CESifo WORKING PAPERS

10354
2023

March 2023

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Marko Koethenbuerger, Gabriel Loumeau

CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de
Editor: Clemens Fuest
https://www.cesifo.org/en/wp
An electronic version of the paper may be downloaded
· from the SSRN website: www.SSRN.com
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CESifo *Working Paper No. 10354*

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Abstract

The transfer elasticity of income tax rates is an important parameter in public finance. Given the significant fiscal autonomy of Swiss municipalities, Switzerland is an ideal setting for examining behavioral responses to tax policy. Using a regression kink design, we find robust causal evidence that transfers have a positive local average treatment effect on municipal expenditures while leaving the income tax rate (and other tax rates) unchanged. Thus, 'money sticks where it hits', providing comprehensive support for the flypaper effect, including with regard to income tax responses.

JEL-Codes: C210, H720, H770.

Keywords: public finance, regression kink design, flypaper effect, transfers.

*Marko Koethenbuerger**
ETH Zürich, Department of Management, Technology, and Economics
Leonhardstrasse 21
Switzerland – 8092 Zurich
koethenbuerger@ethz.ch

Gabriel Loumeau
VU Amsterdam
Department of Spatial Economics
De Boelelaan 1105
The Netherlands – 1081 HV Amsterdam
g.s.loumeau@vu.nl

*corresponding author

We are grateful to seminar and conference participants in Aix-en-Provence, Bath, Barcelona, Copenhagen, Helsinki, Lake Tahoe, London, Lugano, Mannheim, Munich, Washington and Zurich. The paper has first been presented at the 6th Sinergia Workshop, Lugano, October 23, 2015. In particular, we are grateful for the valuable comments made by David Agrawal, Gabriel Ahlfeldt, Lars Erik Borge, Florian Chatagny, Peter Christensen, Matz Dahlberg, Patricia Funk, Benny Geys, Oliver Giesecke, Erzo F.P. Luttmer, Costanza Naguib, Agustin Redonda, Frédéric Robert-Nicoud, Claus Thustrup Kreiner and Albert Sollé-Ollé.

1 Introduction

Fiscal transfers constitute a significant share of local governments' incomes. Receiving transfers influences local policy choices in various ways. In a system with 'frictionless' local policy-making, a government is expected to spend transfer income on both tax rate reductions and expenditure increases, with the exact split between these responses being determined by constituents' preferences. Despite its importance of the transfer elasticity of tax rates, particularly on income tax rates, in academic and policy work, there is little empirical evidence regarding this behavioral response. Income taxes are an important source of tax revenue for governments. Their responses are central elements in different studies, including analyses of the effectiveness of fiscal stimulus packages (Romer and Romer, 2010; Mineshima et al., 2014); research on the spatial interaction of tax policies (Eugster and Parchet, 2019; Parchet, 2019); finding regarding the effect of equalizing transfers (Fajgelbaum and Gaubert, 2020; Henkel et al., 2021); and for analyses of Leviathan-type frictions in local policy responses (Lutz, 2010; Leduc and Wilson, 2017).

The existing empirical works exploring the fiscal responses of local governments focus on expenditures within local budgets, examining how transfers to specific expenditure programs diffuse across different subcategories of public spending. This focus is not surprising since local governments must enjoy sufficient tax autonomy over important and salient taxes in order for behavioral responses to be studied. With no tax autonomy, a government is *mechanically* constrained to spend additional transfer income on public service provision. In practice, federal fiscal constitutions are seldom balanced in terms of local expenditure and tax autonomy (OECD, 2021; Reschovsky, 2019).[1] Most federal states exhibit a high degree of expenditure decentralization but only a small (if any) degree of tax autonomy at the local level, which limits the ability or even makes it impossible to analyze how tax policy responds to transfers.

In this paper, we analyze municipal policy responses to unconditional transfer payments in the canton of Vaud, Switzerland. In international comparisons, Swiss

[1] Reschovsky (2019) applies the OECD methodology in assessing tax autonomy of US local governments and arrives at similar levels of tax autonomy as for the average OECD country.

municipalities enjoy a significant degree of fiscal autonomy with regard to both expenditures and revenue, providing a sufficient behavioral scope to adjust tax rates in response to higher transfer income. For instance, municipalities levy an income tax, a profit tax, a land tax, and an inheritance tax. Income tax is an important revenue source for municipalities.[2] It is a salient tax instrument and municipalities frequently adjust the income tax rate (sometimes in relatively small amounts), demonstrating that tax policy rigidities are not overly significant. Municipalities choose a tax rate for each of the tax bases while the tax base is defined by cantonal legislation. Tax rates thus fully summarize tax policy choices at the municipal level.

Using a regression kink design (RKD), the empirical analysis shows that municipalities do not adjust the income tax rate (or other tax rates) in response to higher transfers. Instead, they use additional transfers to increase expenditures. In our preferred specification, we observe an expenditure change of CHF 0.9 when transfers rise by CHF 1. The expenditure response spreads through different spending categories, including personnel, municipal goods, and investment spending. In line with higher spending on personnel, a transfer stimulates an increase in public sector employment. In documenting the findings, we analyze a wide range of expenditure and revenue categories, test for the identifying assumptions of the empirical approach, and provide a variety of robustness checks, including (non-significant) placebo treatments. The concentration of the fiscal responses to the expenditure of the local public budget is not related to missing tax autonomy. The response is behavioral in nature.

