GOSPODARKA NARODOWA

2(314)2023, 47–65
DOI: 10.33119/GN/166103
gnpje.sgh.waw.pl
SGH

The Polish Journal of Economics

Istnieje od / Published since 1931

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Equalisation Grants and Local Taxation: The Case of Poland*

Transfery wyrównawcze i opodatkowanie lokalne. Przypadek Polski

Abstract

This paper uses data on real estate tax revenue obtained by Polish municipalities from 2005 to 2017 to determine whether equalisation grants discourage local governments from collecting their own revenue. This question lies at the heart of efforts to build revenue equalisation systems for local government units. A discontinuous change in the transfer scheme makes it possible to employ a quasi-experimental approach (difference-in-differences estimation). An increase in the vertical equalisation rate is found to diminish the tax effort of municipalities that receive equalisation grants. The income effect of these grants is also documented. The research results indicate that shifts in an institutional setting trigger permanent changes in local fiscal policies. Moreover, it has been found that the effect increases after a few years and remains significant in the medium term. This implies that any modifications in the sub-national fiscal framework should be preceded by thorough analysis and consultations.

Keywords:
vertical equalisation, marginal equalisation rate, local tax policy, tax effort, yardstick competition

JEL classification codes:
H71, H77

Article history:
submitted: January 4, 2023
revised: April 5, 2023
accepted: May 12, 2023

Streszczenie

W artykule dane na temat dochodów z tytułu opodatkowania nieruchomości osiąganych przez gminy w Polsce w latach 2005–2017 wykorzystano do ustalenia, czy transfer wyrównawczy zniechęca do gromadzenia dochodów własnych. Pytanie to znajduje się w centrum zainteresowania osób odpowiedzialnych za konstruowanie systemu wyrównywania dochodów jednostek samorządowych. Nieciągła zmiana w systemie wyrównawczym umożliwia zastosowanie podejścia quasi-eksperymentalnego (metody podwójnej różnicy). Okazuje się, że wzrost stopy wyrównywania pionowego prowadzi do spadku wysiłku fiskalnego gmin – beneficjentów transferu wyrównawczego. Udokumentowany jest również efekt dochodowy rozpatrywanych części subwencji ogólnej. Rezultaty badania wskazują, że zmiany w otoczeniu instytucjonalnym wywołują trwałe zmiany w lokalnych politykach fiskalnych. Co więcej, okazało się, że efekt wzmacnia się po kilku latach i pozostaje istotny w średnim okresie. Wskazuje to na fakt, że jakiekolwiek modyfikacje subcentralnych ram fiskalnych powinny być poprzedzone gruntownymi analizami i konsultacjami.

Słowa kluczowe:
wyrównywanie pionowe, marginalna stopa wyrównywania, lokalna polityka podatkowa, wysiłek podatkowy, konkurencja porównawcza

Kody klasyfikacji JEL:
H71, H77

Historia artykułu:
nadesłany: 4 stycznia 2023 r.
poprawiony: 5 kwietnia 2023 r.
zaakceptowany: 12 maja 2023 r.

* The author gratefully acknowledges the support received from Deutscher Akademischer Austauschdienst (DAAD).

Introduction

Equalisation transfers are a pervasive element of multi-level fiscal structures. The reduction of spatial fiscal disparities is motivated on both equity and efficiency grounds (e.g., **Boadway [2004]**). Fiscal federalism scholars formulate some recommendations for equalisation schemes. They indicate that equalisation grants should not discourage revenue collection and thereby either lessen budget constraints or reduce the accountability of local authorities [**Bird, Smart, 2002**; **Boadway, 2006**; **Spahn, 2006**]. Theoretical and empirical studies reveal that equalisation grants hardly ever satisfy this criterion. The incentive effect turns out to be widespread [**Smart, 1998**; **Köthenbürger, 2002**; **Bucovetsky, Smart, 2006**; **Buettner, 2006**; **Ferede, 2017**; **Shishkin, 2018**].

The parameter of interest is the fraction of extra revenues "lost" due to smaller equalisation transfers, known as the marginal equalisation rate (MER), or else called the equalisation rate, tax-back rate or marginal contribution rate [**Miyazaki, 2016**].[1] The research question in our paper is whether a higher marginal equalisation rate increases the use of preferential tax measures by municipalities that are beneficiaries of such grants. We test the existence of an incentive effect, using a sample of Polish municipalities for the 2005–2017 period. Our contribution is fourfold. First, most previous studies analysed the impact of equalisation grants on the choice of local tax rates (e.g., **Buettner [2006]**; **Dahlby, Warren [2003]**; **Smart [2007]**). What remains unexplored is their impact on special provisions such as tax exemptions and tax deferrals (tax base reductions), which are also within the discretion of sub-national governments in numerous countries.[2] The few exemptions include **Baretti et al. [2002]**; **Liu and Zhao [2011]**; and **Rodríguez [2013]**. We aim to add to this emerging strand of literature. In our paper, we measure tax effort as the ratio of actual to *de jure* tax revenues. Actual revenues are revenues corrected by the monetary effects of tax rate reductions and tax base reductions.

Second, previous papers on the incentive effect of equalisation grants focused on either developed countries, such as Australia, Canada, Germany, and the United States (e.g., **Buettner [2006]**; **Ferede [2017]**), or developing countries, such as Benin and Tanzania (e.g., **Caldeira, Rota-Graziosi [2014]**; **Masaki [2018]**). This study explores the link between the equalisation scheme and local tax policies in a new institutional setting: a transition country that is also a new EU member state.

Third, this paper extends the existing literature on the effects of equalisation grants (e.g. **Esteller-Moré, Solé-Ollé [2002]**; **Dahlby, Warren [2003]**; **Buettner [2006]**; **Egger et al. [2010]**; **Ferede [2017]**; **Holm-Hadulla, [2018]**; **Shishkin [2018]**). Most previous papers in the field concerned taxes with a mobile tax base. In their case, the focus was the interplay between local tax rates and the local tax base, known from the tax competition literature (e.g. **Zodrow, Mieszkowski [1986]**; **Wildasin [1988]**). The underlying mechanism is that a reduction in revenues due to higher tax rates is partly compensated by an equalisation grant. This effect, indicated in previous studies, seems to be of little relevance in our case as real estate taxes under analysis are not value-based but area-based. Consequently, the base of real estate taxes is "sticky-down," meaning that it can move up easily but move down only with difficulty. Lowering the tax rate may trigger an extension in the area of buildings. Meanwhile, a reduction of the tax base due to an increase in the tax rates is less likely as it would require demolishing physical buildings. Without loss of generality, tax competition can be ignored in our study. Instead, yardstick competition [**Besley, Case, 1995**] may play a role.

Fourth, to the best of our knowledge, there are only a few papers in this strand of literature that employ a quasi-experimental approach [**Egger et al., 2010**; **Holm-Hadulla, 2018**]. Adding to this, we exploit a difference-in-differences framework with two-way fixed effects. The identification strategy exploits the exogenous raise of the marginal equalisation rate with respect to the poorest municipalities. Municipalities that experienced a significant increase in the marginal equalisation rate (from 90% to 99%) serve as a treatment group.

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1 Symmetrically, the marginal equalisation ratio (MER) provides information about the proportion of extra revenues lost due to a higher contribution to the equalisation system. This is the case for horizontal equalisation in which money is transferred form "rich" units to "poor" units.

2 **Blöchliger and Nettley [2015]** discuss various indices of sub-national tax autonomy in OECD countries.

Real estate taxation in Poland accounts for an interesting research subject for a few reasons. First, it constitutes a non-negligible source of municipal revenues (14% of total municipal revenues from 2005 to 2017 on average). Second, municipal authorities possess numerous prerogatives to introduce preferential tax treatment. On average, tax rate reductions are responsible for three-quarters of the loss in Polish municipal tax revenues due to discretional local tax policies, while tax base reductions account for the remaining quarter. There is also a considerable variation in overall preferential tax treatment across municipalities.

The results of empirical analysis suggest that an increase in marginal equalisation rate incentivises decision makers to conduct more lenient local tax policy (incentive effect). This result persists over the medium term and is confirmed through a series of sensitivity checks and placebo analyses. We also document an income effect.

