the Theory of Fiscal Federalism [popularised by Oates: 1972]. However, the use of real property taxes at the local level of government varies across the world. Awasthi, Le, You [2020] mention, that while in developed countries, real property tax revenues are an important source of local tax revenue, developing countries struggle with it. This is confirmed by other studies, too. E. g. Collier et al. [2018] refer, that property tax presents the largest source of untapped municipal revenue in sub-Saharan Africa and South Asia. In California (USA), property taxes create nearly three-quarters of local tax collections [Zhu, Pardo: 2021]. In Slovakia, the mean of the share of real property tax on local tax presents 15 % (as mentioned hereinafter). In the neighboring country, the Czech Republic, the municipalities´ real estate tax revenue is low and below potential [Kukalová et al.: 2021, Sedmihradská, Bakoš: 2016]. Comparing Visegrad countries, the real property tax revenues play a more important role in municipal budges only in Poland, In Slovakia, the Czech Republic, and Hungary is its portion low [Vartašová, Červená: 2022].

In the empirical evidence, determinants of tax revenues at the national level, as well as determinants of local tax revenue are broadly investigated. The examination of the relationship between tax revenues and various macroeconomic variables is often enriched by the interconnection between tax revenues and population characteristics. However, in Slovak conditions, the explicit investigation of the local tax revenue determinants, including the real property tax revenues, is not very frequent, which creates an open field of questions related to the local tax policy and local tax mixes.

The paper aims to analyze the municipal population´s demographic and economic characteristics as determinants of real property tax revenues of Slovak municipalities in the period 2005-2020. Using the panel data regression analysis, the relationship between the share of real property tax on local tax revenue and several variables referring to the structure of the municipalities´ population is examined. The research contributes to the gain of knowledge of local tax policy and diminished the gap in the research in Slovak conditions.

2. Literature review

In the empirical evidence, a lot of attention focuses on determinants of tax revenues [e.g. Minh Ha et al.: 2022; Boukbech, Bousselhamia, Ezzahid: 2021; Piancastelli, Thirwall: 2020; Castro, Ramírez Camarillo: 2014 or Karagöz: 2013]. Local tax revenue determinants are

investigated in e. g. Awasthi, Le, You [2020], Yaru [2020], Maličká, Harčariková, Gazda [2012], and Geys, Revelli [2011].

The research often supposes that the economic circumstances mirror tax revenue generated in the public sector [Minh Ha et al.: 2022; Castro, Ramírez Camarillo: 2014]. Besides, the interconnection between tax revenue and population characteristics or population growth is examined, too [Castañeda Rodríguez: 2018; Bird et al.: 2008; Bahl: 2004]. These determinants, demographic and economic characteristics of the population are often considered, too.

In Slovak conditions, the explicit investigation of the local tax revenue determinants is not very frequent. However, own tax revenues including the real property tax are under scrutiny in many studies focusing on the financial autonomy of local governments in the Slovak Republic (SR) [see Maličká: 2019 or Maličká: 2021] or the adequacy of the powers to impose and collect local taxes is examined, too. [Románová, Radvan, Schweigl: 2019]. As mentioned by Stegarescu [2005], Foremny [2014], and Maličká [2021] indicators of local financial autonomy should be based on own tax resources (and own non-tax revenues respectively). As it will be mentioned hereinafter, except of the real property tax revenue, there is not any other yielding own local tax in Slovak local budgets. The financial autonomy of local governments differs due to many determinants including population characteristics or economic circumstances. The research of Maličká [2021] finds a statistically significant relationship between the financial autonomy of Slovak municipalities and the municipalities´ population variable. Further structure of the population is not considered. The same is observed in other research provided in other countries, e. g. Boukbech, Bousselhamia, Ezzahid [2021], and Awasthi, Le, You [2020]. Contrary, Castañeda Rodríguez [2018] considers the population share above 65 years, and Maličká, Harčariková, Gazda [2012] examine the effect of the population less than 14 years, and the population aged over 65 years on local tax revenues in EU countries.

Taking into account, that empirical evidence found a statistically significant relationship between local tax revenue and population characteristics, in this research, we suppose that demographic and economic characteristics of the municipalities´ population have an important effect on local tax revenue, correspondingly on the revenue from the real property tax, too.

3. Methods and data

The main research method of this paper is an econometric analysis. It is employed to estimate the relationship between receipts from the real property tax and selected determinants. In this paper, demographic and economic determinants are under scrutiny. In the regression, on the left side of the equation, the portion of the real property tax on local tax revenues of Slovak municipalities is a dependent (explained) variable.

Values are extracted from groups 120 (real property taxes) and 100 (tax revenues) according to the economic classification of public revenues and expenditures arranged by the Methodical Regulation of the Ministry of Finance of the Slovak Republic no. MF/010175/2004-42). The right side of the equation contains demographic and economic independent (explanatory) variables and a vector of control variables. Independent variables under the consideration refer to the age structure of the population (population less than 14, population over 65 and pupils) and economic activity (productive population i.e. population between 14 and 65, unemployed population). All these variables are expressed as shares of the total municipal population. The variable of municipalities´ population size is not included in the estimations due to the multicollinearity observed between all mentioned demographic and economic variables. To control the receipts from the real property tax, several budget items are involved in the estimation as non-tax revenue (group 200) and other receipts from other local taxes (local tax on goods and services that are reported the group 130 of the tax revenues). The non-tax revenue is expressed as a share of total municipal revenue. The receipts from other local taxes are expressed as a share of local tax revenues. The portion of the shared tax (the income tax) is excluded from the analysis due to multicollinearity.

Data cover the period 2005-2020 and are collected for 2,926 Slovak municipalities. Data on budget items are provided by the Ministry of Finance of the Slovak Republic [MF SR, 2021] based on Act no 211/2000 on free access to information. Data on demographics and economic characteristics of the municipalities´ population are provided by the Statistical Office of the Slovak Republic [SO SR, 2022]. The number of municipalities in the sample (2,926) is limited to the dataset of the MF SR, which in fact covers all the local self-governments in the SR. The SO SR (2022) reports 2,890 municipalities in the SR, the sample (as well as the dataset of the MF SR) covers also city municipalities of Bratislava city (17) and Košice city (22) with their own budgets and excludes military districts (3). The overview of variables involved in the research is displayed in Table 1.

As the dataset is built for 2,926 cross-sectional units in the times-series length of 16 periods (annual frequency), regression models for panel (longitudinal) data are employed in this research [for details on panel data models see e.g. Balthagi, 2013]. First, the pooled model (based on the OLS estimator) is estimated. Second, the fixed-effect model (FEM) is estimated to individual effects in a panel data set, that are constant across individuals (here municipalities). Finally, the random effect model (REM) is estimated to control for unobserved heterogeneity, when variables are random and unpredictable. The adequacy of pooled OLS model vs. the FEM model is tested using the F-test (null hypothesis: the pooled model is adequate). The adequacy of pooled OLS model vs. the REM model is tested using the Breusch-Pagan test (null hypothesis: the pooled model is adequate). The adequacy of the FEM model vs. the REM model is tested using the Hausman test (null hypothesis: the GLS estimates are consistent – REM is adequate).

All models are arranged by the Beck-Katz standard errors (PCSE, which is the alternative to HAC) to deal with potential heteroscedasticity and autocorrelation. In the REM model, the Swamy-Arora transformation is used. Collinearity diagnostic is provided using the Belsley-Kuh-Welsch collinearity diagnostics (BKW) and the Variance Inflation Factor (VIF) test. According to BKW diagnostics, the condition >= 30 indicates strong near linear dependence, and the condition between 10 and 30 (>= 10) signalizes moderately strong dependence. In the VIF test, the values > 10.0 may indicate a collinearity problem.