The paper is structured as follows: The next section discusses related literature. Then the institutional background is explained. It is followed by a presentation of variables, hypotheses, and empirical models. The next section reports and discusses the empirical results. Finally, some concluding remarks are offered.

Literature review

One of the key questions regarding intergovernmental fiscal relations is whether grants discourage revenue collection. This is reflected in a wide body of both theoretical and empirical literature. Two main direct economic effects of equalisation grants are identified: the income effect and the incentive effect.

Grants add to the pool of money available to beneficiaries.[3] Extra money can be used to increase expenditures and/or to reduce taxation. At odds with conventional predictions on the income effect, the flypaper effect points out that grants have an effect on local fiscal policy different from that triggered by an equivalent increase in local private incomes. "Money sticks where it hits" so that grants result in relatively higher spending and relatively lower tax reductions. The literature identifies numerous explanations of this phenomenon [**Hines, Thaler, 1995**; **Bailey, Connolly, 1998**; **Inman, 2008**]. They fall into two categories. The first one groups pitfalls in identification strategies (e.g., specification errors, reference to an inappropriate aid scheme). The second category encompasses the theoretical foundations of the flypaper effect (e.g., bureaucratic behaviour, fiscal illusion, loss aversion, the low-income constraint). According to research reports focusing on deficiencies in identification strategies, the flypaper effect should be treated as an anomaly. Other studies explain the mechanisms underlying this effect and suggest that this is a widespread trend that needs to be addressed with properly constructed institutions. Recent empirical studies on the flypaper effect that employ quasi-experimental identification strategies have reported conflicting results and do not help to solve this puzzle [**Knight, 2002**; **Gordon, 2004**; **Dahlberg et al., 2008**; **Baskaran, 2012**].

Jia, Ding and Liu [**2020**] demonstrate that higher fiscal transfers negatively affect local tax enforcement in Chinese counties. Meanwhile, **Caldeira and Rota-Graziosi** [**2014**] show in their model that unconditional grants crowd out (crowd in) revenue collection if the marginal utility of a local public good decreases (increases) with local tax revenue. Crowding-in occurs when grants are used to increase local government spending translating into higher private income and/or improved tax compliance, which in turn increases local revenues. Such a "virtuous circle" is most likely to occur in countries at a low level of development that struggle to provide basic public goods and whose low tax compliance stems from inefficient tax administration and social dissatisfaction about the quality of public goods. The crowding-in effect of the central unconditional grant has been documented for Beninese communes [**Caldeira, Rota-Graziosi, 2014**] and Tanzanian districts [**Masaki, 2018**]. Interestingly, a comparable result has been found by **Zárate Marco and Vallés Giménez** [**2018**] for Spanish regions. The main purpose of their paper is to estimate the tax capacity and tax effort of Spanish regions. As the difference between the tax frontier and actually collected revenues cannot be attributed solely to inefficiency, the authors introduce several socio-economic and political factors that presumably affect the

[3] Apart from the income effect, matching grants also generate a substitution effect because of a decrease in the relative price of supported activity. Equalisation grants as a rule are non-matching so that we do not investigate this issue further.

tax effort. Contrary to their expectations, revenues from transfers from higher-level government are found to increase the tax effort.

The papers discussed so far consider the effects of unconditional grants in general on local revenue collection. The strand of literature closely related to this paper deals with the impact of equalisation grants. Even if tax competition concerns are absent, as in the case of real estate taxation in Poland, equalisation grants may affect the local tax setting through yardstick competition. Studies within this strand of literature also document that the incentive effect of equalisation grants goes beyond setting the tax rates. In the model by **Kotsogiannis and Schwager [2008]**, rent-seeking behaviour is reflected in diminished revenue collection and the undersupply of a local public good. The researchers show that re-election concerns create two countervailing effects on accountability. On the one hand, the horizontal equalisation scheme can help voters identify and punish rent-seeking behaviour (direct effect). On the other, the non-transparent system of reducing inter-municipality disparities blurs the identification of politicians undertaking rent-seeking and thereby incentivises such activities (indirect effect). The question of which effect prevails must be addressed empirically.

Under the assumption that the local tax effort is irrelevant for the value of an equalisation transfer, in the model by **Liu and Zhao [2011]**, the tax effort decreases with the equalisation transfer. To test this presumption, they conduct an empirical study for Chinese provinces in which the tax effort is expressed as the proportion of actual revenues in provincial tax capacity.[4] The empirical results are in line with the theoretical prediction: provinces that receive higher per capita equalisation transfers exert a weaker tax effort.

Additionally, equalisation grants may affect tax revenues even if sub-national governments have no discretion over the rate and base of taxes assigned to them but are only in charge of their collection. In a sense, the revenue equalisation system levies a tax on additional revenues and thereby reduces the incentive to collect tax revenues by its beneficiaries. The model of **Baretti et al. [2002]** shows that sub-national enforcement activities decrease with the marginal equalisation rate and lump-sum transfers. Put differently, these two effects correspond to the incentive and income effects of grants respectively. These prepositions are tested for German states in the 1970–1998 period. The intensity of enforcement activities is proxied by the ratio of tax revenues to GDP. In line with theoretical predictions, it is found that the marginal equalisation rate exerts a statistically significant and negative impact on the ratio of tax revenues to GDP. The sign of the coefficient on lump-sum grants is as expected negative albeit insignificant in most specifications.

Institutional background

Municipalities are the core element of Poland's three-tier local government system. They oversee most local public goods and services. The municipal portfolio of activities includes primary education, road infrastructure, communal services, sports, and culture. The wide scope of tasks assigned to municipalities is reflected in their size. Municipalities in Poland are much bigger than the lowest-tier local government units in the European Union on average (15,500 vs. 5,600 inhabitants; **[Dexia, 2011/2012]**). Some of the municipalities have been given county status, which means they perform both municipal and county tasks. Since these municipalities also participate in the equalisation scheme for counties (with separate eligibility criteria), they are excluded from our empirical analysis. For the sake of brevity, the term "municipalities other than cities with county status" will be replaced by "municipalities."

Real estate taxation. In general terms, municipalities collect revenues from local taxes (15% of total revenues), shares in income taxes (17%), conditional grants (32%), the educational grant (18%), and equalisation grants (6%).[5] User charges, fees, and revenues from communal property make up the remaining part (12%). Municipal tax revenues in Poland are obtained mostly from real estate taxes: property tax, agricultural tax, and forest tax. On average, they generate about 14% of total revenues and 90% of local tax revenues. The rest

4 Tax capacity is estimated with the use of the regression approach.

5 Shares as of 2017.

of local taxation revenues is obtained from vehicle tax and non-autonomous local taxes, such as civil law activities tax, legacies and donations tax, and tax on small businesses.

Non-autonomous local taxes are not considered in our analysis of local tax policies because municipal government neither has control over the tax rates nor collects tax revenues. As for vehicle tax, we do not take it into account as it provides negligible revenues (0.7% of all revenues on average). Essentially the same argument would lead to the omission of agricultural tax and forest tax, with average shares of 2.3% and 0.4% respectively. Yet, it would bias our results as municipalities vary with respect to land usage.[6] To control for it, we analyse property tax, agricultural tax, and forest tax jointly under the term "real estate taxes."

Real estate taxes are mutually exclusive, i.e. an item of real estate is subject to only one of them. Agricultural tax and forest tax are levied on land used for farming and forestry activities respectively. The rest of land plus buildings and structures are subject to property tax. Real estate taxation in Poland is area-based.[7]

As for property tax, municipal councils are allowed to set unit tax rates per square metre no higher than those announced each year by the Ministry of Finance. The maximum property tax rates are differentiated between types of real estate (land, building, structure) and its usage (residential, commercial, and other). For instance, in 2014 residential buildings were subject to a maximum tax rate of PLN 0.74 per square metre and the maximum tax rate on commercial buildings was PLN 23.03 per square metre.

The centrally mandated maximum agricultural tax rate stems from the market price of rye. To calculate the actual tax obligation, the tax rate is then multiplied by a coefficient whose value depends on the quality, location, and type[8] of agricultural land.