Table 1. List of variables

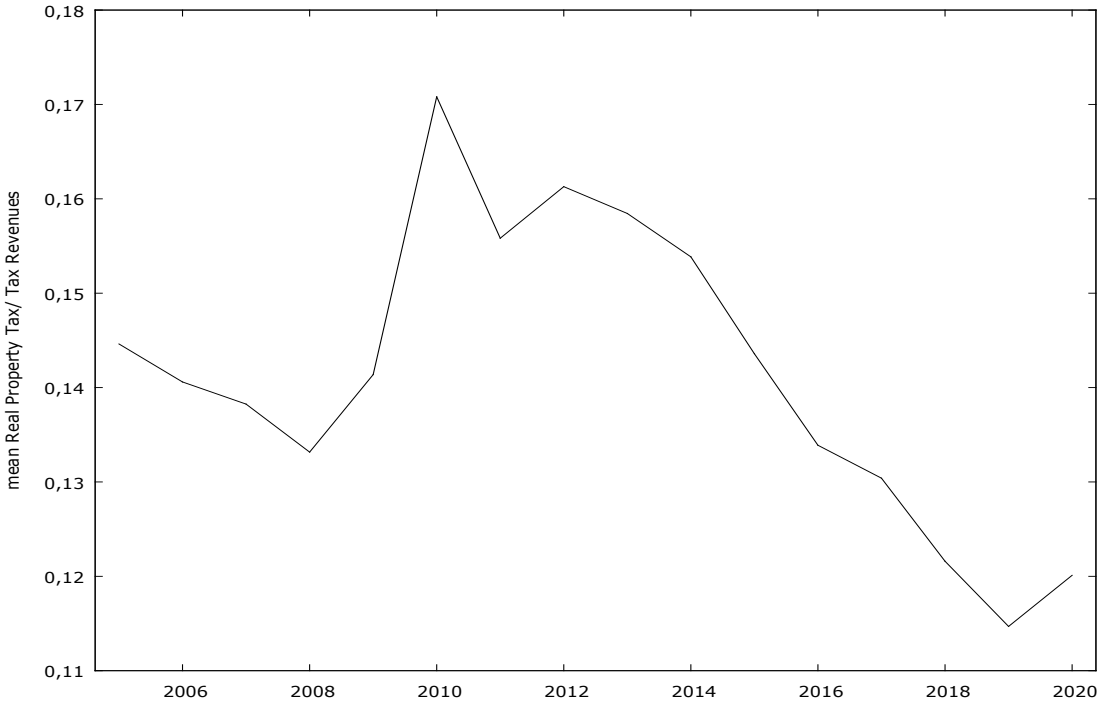
Variable	Description	Source of data
Dependent variable		
Real property tax revenue	The share of real property tax revenues on local tax revenues (revenue group 120/revenue group 100 according to the economic classification of public revenues and expenditures arranged by the Methodical Regulation of the Ministry of Finance of the Slovak Republic no. MF/010175/2004-42)	MF SR [2021]
Independent (explanatory) variables		
Productive population	Population between 14 and 65 years as the share of the total municipal population (including population exactly aged 14 and 65 years)	SO SR [2022]
Unemployed population	The share of the unemployed population in the total municipal population	SO SR [2022]
Pupils	Population aged 6-14 years as the share of the total municipal population	SO SR [2022]
Population less than 14	Population aged less than 14 years as the share of the total municipal population	SO SR [2022]
Population over 65	Population aged more than 65 years as the share of the total municipal population	SO SR [2022]
Control variables		
Nontax revenue	The non-tax revenue (revenue group 200) as a share of total municipal revenue (the same regulation as mentioned hereinbefore)	MF SR [2021]
Other local taxes	The other local tax revenues (revenue group 130) as a share of total municipal revenue (the same regulation as mentioned hereinbefore)	MF SR [2021]

Source: author's own elaboration.

4. Results and discussion

The share of real property tax on municipal tax revenue has overcome a turbulent era during the period 2005-2020 (see Figure 1.). Even after the fiscal decentralization in 2005 enormous increase in real property tax rates was recorded, its position in local tax revenues was weakened by the receipts from shared, personal income tax, which increased dramatically during the period of expansion up to the beginning of the global financial crisis. Other local taxes have reacted to the increase of the position of shared tax in local tax revenues moderately. Group means of shared tax and other local taxes on local tax revenues are projected in Appendix.

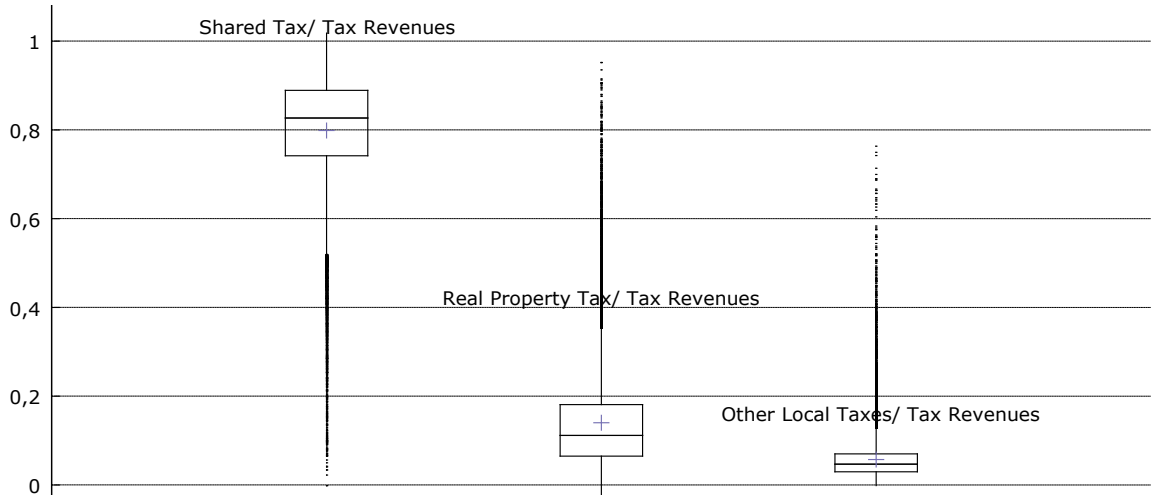
Figure 1. Dynamics of the portion of real property tax on local tax revenues in 2005-2020



Source: authors' own elaboration based on made-up data on the subject matter of articles published in the Financial Law Review

Figure 2 displays a structure of local tax revenues of Slovak municipalities in the period 2005-2020 and points out the position of the real property tax revenues in local tax revenues. The mean ratio of shared tax on local tax is 80 %, real property tax on local tax 15 %, and other local tax on local tax is 6.5 %. The mean ratio of shared tax on local tax is 83 %, real property tax on local tax 12 %, and other local tax on local tax is 5.6 %.

Figure 2. Structure of local tax revenues and the position of real property tax



Source: authors own elaboration based on made-up data on the subject matter of articles published in the Financial Law Review

Results of estimations show (see Table 2, final model FEM), that an increase in the share of the productive population on the municipality's total population affects the portion of real property tax on local tax revenues positively. The explanation might be tight to the supposed enhancement of local conditions and thus the municipality might increase real property tax rates. Besides it, the population of productive age might build their own homes and thus contribute to the enlargement of the municipality's tax base. The positive sign of the beta estimate of the unemployment population seems to be unexpected. But in fact, the unemployed population belongs to the productive population, and unemployment itself is not a reason for the tax exemption. Besides, preliminary correlation analysis unveiled positive correlation coefficients among the total municipal population and productive and unemployed population, which points to coherence, i.e. larger the total municipal population, the larger the portion of the productive population and unemployed population. From the beta estimates of the productive population and unemployment population, it is observable, that the effect is stronger when considering the productive population (higher positive coefficient of the beta estimate). The inverse relationship between the dependent variable and variable referring to the portion of pupils in the population, and the inverse relationship between the dependent variable and variable referring to the portion of the population over 65 years in the population might rest in the simultaneous increase in the revenue from the shared tax, which amount, shifted to the municipal budget, is explicitly tied to both these variables.

The coefficient of the beta estimate of the variable referring to a population less than 14 years is positive, but the lowest form observed coefficients and it is statistically significant on the 10 % significance level. However, any increase in the population counts for the possibility of the creation of additional taxable resources. When considering the population of fewer than 14 years, this will affect predominantly the future tax revenue (in Slovakia massive support for fertility in the 1970s is observed, with an overall positive impact on tax revenue when reaching the productive age). The observed positive relationship between the dependent variable and the population less than 14 years might be explained by the simultaneous increase in the productive population (that has these children).

Table 2. Results of estimated models

model	Pooled OLS		FEM		REM	
variable	Estimate	Significance (p-value)	Estimate	Significance (p-value)	Estimate	Significance (p-value)
Intercept	-0.1939	*** (<0.0001)	0.0338	- (0.2871)	-0.0025	- (0.9558)
Productive population	0.3348	*** (<0.0001)	0.2010	*** (<0.0001)	0.2347	*** (<0.0001)
Unemployed population	0.0126	*** (<0.0001)	0.0155	*** (<0.0001)	0.0158	*** (<0.0001)
Pupils	-0.1264	*** (<0.0001)	-0.1249	** (0.0303)	-0.1300	** (0.0167)
Population less than 14	0.0021	*** (<0.0001)	0.0008	* (0.0849)	0.0011	** (0.0233)
Population over 65	0.6091	*** (<0.0001)	-0.1232	** (0.0414)	-0.0448	- (0.4859)
Nontax revenue	0.0199	- (0.2250)	-0.0188	* (0.0667)	-0.0172	- (0.1133)
Other local taxes	0.2243	*** (<0.0001)	-0.1053	*** (<0.0001)	-0.0871	** (0.0013)