The maximum tax rate of forest per hectare tax equals the market price of 0.222 cubic metres of wood. It is reduced by 50% for what are known as protection forests and forests classified as nature reserve and national parks.

Besides a tax rate reduction, municipal authorities can offer a tax exemption, tax allowance, tax debt write-off, deferral of tax liability or payment of tax liability in instalments (tax base reductions). In official statistics, the value of local tax expenditures is estimated with the method of lost sovereign revenues, also known as initial revenue loss. It means that one assumes that the tax base is not elastic to tax reductions. The interdependencies between taxes are also ignored [**OECD, 2010**; **Dziemianowicz, Wyszkowski, 2012**; **Galiński, 2014**].[9] Data collected and reported by municipalities makes it possible to construct the measure of tax effort:

$$tax\_effort = \frac{tax\ revenues}{tax\ revenues + loss\ due\ to\ tax\ rate\ reductions + loss\ due\ to\ tax\ base\ reductions} 100\%. \quad (1)$$

The denominator serves as a proxy for tax capacity. It is also dubbed as *de jure* revenues (potential revenues). *De jure* revenues mean the actual revenues plus the monetary value of local tax policy measures, including tax rate reductions and tax base reductions [**Bukowska, Siwińska-Gorzelak, 2018**; **Siwińska-Gorzelak, Bukowska, Wójcik, 2019**]. If a municipality does not offer any preferential tax treatment, the index takes the value of 100%; the higher the scope of tax rate and tax base reductions, the lower the tax effort.

Besides the already mentioned limitations, the formula ignores the problem of tax evasion. Yet, one may argue that tax evasion with respect to real estate taxes is rather limited in comparison to income taxes as real estate taxes concern immobile physical objects.[10]

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6 In the 2005–2017 period, for 9.5% of observations, revenues from agricultural tax were greater than from property tax.

7 Except for structures subject to the *ad valorem* property tax rate. In this case, the tax base equals either the initial book value or the market value.

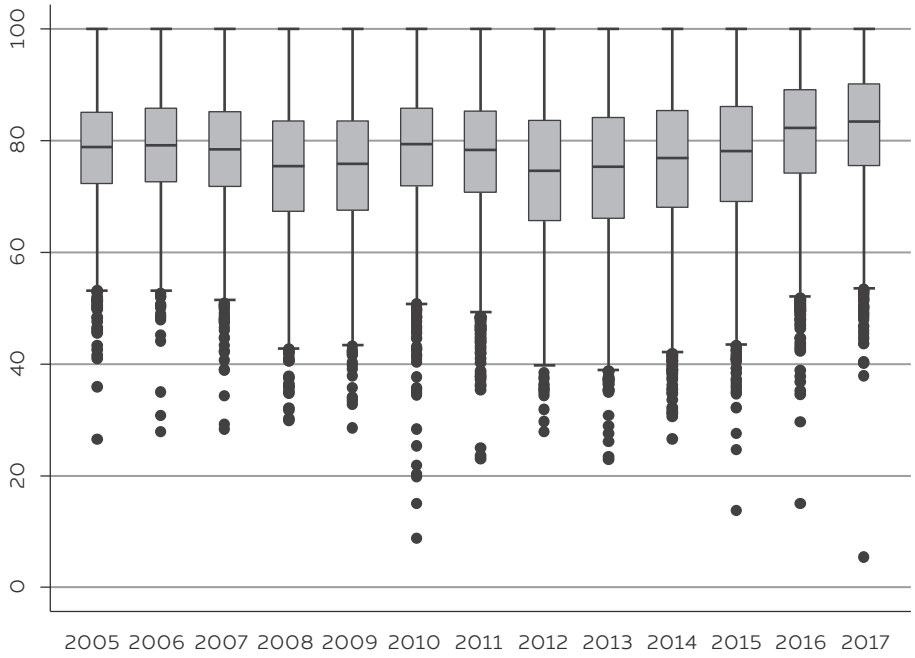
8 For example, meadow or arable land.

9 These losses in revenues are classified as tax expenditures, i.e. "provisions that allow [...] to pay less in taxes" [**OECD, 2010**: 3]. The literature uses the term "expenditures" as the effects of the losses in revenues mirror those for conventional revenues. The alternative notions are tax subsidies, tax preferences and tax aid.

10 In the Polish institutional setting, taxpayers sometimes evade real estate taxes through underreporting the area of buildings. It is also possible that an individual fails to report that (a part of) a residential estate is in fact used for business activities.

There is a considerable variation among municipalities in terms of tax policies. As Figure 1 shows, some units do not use any measures to reduce real estate taxes, while others forego more than half of *de jure* revenues. In the 2005–2017 period, the 1st quartile of the tax effort equalled 70.0% and the 3rd quartile was 85.8%.

Figure 1. Tax effort with respect to real estate taxes in Polish municipalities in the years 2005–2017



Notes: Data for municipalities other than cities with county rights.
Source: Author's own elaboration on the basis of Ministry of Finance database.

Both the mayor and the municipal council possess legal competencies in a local tax setting. The tax rates are decided by municipal councillors, who are also eligible to enact tax deductions and tax credits. In response to a taxpayer's request, the mayor may grant additional tax reliefs such as tax deferral or the split of tax liability into instalments. Despite *de jure* arrangements according to which local taxes are shaped mainly by the municipal council, empirical studies point out that the mayor plays *de facto* a decisive role in this area [**Swianiewicz, 2016**; **Swianiewicz, Łukomska, 2015**].

Equalisation scheme. Like in many other countries, such as Australia, Canada and Germany, the equalisation scheme in Poland aims to reduce spatial disparities in revenue capacity. The Polish equalisation system consists of two types of general-purpose formula-based transfers: vertical and horizontal. Both are meant to reduce fiscal disparities. While the vertical equalisation scheme is based on central government funds, the horizontal equalisation scheme makes use of money collected from the richest local governments.

In contrast to equalisation schemes in various other countries, such as Australia, Canada and Germany, the reference tax rate is not determined as the average of the actual tax rates but the centrally mandated maximum tax rate serves as a benchmark. The average municipal revenue capacity ($\overline{R}$) is the population-weighted average of 2,479 entities. Among the municipalities included in the sample, the weight of the biggest municipality (Piaseczno) is a mere 0.2% so the tax policy of an individual municipality has virtually no impact on the average tax capacity.

A vertical transfer consists of two parts: basic and supplementary. The eligibility for the basic part is determined by the ratio of a municipality's revenue capacity to the country average. For beneficiaries, it does not exceed 92%. There are three marginal equalisation rates. They are inversely related to the municipal revenue capacity. There is also a variation in these rates over time. The set of equalisation rates was changed from {75%; 80%; 90%} to {76%; 83%; 99%} from 2008 onward, while the eligibility thresholds remained unchanged.

Table 1 shows the detailed calculation formulas. The marginal equalisation rates and grants per capita against relative revenue capacity within two sub-periods are depicted in Figure 2.