Panel diagnostics	
Test	p-value
F test Pooled vs. FEM	(0.0000) FEM
Breusch-Pagan test Pooled vs. REM	(0.0000) REM
Hausman test FEM vs. REM	(<0.0001) FEM

Collinearity diagnostics		
VIF test		BKW
Productive population	1.307	Count of condition indices >= 30: 0 >= 10: 1 (productive population)
Unemployed population	1.017	
Pupils	1.029	
Population less than 14	1.011	
Population over 65	1.280	
Nontax revenue	1.040	
Other local taxes	1.061	

*** denotes 0,01 significance level, ** 0,05 and * 0,1; p-values are in parentheses.

Source: authors own elaboration.

The relationship between the dependent variable and both control variables of fiscal nature is negative. The increase in non-tax revenue influences the portion of real property tax on local tax revenues inversely. Similarly, the increase of other local taxes influences the portion of real property tax on local tax revenues inversely, too. In these two cases, the result is expected, because non-tax revenues and receipts from other local taxes are like alternative own resources for municipalities. Then, a decrease in these groups of own revenues is compensated by the increase in other revenue groups, real property tax revenues correspondingly.

5. Conclusion

In the Slovak Republic, as in many other countries, the revenue from the real property tax is the revenue of local budgets. It importantly determines the financial autonomy of the municipalities and local authorities should take a lot of care to consider all impacts of real property tax policy.

In this paper, the relationship between the share of real property tax on local tax revenue and several variables referring to the structure of the municipalities´ population is examined. Two interconnected points of view on municipal population characteristics were taken into account – demographic and economic. The consideration of the socio-economic conditions in the municipalities is important to shape the local fiscal and tax policies to local needs and local specifics. Besides, the socio-economic development in the local public sector should be mirrored in the legislation made by the national level of the government, too.

In this research shares of the productive population, unemployed population pupils, the population aged less than 14 years, and the population aged over 65 years in the total municipal population are involved in the econometric investigation. As the research covers 2,926 Slovak municipalities in the period 2005-2020, the final dataset has the nature of panel data. Thus, the panel data models were employed to estimate the relationship in the question. Estimation results show a positive relationship between the dependent variable and variables referring to the productive population, unemployed population, and population aged less than 14 years. A negative relationship is observed in the case of variables referring to pupils and the population aged over 65 years.

Further research might focus on the enrichment of the analysis by other determinants e.g. political and institutional considering the mayors' political affiliation or re-election. Besides, many other budget items (e.g. received transfers, current expenditure, debt service) might be involved in the research.

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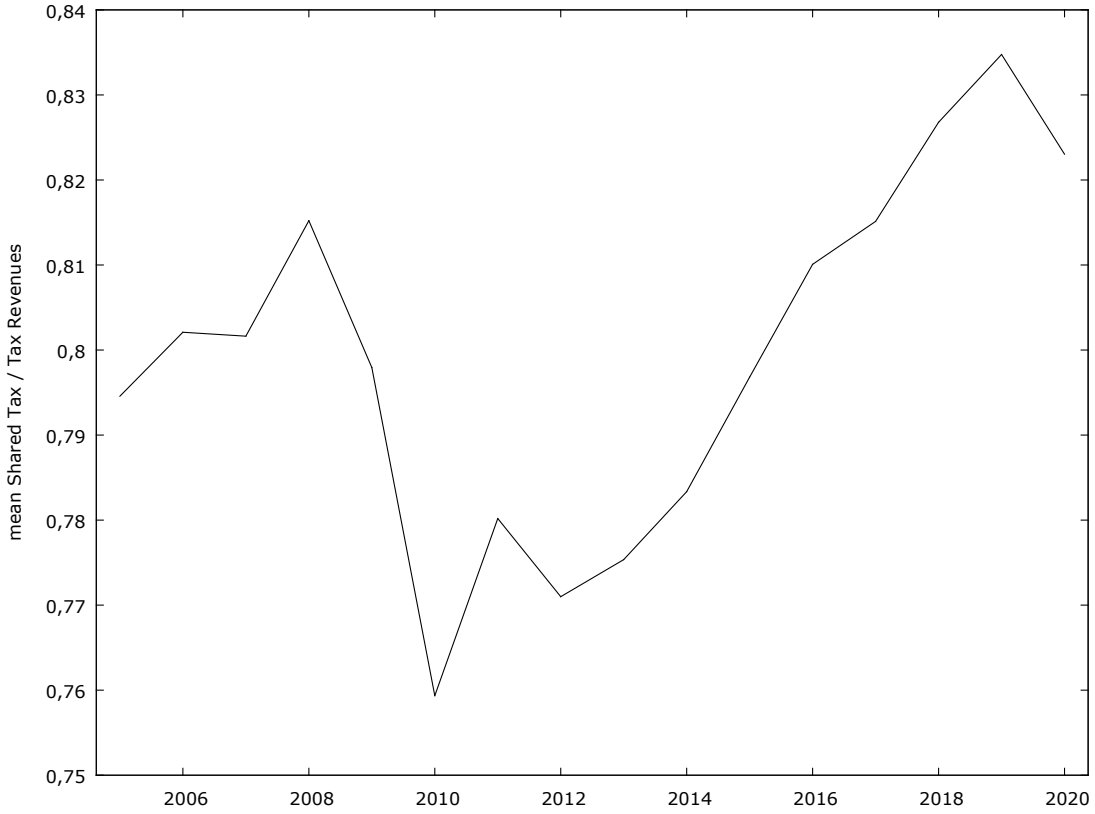
Appendix: Group means of shared tax and other local taxes on local tax revenues