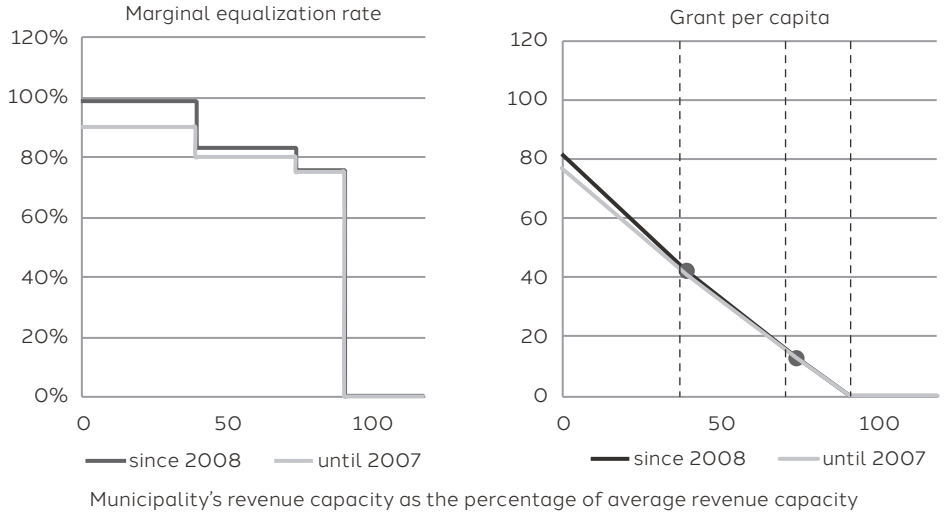
Table 1. The formula of vertical equalisation grants in Poland

Group of municipalities	Grant per capita	
	Years 2004–2007	Since 2008
Basic part		
$R \leq 40\% \bar{R}$	$90\% (40\% \bar{R} - R) + 40{,}75\% \bar{R}$	$99\% (40\% \bar{R} - R) + 41{,}97\% \bar{R}$
$40\% \bar{R} < R \leq 75\% \bar{R}$	$80\% (75\% \bar{R} - R) + 12{,}75\% \bar{R}$	$83\% (75\% \bar{R} - R) + 12{,}92\% \bar{R}$
$75\% \bar{R} < R < 92\% \bar{R}$	$75\% (92\% \bar{R} - R)$	$76\% (92\% \bar{R} - R)$
Supplementary part		
$D < \bar{D}$ and $R \leq 150\% \bar{R}$	$17\% \bar{R} (\bar{D} - D) / \bar{D}$	

Notes: R – revenue capacity, $\bar{R}$ – average revenue capacity, D – population density, $\bar{D}$ – average population density.
Revenue capacity is calculated based on *de jure* revenues from the following sources: property tax, agricultural tax, forest tax, motor vehicle tax, civil law activities tax, tax on small businesses, stamp duty, extraction fee, shares in PIT and CIT.

Source: Law on local government unit revenues.

Figure 2. Marginal equalization rates and grant per capita under vertical equalization scheme



Notes: The figure regards the basic part of the grant. It is assumed that average revenue capacity amounts to 100 units. Horizontal dashed lines refer to thresholds in the equalization formula, respectively: 40%, 75% and 92% of average revenue capacity.

Source: Author's own elaboration on the basis of Law on local government units' revenues.

The supplementary part of the vertical transfer is distributed among municipalities with lower-than-average population density, providing that their revenue capacity does not exceed 150% of the nationwide average. Low population density can be treated as a rough measure of inflated spending needs.

Horizontal equalisation grants come from mandatory contributions made by municipalities whose revenue capacity exceeds 150% of the national average. This money is distributed among municipalities with relatively large spending on house benefits[11] as well as rural and urban-rural municipalities with low revenue capacity. The conditions defining payees and beneficiaries are not mutually exclusive so it happens that a municipality plays these two roles simultaneously.[12]

11 Spending on house benefits is strictly regulated by central legislation.

12 The number of municipalities playing both roles ranged from 55 in 2010 to 81 in 2005.

Vertical equalisation grants are one order of magnitude greater than horizontal ones. For instance, in 2014 municipalities received PLN 6.1 billion in equalisation subsidies, whereas revenues from horizontal subsidies amounted to only PLN 500 million.

Vertical equalisation grant eligibility in year t is determined by fiscal capacity as of year t – 2. The following revenue sources are included: property tax, agricultural tax, forest tax, motor vehicle tax, civil law activities tax, tax on small businesses, basic local fees, and shares in PIT and CIT. In order to avoid a direct shifting of the fiscal burden onto the central government through tax expenditures, the formula refers to *de jure* instead of actual local government revenues.

Fiscal capacity varies considerably across Polish municipalities. For instance, in 2014 for municipalities in the lowest decile, it amounted to up to PLN[13] 713 per capita, while in the top decile it exceeded PLN 1,796 per capita. This translates into a 90/10 ratio of 2.5. Similar values of the 90/10 ratio (within the range of 2.5–3.0) have been obtained for other analysed years.

Data and hypothesis

The paper investigates the impact of equalisation subsidies on local tax policy. Our sample covers 2,413 municipalities in Poland. We exclude cities with county status (66 units) from the sample because they also participate in the equalisation scheme at the county level, which is subject to distinct eligibility criteria. We analyse the period from 2005 to 2017.[14] We consider a crucial feature of the equalisation scheme: the marginal equalisation rate. To assess its impact on the local tax effort, we exploit the variation in marginal equalisation rates over time and across municipalities. In our empirical analysis, we refer to various data sources: Ministry of Finance and Statistics Poland databases as well as data obtained from the National Electoral Commission.

The empirical analysis considers taxes with an immobile and sticky-down tax base so that a more rigorous tax policy is unlikely to reduce the tax base and thereby increase governmental grants. Despite the specific features of the equalisation scheme in Poland (for details please see section 3), the rule that acquiring an additional tax base *ceteris paribus* reduces the equalisation grant also holds in our case. Moreover, the enlargement of the tax base has a varying effect on municipal revenues, depending on the marginal equalisation rate. The marginal benefit from an additional unit of the tax base is inversely related to the marginal equalisation rate. Therefore, the mayor who experiences an increase in the marginal equalisation rate has less incentive to utilise the available tax base since it brings about a smaller net fiscal effect understood as the marginal benefit from tax receipts minus the marginal loss in the equalisation grant. Considering insights from previous studies, the research hypothesis is that the municipal tax effort is inversely related to the marginal equalisation rate (incentive effect).

Empirical strategy

Our main interest lies in testing the incentive effect of vertical equalisation grants. We exploit the reform in the vertical equalisation scheme that came into force in 2008. Its objective was to strengthen the degree of vertical equalisation. As a result of the change, the marginal equalisation rate for municipalities whose revenue capacity does not exceed 40 percent of the national average increased from 90% to 99%. The new formula implies almost perfect substitution between revenues and the equalisation grant. In contrast, the increase for

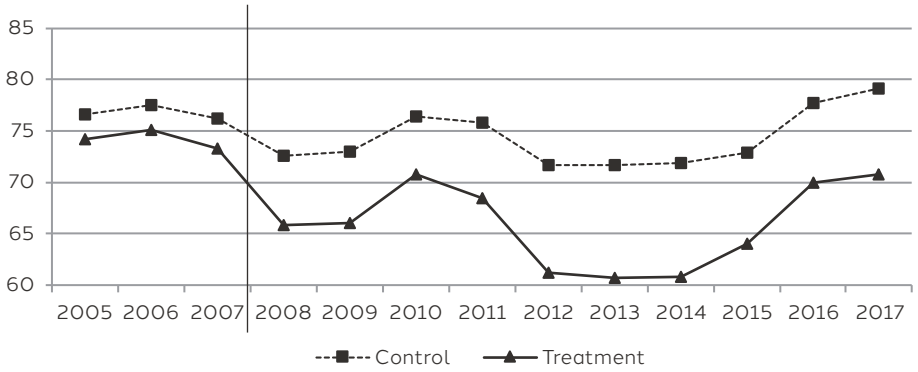
13 PLN – Polish zloty, the official currency in Poland.

14 The year 2005 is the first year for which data on the equalisation system are available. The study period ends in 2017 due to various approaches adopted by municipalities in response to a mid-year decrease in the taxation of wind turbines in 2018. Some municipalities decided to pay back overpaid property tax, whereas others counted it towards future tax payments. Under cash accounting, it creates differences in registered revenues. The amount of lost tax revenues was estimated at approximately PLN 500 million. The size and composition of our sample varied negligibly due to a change in the status of one municipality (in 2013), the creation of one new municipality (in 2010), and a merger of two municipalities (in 2015).

the second equalisation group (i.e. municipalities with revenue capacity between 40 and 75 percent of the national average) was 3 percentage points (from 80% to 83%). Municipalities whose revenue capacity does not exceed 40 percent of the national average constitute the treatment group, while municipalities with revenue capacity between 40 and 75 percent of the national average make up the control group. The equalisation subsidy to which a municipality is entitled in year t is determined by its tax capacity in year t – 2. Hence, the concern of the simultaneity bias is at least partly mitigated.

One of the identifying assumptions of the difference-in-differences estimation is that there are common pre-treatment trends among the treated and control groups. The visual inspection of Figure 3 suggests that this assumption is well satisfied in our case. We also tested the assumption of parallel trends formally, with the use of the panel FE difference-in-differences estimation. The coefficient on the difference-in-differences term is found to be insignificant in regressions comparing 2007 with 2005 and 2006 as well as those comparing 2005 with 2006 and 2007 (see Panel A in Table 2).

Figure 3. Pre- and post-treatment trends in tax effort with respect to real estate taxes in the years 2005–2017



Notes: Treatment group: municipalities with $R \leq 40\%\bar{R}$, control group: municipalities with $40\%\bar{R} < R \leq 75\%\bar{R}$. Post-treatment period: years: 2008–2017.

Source: Author's own elaboration.

Table 2. Test on the validity of treatment and control groups for tax effort with respect to real estate taxes

VARIABLES	(1)	(2)	(3)	(4)
	Pre-treatment: 2005 & 2006 Post-treatment: 2007		Pre-treatment: 2005 Post-treatment: 2006 & 2007	
	A. Treatment group: municipalities with $R \leq 40\%\bar{R}$ Control group: municipalities with $40\%\bar{R} < R \leq 75\%\bar{R}$			
Diff-in-diff	–0.715* (0.388)	–0.482 (0.393)	–0.346 (0.308)	0.230 (0.359)
Controls	NO	YES	NO	YES
Municipality FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	4,659	4,655	4,659	4,655
R-squared	0.031	0.038	0.000	0.012
Number of code	1,658	1,658	1,658	1,658
	B. Treatment group: municipalities with $R \leq 40\%\bar{R}$ Control group: municipalities with $75\%\bar{R} < R < 92\%\bar{R}$			
Diff-in-diff	–1.549*** (0.471)	–1.641*** (0.559)	–0.285 (0.384)	1.497** (0.595)
Controls	NO	YES	NO	YES
Municipality FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	2,011	2,008	2,011	2,008

VARIABLES	(1)	(2)	(3)	(4)
	Pre-treatment: 2005 & 2006 Post-treatment: 2007		Pre-treatment: 2005 Post-treatment: 2006 & 2007	
R-squared	0.027	0.040	0.001	0.026
Number of code	893	891	893	891
	C. Treatment group: municipalities with $40\%\bar{R} < R \leq 75\%\bar{R}$ Control group: municipalities with $75\%\bar{R} < R < 92\%\bar{R}$			
Diff-in-diff	−0.942***	−0.862***	0.0241	0.986***
	(0.294)	(0.322)	(0.140)	(0.206)
Controls	NO	YES	NO	YES
Municipality FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	5,022	5,017	5,022	5,017
R-squared	0.019	0.026	0.000	0.017
Number of code	1,793	1,793	1,793	1,793

Notes: Table reports the results of two-way panel FE regressions.
Robust standard errors clustered at municipality level in parentheses. Significance levels denoted as: * – $p < 0.1$, ** – $p < 0.05$, *** – $p < 0.1$.
Source: Author's own elaboration.

We also tried other possible combinations of treated and control groups. Municipalities whose revenue capacity is between 75 and 92 percent make up a presumably better control group as the marginal equalisation rate for them was fixed within the whole analysed period. Accordingly, we tested the following pairs: i. treated – municipalities with revenue capacity of up to 40 percent of the national average; control – municipalities whose revenue capacity is between 75 and 92 percent of the national average; ii. treated – municipalities whose revenue capacity is between 40 and 75 percent of the national average; control – municipalities whose revenue capacity is between 75 and 92 percent of the national average. However, as Panels B and C in Table 2 indicate, these combinations do not satisfy the condition of parallel pre-treatment trends.

Table 3 shows that in 2005–2017 control municipalities constituted approximately 50% of the population (1,231–1,354 units). There were far fewer treated municipalities (88–375 units; 3% – 15% of the population), whose number decreased markedly after 2013. This trend coincides with the convergence of PIT revenues at the municipal level [**Wójcik, 2018**].

Our empirical analysis encompasses 1,786 municipalities (out of 2,414 in total) that at least once belonged to either the treatment or control groups. Additionally, as can be seen from Table 4, in the analysed period there were 921 switches between the treatment and control groups. This is of importance for the empirical analysis because the FE estimator exploits the within-unit variation.

Table 3. The size of treatment and control groups, 2005–2017

Year	Number of municipalities			Percentages		
	Treatment group ($R \leq 40\%\bar{R}$)	Control group ($40\%\bar{R} < R \leq 75\%\bar{R}$)	Total	Treatment group ($R \leq 40\%\bar{R}$)	Control group ($40\%\bar{R} < R \leq 75\%\bar{R}$)	Total
2005	248	1,288	2,413	10.28	53.38	100.00
2006	293	1,269	2,413	12.14	52.59	100.00
2007	283	1,278	2,413	11.73	52.96	100.00
2008	348	1,281	2,413	14.42	53.09	100.00
2009	375	1,272	2,413	15.54	52.71	100.00
2010	214	1,354	2,413	8.87	56.11	100.00
2011	240	1,320	2,413	9.95	54.70	100.00
2012	296	1,288	2,414	12.26	53.36	100.00
2013	231	1,305	2,413	9.57	54.08	100.00
2014	112	1,268	2,413	4.64	52.55	100.00

Year	Number of municipalities			Percentages		
	Treatment group ($R \leq 40\%\bar{R}$)	Control group ($40\%\bar{R} < R \leq 75\%\bar{R}$)	Total	Treatment group ($R \leq 40\%\bar{R}$)	Control group ($40\%\bar{R} < R \leq 75\%\bar{R}$)	Total
2015	97	1,231	2,413	4.02	51.02	100.00
2016	88	1,242	2,413	3.65	51.47	100.00
2017	90	1,264	2,412	3.73	52.40	100.00

Notes: Data for municipalities other than cities with county status.
R – revenue capacity, $\bar{R}$ – average revenue capacity.

Source: Author's own elaboration based on Ministry of Finance data.

Table 4. Switches between treatment and control groups, 2005–2017

Year	Number of municipalities	
	Switch from control to treatment group	Switch from treatment to control group
2007	65	20
2008	25	35
2009	85	20
2010	50	163
2011	2	15
2012	82	27
2013	11	76
2014	4	123
2015	12	27
2016	16	25
2017	20	18
Total	**372**	**549**

Notes: Data for municipalities other than cities with county status.
Treatment group: municipalities with $R \leq 40\%\bar{R}$, control group: municipalities with $40\%\bar{R} < R \leq 75\%\bar{R}$. Post-treatment period: 2008–2017.
R – revenue capacity, $\bar{R}$ – average revenue capacity.