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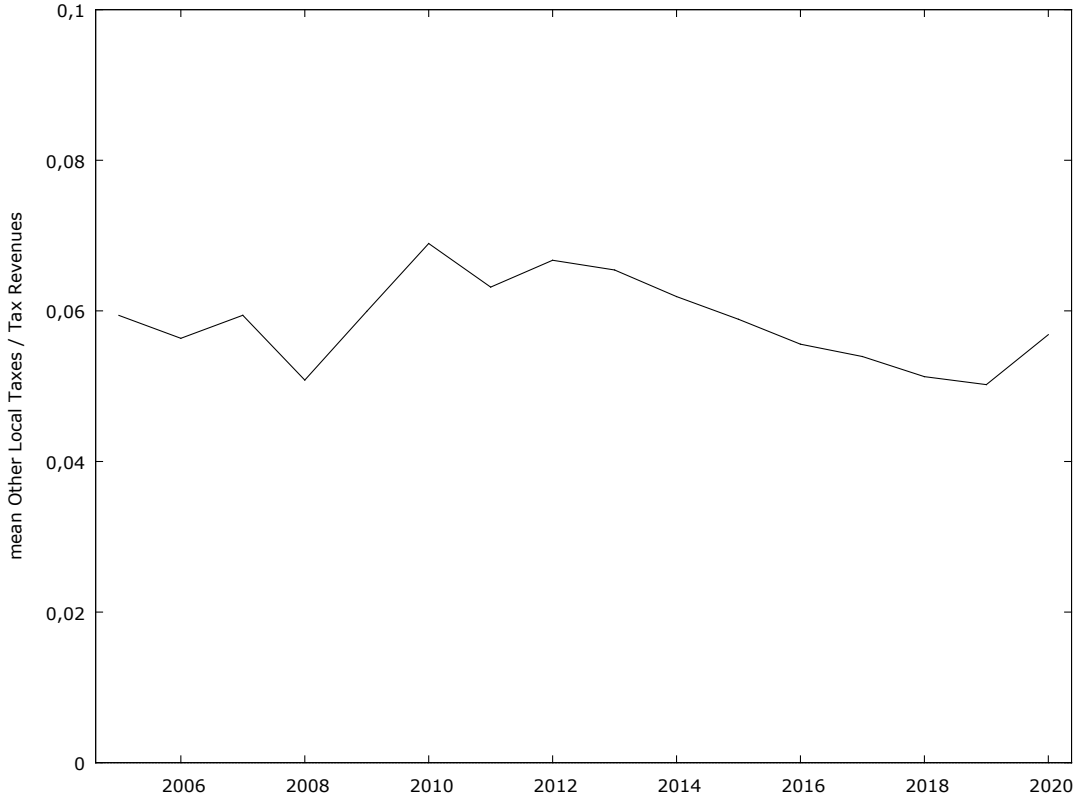

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