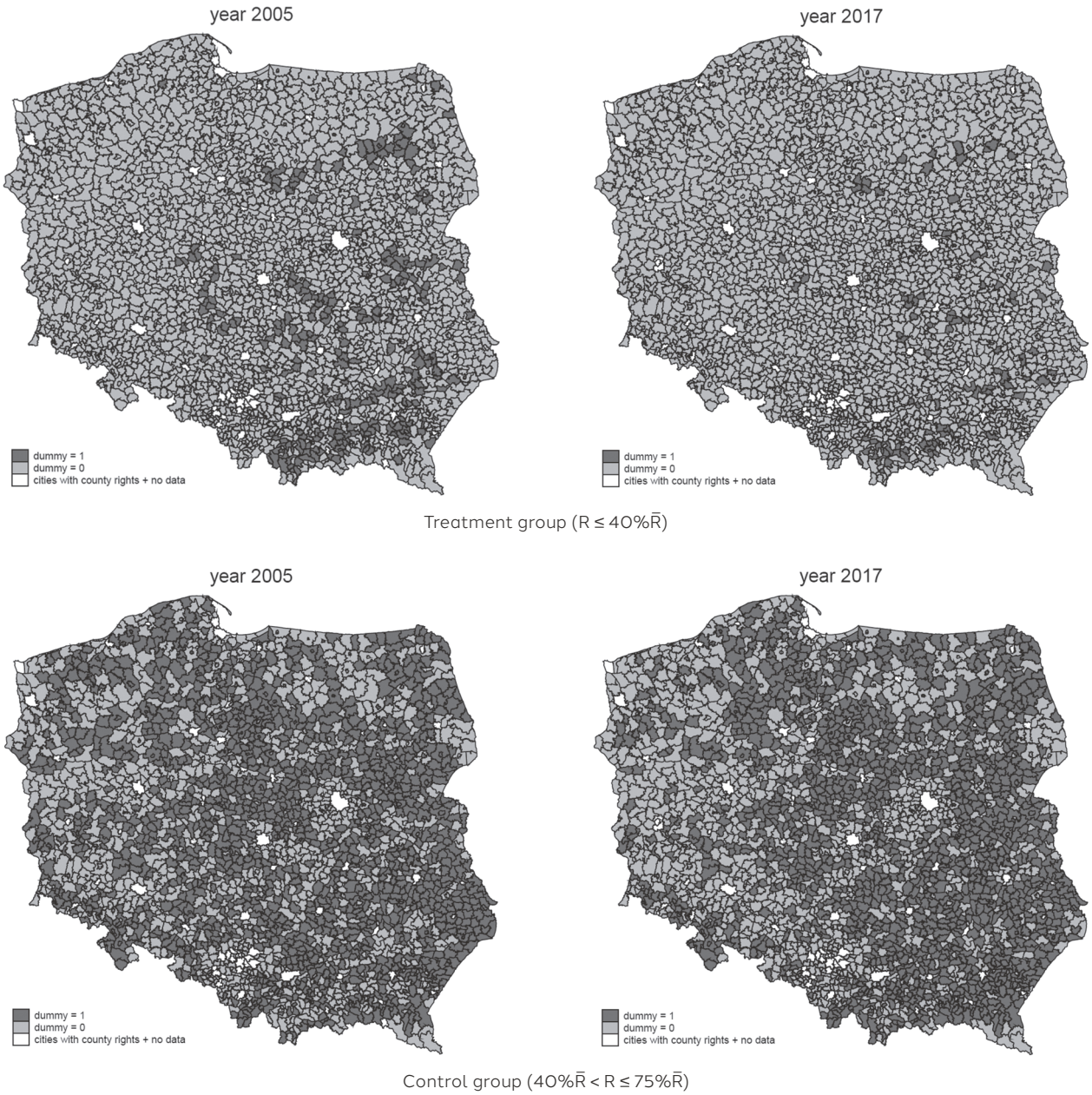
Source: Author's own elaboration based on Ministry of Finance data.

The geographical distribution of both groups of municipalities as of 2005 and 2017 is displayed in Figure 4. It shows that most of the treated municipalities are in the eastern part of Poland, whereas the spatial distribution of the control group is more balanced. To account for these discrepancies, in some specifications we control for covariates.

Tax effort (see Formula 1) serves as our dependent variable. The regressions include a set of controls such as population size, population density, the ratio of the unemployed to the working-age population, the lagged debt to revenues ratio, and the share of votes obtained by the incumbent in the first round of previous elections.[15] The rationale behind them is as follows. Tax collection may be affected by economies of scale. The tax burden may be adjusted to the local economic and budgetary situation. As stressed in section 3, the mayor has a decisive voice in the local tax setting. **Banaszewska [2022b]** shows that there is an inverse relationship between support for the incumbent in previous elections and the leniency of local tax policy. Following **Bischoff and Krabel [2017]**, we also control for the difference between the shares of the post-working and pre-working age population groups. We also account for several fiscal controls: the real *per capita* value of vertical and horizontal grants, the educational grant, and the shares in PIT and CIT. By doing so, we account for the fact that grants not only have an incentive effect, but they also exert an income effect. The equalisation subsidy in year t depends on fiscal and demographic variables in year t – 2. Therefore, the concern of simultaneity bias is diminished.

15 If none of the candidates receives over 50 percent of the vote in the first round, the winner among the two most popular candidates is determined in the second round.

Figure 4. Spatial distribution of treated and control municipalities in the year 2005 and 2017



Source: Author's own elaboration on the basis of Ministry of Finance and Geodesic and Cartographic Documentation Center data.

One may argue that the relationship between the equalisation subsidy and preferential tax measures may in fact capture the effect of adjusting property tax to local community tax-paying capacity. Hence, the regressions also include a proxy of local welfare – lagged natural logarithm of average salaries and wages. We employ difference-in-differences estimation with two-way fixed effects to check if the shift in the vertical equalisation scheme prompted an adjustment in local tax policies among Polish municipalities. The post-treatment period, which spans from 2008 to 2017, is considerably longer than the one before the treatment (2005–2007) so that we can identify not only short- but also medium-term effects of the reform. We run the following regression:

$$tax\_effort_{it} = \alpha + \delta D_{it} + \mu controls_{it} + \vartheta_i + \tau_t + \varepsilon_{it},$$

where:
D – 1 for treated group in 2008–2017, 0 otherwise,
ϑ_i – municipal fixed effect,

τ_t – time fixed effect,
ε_{it} – error term.

The law that introduced new marginal equalisation rates was enacted on 7 September 2007 so it had arguably little impact on local tax policies that year. Therefore, in the baseline specification, we classify 2007 as a pre-reform year. Still, one may argue that the legislative process is lengthy so that some municipalities may have already adjusted their tax policies in 2007. Consequently, for the sake of sensitivity checks, we exclude the year 2007 from our analysis.[16]

Results

Baseline results

We investigate whether more generous equalisation grants prompt municipalities to offer more preferential tax treatment. For this purpose we exploit the institutional change as of 2008 and employ the difference-in-differences approach. In the baseline, we do not account for covariates.

Table 5. Difference-in-differences estimates of tax effort with respect to real estate taxes

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pre-treatment: 2005–2007		Pre-treatment: 2005 & 2006		Pre-treatment: 2005–2007		Pre-treatment: 2005 & 2006	
	Full sample				Restricted sample			
Diff-in-diff	−2.350***	−1.441***	−1.937***	−0.944***	−2.861***	−1.904***	−2.432***	−1.345***
	(0.327)	(0.335)	(0.337)	(0.351)	(0.430)	(0.445)	(0.459)	(0.480)
Natural log of population		−8.813**		−10.35**		−5.063		−6.424
		(4.468)		(4.437)		(4.735)		(4.744)
Population density		0.000381		−0.00289		−0.00609		−0.0171
		(0.0157)		(0.0158)		(0.0211)		(0.0210)
Unemployment		−0.221***		−0.266***		− 0.215***		− 0.265***
		(0.0519)		(0.0524)		(0.0537)		(0.0543)
Average salary		0.00405***		0.00420***		0.00401***		0.00424***
		(0.000925)		(0.000899)		(0.000960)		(0.000938)
Share of population at post-production – pre-production age		0.650***		0.631***		0.654***		0.618***
		(0.110)		(0.105)		(0.109)		(0.106)
Debt-to-revenues ratio		0.259		0.0592		0.263		0.176
		(0.747)		(0.735)		(0.738)		(0.734)
Share of votes for incumbent mayor in previous 1st election round		0.0183***		0.0182***		0.0204***		0.0203***
		(0.00594)		(0.00591)		(0.00613)		(0.00612)
Equalisation grant per capita		−0.00536***		−0.00592***		−0.00475***		−0.00517***
		(0.00178)		(0.00179)		(0.00183)		(0.00185)
Balancing grant per capita		−0.0468***		−0.0507***		−0.0414***		−0.0452***
		(0.00739)		(0.00736)		(0.00774)		(0.00779)
Shares in PIT and CIT per capita		−0.00304		−0.00296		−0.00339		−0.00297
		(0.00219)		(0.00220)		(0.00232)		(0.00233)
Educational grant per capita		−0.00227		−0.00226		−0.00227		−0.00223
		(0.00165)		(0.00163)		(0.00170)		(0.00169)
Constant	71.48***	143.6***	71.45***	157.6***	71.71***	111.1***	71.69***	123.7***
	(0.185)	(38.91)	(0.178)	(38.72)	(0.196)	(40.92)	(0.188)	(41.09)
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES

[16] The change in the equalisation scheme was proposed by the government. The draft legislation was submitted to parliament on 18 June 2007.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pre-treatment: 2005–2007		Pre-treatment: 2005 & 2006		Pre-treatment: 2005–2007		Pre-treatment: 2005 & 2006	
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	19,573	19,515	18,012	17,956	17,223	17,177	15,858	15,814
R-squared	0.188	0.207	0.196	0.216	0.184	0.201	0.192	0.211
Number of code	1,786	1,786	1,783	1,783	1,735	1,735	1,731	1,731

Notes: Table reports the results of two-way panel FE regressions. Under full sample, treatment group: municipalities with $R \leq 40\%\bar{R}$, control group: municipalities with $40\%\bar{R} < R \leq 75\%\bar{R}$. Under restricted sample, treatment group: municipalities with $R \leq 38\%\bar{R}$, control group: municipalities with $42\%\bar{R} < R \leq 73\%\bar{R}$. Post-treatment period: 2008–2017.
Robust standard errors clustered at municipality level in parentheses. Significance levels denoted as: * – $p < 0.1$, ** – $p < 0.05$, *** – $p < 0.01$.
Source: Author's own elaboration.

Table 5 shows that the difference-in-differences estimate is negative and statistically significant in regressions both with and without control variables (see columns 1 and 2). Controlling for a set of fiscal, demographic, economic and political variables, the average treatment effect in the 2008–2017 period was –1.44 (significant at $\alpha = 0.05$). This means that the tax effort of municipalities experiencing a relative increase in the equalisation rate was 1.44 percentage points lower on average than in the control group. To test the robustness of our baseline result, we exclude 2007 from the pre-treatment period to mitigate the potential announcement effect as the law in question was enacted in the year preceding its coming into force. The results displayed in columns 3 and 4 of Table 5 indicate that the baseline result remains unchanged: municipalities that experienced an increase in the equalisation rate became more lenient in their tax policies, albeit the point estimate is lower in absolute terms.

Another threat is that municipalities self-select into treatment. The highest probability of such behaviour is in municipalities close to equalisation thresholds. Hence, we conduct regressions excluding municipalities with a revenue capacity index close to the equalisation formula thresholds, i.e., within the +/- 2 percentage point range around 40 and 75 percent of the national average. The results for the restricted sample (column 5) resemble those from column 1.

Our difference-in-differences estimations support hypothesis 1, according to which municipal tax efforts are inversely related to the marginal equalisation rate. Although there is no compensation for extra tax privileges granted at the local level, the tax policies of the treated municipalities are found not to be neutral to the change in the equalisation formula.

The coefficients on equalisation grants per capita are negative and statistically significant in all the regressions displayed in Table 5. This means that, thanks to greater support from the central government, municipalities grant higher tax rate and base reductions. Hence, the empirical evidence points to the existence of an income effect.

The performance of the control variables is also worth a comment. We find that local economic conditions captured by the average salary and unemployment significantly shape the municipal tax effort, with countervailing effects (positive and negative respectively). Since tax effort is measured with respect to the maximum admissible taxation level, municipal authorities are found to adjust the level of taxation to local tax-paying capacity. Our results also suggest that municipalities with a shrinking population pyramid are stricter in terms of their tax policies. Finally, as in the case of equalisation grants (vertical equalisation), we document the income effect with respect to horizontal equalisation.

The question arises whether fiscal losses due to more lenient local tax policies are compensated by higher equalisation grants. To answer it, we make a back-of-the-envelope calculation. For each year, we determine the difference between the value of equalisation grants according to the old and new formulas for a municipality with average revenue capacity among the treated municipalities (i.e. municipalities with $R \leq 40\%\overline{R}$). Then, we compare this difference with the average *de jure* revenues from real estate taxes among the treated units. We find that an increase in the equalisation grant accounts for 5.6% to 9.4% of potential revenues from

real estate taxes. This implies that a higher grant from the central government by far overcompensates the estimated reduction in the local tax effort as the upper limit for its 95-percent confidence band is equal to 1.78 percentage points of *de jure* revenues from real estate taxes.

Additional tests[17]

It is also necessary to address the fact that the post-treatment period is considerably longer than the pre-treatment period (10 vs. three years/10 vs. two years). As time passes after the reform, the greater becomes the impact of other factors shaping local tax policy that may strengthen or weaken the effect in question. Therefore, Table A1. in the Appendix shows the array of results for various post-treatment periods spanning from one to nine years. Regardless of which post-treatment period is analysed, the coefficient of difference-in-differences term is qualitatively and quantitatively similar to the baseline estimates.[18]

We conducted a series of placebo tests in which we considered fake outcomes (see Table A2) and fake treatment and control groups (see Table A3). Among the dependent variables presumably not affected by the reform, we considered expenditures per capita, investment expenditures per capita and the debt-to-revenue ratio. The coefficients on the difference-in-differences term are found to be insignificant in all regressions controlling for covariates. In the second step, we compared tax policies between pairs of groups of municipalities for which the marginal equalisation rate was fixed over time, i.e. municipalities with $75\%\overline{R} < R < 92\%\overline{R}$, municipalities with $92\%\overline{R} \leq R \leq 150\%\overline{R}$ and $D > \bar{D}$, municipalities with $R > 150\%\overline{R}$. The $150\%\overline{R}$ threshold distinguishes municipalities that neither receive the basic part of the equalisation grant nor contribute to the horizontal equalisation scheme from municipalities that are not eligible for an equalisation grant and make contributions to the horizontal equalisation scheme. Again, we do not find any significant effects. As such, the placebo tests lend further support to our main findings.

Conclusions

We investigate the impact of equalisation grants on local taxation policies. We consider preferential tax treatment in real estate taxes in Polish municipalities from 2005 to 2017. We use a quasi-experimental approach (difference-in-differences estimation with two-way fixed effects) to examine a change in the equalisation formula in 2008. The treated municipalities were subject to a much bigger increase in the marginal equalisation rate in comparison to the control group.

The empirical analysis reveals that an increase in the marginal equalisation rate in Poland discourages municipal tax effort. Apart from that, grants are found to diminish tax collection due to the income effect. The baseline result for the incentive effect is robust to a series of sensitivity analyses and placebo tests. Even though the grant formula in Poland prevents a direct substitution of locally raised revenues with central government grants, the tax effort of municipalities that are beneficiaries of equalisation grants decreases with the marginal equalisation rate. The results obtained in this paper are in line with the mechanism of yardstick competition identified with respect to local taxation in Polish municipalities [**Swianiewicz, Łukomska, 2015**; **Banaszewska, 2022a**].

Our result is comparable to those obtained by **Baretti et al. [2002]**, **Liu and Zhao [2011]**, and **Rodríguez [2013]** despite significant institutional differences. The dependence on external grants among the treated municipalities rose in two ways: due to more generous vertical grants and because of more lenient local tax policies. According to previous literature (e.g. **Pisauro [2001]**; **Rodden et al. [2003]**), an excessive reliance on external grants may be detrimental to budgetary discipline.

17 The results discussed in this subsection are available from the author upon request.

18 We reran these regressions for the pre-treatment period considering only the data for 2005 and 2006. The conclusions remain unchanged. The results are available from the author upon request.

We can also conclude that shifts in an institutional setting trigger prolonged changes in local fiscal policies. Moreover, the effect inflates after a few years and remains significant over the medium term. This implies that any modifications in the sub-national fiscal framework should be preceded by thorough consultations and analyses. An interesting avenue for future research is to test whether a more generous equalisation scheme has an impact on the sustainability of local budgetary policies.

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Appendix

Table A1. Varying post-treatment periods in difference-in-differences estimates of tax effort with respect to real estate taxes

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	2008	2008 & 2009	2008–2010	2008–2011	2008–2012	2008–2013	2008–2014	2008–2015	2008–2016
Diff-in-diff	−2.843***	−2.607***	−2.038***	−2.100***	−2.387***	−2.359***	−2.066***	−1.728***	−1.534***
	(0.491)	(0.441)	(0.402)	(0.388)	(0.376)	(0.366)	(0.337)	(0.329)	(0.331)
Natural log of population	28.12***	33.03***	5.414	−3.438	2.816	9.547*	11.65**	7.783	−2.250
	(9.858)	(9.435)	(6.189)	(6.263)	(5.719)	(5.734)	(5.325)	(5.126)	(4.752)
Population density	−0.114**	−0.0832	−0.103**	−0.113**	−0.0859*	−0.0882*	−0.0574*	−0.0358	−0.0144
	(0.0524)	(0.0563)	(0.0492)	(0.0550)	(0.0505)	(0.0485)	(0.0335)	(0.0269)	(0.0204)
Unemployment	−0.290***	−0.251***	−0.294***	−0.333***	−0.337***	−0.341***	−0.355***	−0.358***	−0.297***
	(0.0593)	(0.0568)	(0.0534)	(0.0539)	(0.0538)	(0.0543)	(0.0545)	(0.0542)	(0.0529)
Average salary per capita	0.00130	0.00277**	0.00262**	0.00292***	0.00342***	0.00388***	0.00425***	0.00485***	0.00433***
	(0.00151)	(0.00130)	(0.00114)	(0.00106)	(0.00103)	(0.00106)	(0.00108)	(0.00106)	(0.000981)
Share of population at post-production – pre-production age	0.372*	0.633***	0.296**	0.169	0.426***	0.640***	0.821***	0.844***	0.737***
	(0.222)	(0.196)	(0.148)	(0.133)	(0.128)	(0.133)	(0.129)	(0.130)	(0.117)
Debt-to-revenues ratio	−0.629	0.424	0.706	0.281	0.958	0.821	0.745	0.361	0.337
	(1.442)	(1.244)	(1.045)	(0.865)	(0.810)	(0.801)	(0.788)	(0.800)	(0.769)
Share of votes for incumbent mayor in previous 1st election round	0.00698	0.00783	0.00917	0.0115*	0.0163***	0.0177***	0.0172**	0.0176***	0.0191***
	(0.00826)	(0.00858)	(0.00831)	(0.00640)	(0.00614)	(0.00652)	(0.00688)	(0.00625)	(0.00598)
Equalisation grant per capita	−0.0165***	−0.0173***	−0.0133***	−0.0104***	−0.0124***	−0.0113***	−0.00793***	−0.00540***	−0.00613***
	(0.00311)	(0.00287)	(0.00239)	(0.00223)	(0.00221)	(0.00209)	(0.00196)	(0.00188)	(0.00181)
Balancing grant per capita	−0.0114*	−0.0103	−0.0253***	−0.0347***	−0.0403***	−0.0423***	−0.0420***	−0.0463***	−0.0469***
	(0.00629)	(0.00663)	(0.00723)	(0.00751)	(0.00743)	(0.00750)	(0.00731)	(0.00728)	(0.00730)
Shares in PIT and CIT per capita	0.0104***	0.00521*	0.00533**	0.00292	0.000220	0.00102	0.00209	0.00242	−0.000176
	(0.00373)	(0.00310)	(0.00265)	(0.00241)	(0.00233)	(0.00239)	(0.00236)	(0.00235)	(0.00227)
Educational grant per capita	0.00444	0.00414*	−0.000581	−0.00192	−0.00107	−0.00107	−0.00107	−0.00110	−0.00180
	(0.00281)	(0.00232)	(0.00204)	(0.00178)	(0.00169)	(0.00169)	(0.00172)	(0.00176)	(0.00168)
Constant	−164.7*	−210.3***	38.74	115.2**	53.15	−7.726	−32.25	−3.218	85.98**
	(84.50)	(81.04)	(53.00)	(53.19)	(48.46)	(48.55)	(45.82)	(44.38)	(41.26)
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	6,282	7,927	9,488	11,039	12,613	14,141	15,511	16,836	18,163
R-squared	0.273	0.287	0.226	0.189	0.223	0.223	0.204	0.186	0.192
Number of code	1,710	1,748	1,756	1,760	1,772	1,779	1,781	1,783	1,784

Notes: Table reports the results of two-way panel FE regressions.
Treatment group: municipalities with $R \leq 40\%\bar{R}$, control group: municipalities with $40\%\bar{R} < R \leq 75\%\bar{R}$. Pre-treatment period: 2005–2007.
Robust standard errors clustered at municipality level in parentheses. Significance levels denoted as: * – $p < 0.1$, ** – $p < 0.05$, *** – $p < 0.01$.

Source: Author's own elaboration.

Table A2. Difference-in-differences estimates of fake outcomes

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Expenditures per capita		Investment expenditures per capita		Debt-to-revenues ratio	
	A. Pre-treatment: years 2005–2007					
Diff-in-diff	25.99*	–24.03	11.39	–7.745	–0.0120***	–0.00151
	(14.88)	(16.16)	(12.96)	(13.60)	(0.00418)	(0.00439)
Controls	NO	YES	NO	YES	NO	YES[a]
Municipality FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	19,569	19,511	19,569	19,511	19,573	19,515
R-squared	0.606	0.628	0.162	0.183	0.304	0.311
Number of code	1,786	1,786	1,786	1,786	1,786	1,786
	B. Pre-treatment: years 2005 & 2006					
Diff-in-diff	30.30**	–18.56	15.79	–2.082	–0.0122***	–0.00169
	(15.34)	(16.82)	(13.23)	(13.93)	(0.00427)	(0.00455)
Controls	NO	YES	NO	YES	NO	YES[a]
Municipality FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	18,008	17,952	18,008	17,952	18,012	17,956
R-squared	0.592	0.613	0.157	0.175	0.297	0.304
Number of code	1,783	1,783	1,783	1,783	1,783	1,783

Notes: [a] – excluding control variable "debt-to-revenues ratio."
Robust standard errors clustered at municipality level in parentheses. Significance levels denoted as: * – $p < 0.1$, ** – $p < 0.05$, *** – $p < 0.01$.
Table reports the results of two-way panel FE regressions.
Treatment group: municipalities with $R \leq 40\%\bar{R}$, control group: municipalities with $40\%\bar{R} < R \leq 75\%\bar{R}$

Source: Author's own elaboration.

Table A3. Difference-in-differences estimates of fake treatment and control groups on tax effort with respect to real estate taxes

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Treatment group: municipalities with $92\%\bar{R} \leq R \leq 150\%\bar{R}$) and $D \geq \bar{D}$;control group: municipalities with $75\%\bar{R} < R < 92\%\bar{R}$		Treatment group: municipalities with $R > 150\%\bar{R}$, control group: municipalities with $92\%\bar{R} \leq R \leq 150\%\bar{R}$ and $D \geq \bar{D}$		Treatment group: municipalities with $R > 150\%\bar{R}$, control group: municipalities with $75\%\bar{R} < R < 92\%\bar{R}$	
	A. Pre-treatment: years 2005–2007					
Diff-in-diff	–0.187	0.116	–0.968*	–0.771	–1.231**	–0.104
	(0.350)	(0.352)	(0.530)	(0.505)	(0.620)	(0.594)
Controls	NO	YES	NO	YES	NO	YE[S]
Municipality FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	7,832	7,820	3,628	3,624	6,658	6,642
R-squared	0.119	0.140	0.059	0.095	0.116	0.145
Number of code	1,133	1,132	415	414	1,137	1,135
	B. Pre-treatment: years 2005 & 2006					
Diff-in-diff	–0.231	0.163	–0.752	–0.590	–1.106	0.222
	(0.334)	(0.341)	(0.545)	(0.522)	(0.689)	(0.700)
Controls	NO	YES	NO	YES	NO	YE[S]
Municipality FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	7,260	7,248	3,347	3,343	6,175	6,159
R-squared	0.126	0.149	0.062	0.100	0.122	0.152
Number of code	1,125	1,124	411	410	1,128	1,126

Notes: Table reports the results of two-way panel FE regressions.
Robust standard errors clustered at municipality level in parentheses. Significance levels denoted as: * – $p < 0.1$, ** – $p < 0.05$, *** – $p < 0.01$.

Source: Author's own elaboration.