These findings relate to different economic issues. First, the zero behavioral response of tax rates is useful for the quantitative analysis of fiscal policy programs. It provides insight into the anatomy of local fiscal responses that co-determine the multiplier effects of government spending. In many countries, at least a portion of fiscal stimulus funds are spent with the help of local governments, thereby potentially turning incoming transfers into local expenditure and tax responses. Tax and expenditure multipliers tend to be quantitatively distinct, leading to the question

[2]To illustrate the relevance of local income taxation in Switzerland, the amount raised at the municipal level from income taxation is 1.63 times larger than at the federal level.*Source:* 2018 Swiss Tax Conference.

of which multiplier estimate to choose for analyzing overall policy effects (Romer and Romer, 2010; Ramey, 2011; Mineshima et al., 2014). Our findings suggest that, following a rise in transfer income, the expenditure multiplier appears to be relevant in computing the effects of a policy.[3] This is the case even when lower-level governments that serve as fiscal middlemen in disseminating fiscal stimulus funds have the option to reduce taxes.[4] This result is also useful for calibrating models that quantify the macroeconomic effects of fiscal policy programs (Baqaee and Farhi, 2022; Faria-e Castro, forthcoming) or the spatial implications of long-term fiscal transfer programs (Fajgelbaum and Gaubert, 2020; Henkel et al., 2021). The studies frequently assume, both implicitly or explicitly, that local tax rates stay constant and that stimulus spending leads to more public spending. Our empirical results provide an empirical foundation for this assumption.

Second, it appears that 'money sticks where it hits'. The finding that transfer income fully stays within the public budget, despite its fungibility, echoes the flypaper effect phenomenon (Hines and Thaler, 1995; Inman, 2008). The literature builds on the central prediction of Bradford and Oates (1971) who posed that, in a system with 'frictionless' local policy-making, a government recognizes the fungibility of public funds and spends transfer income on both tax rate reductions and expenditure increases, with the exact split between these responses being determined by constituents' preferences. A central element of this reasoning is the income tax response, which is hard to analyze empirically, given the limited local tax autonomy. Unsurprisingly, in empirical works, income tax responses are the poor cousin of expenditure responses. These works emphasize the issue of whether transfers to specific expenditure programs diffuse across different public spending subcategories or whether they stay in a targeted spending category, thus analyzing the flypaper effect on the expenditure side of the public budget.[5] The fiscal and

[3] In this context, we contribute to the long-standing issue whether transfers generate employment effects in the public sector. Different to other studies, which analyze local employment effects, we find transfers to increase local public employment, both for administrative and non-administrative tasks. For instance, also exploiting kinks in transfer policies, Lundqvist et al. (2014) find no statistically significant effects on total local public employment in Swedish municipalities and can exclude even moderate effects.

[4] The finding might provide suggestive evidence why the degree of local tax autonomy is not taken to be an important determinant of the size of the fiscal multiplier (Batini et al., 2014).

[5] See Knight (2002); Baicker and Gordon (2006); Singhal (2008); Lundqvist et al. (2014); Leduc and Wilson (2017) among others.

political institutions in the canton of Vaud both provide an ideal testing ground for Bradford and Oates' central income tax rate prediction (Bradford and Oates, 1971) and for establishing evidence of the flypaper effect accounting for adjustments in income tax rates and other tax rates.

Empirical research on the flypaper effect in a setting with significant local fiscal autonomy with respect to expenditure and revenue, including broad-based tax instruments such as income taxes is rare.[6] One exception is the analysis in Dahlberg et al. (2008), which provides evidence of higher public spending in response to transfer income, but no significant increase in income tax rates in Swedish municipalities between 1996-2004. Dahlberg et al. analyze municipalities that received higher transfers because of sizable out-migration flows. In our setting, the municipalities are not economically distressed. Distress might limit the *de facto* fiscal autonomy of municipalities by impairing their ability to raise taxes and thereby spend funds on public service provision.[7] From this perspective, municipalities in our sample enjoy *de jure* and *de facto* fiscal autonomy, as assumed in Bradford and Oates (1971). The observed expenditure rise in response to transfers is unrelated to the potentially higher propensity of municipalities to spend out of transfer income in times of fiscal distress.[8]

Third, the absence of a tax policy response does not support a rational government model with regard to explaining local policy choices.[9] This might be surprising given that 'voice and exit' options tend to be stronger locally and are frequently expected to guarantee a strong alignment of local constituents' preferences and policy choices (Oates, 1999, 2005).[10] Local income taxation is considered an im-

[6] Gordon (2004) and Lutz (2010) resort to the more fiscally constrained tax environment of US school districts, which levy property taxes on housing. They report evidence that transfers decrease property taxes.

[7] Brooks and Phillips (2008) document a similar effect in the context of *de jure* constraints. Property tax limits in US school districts lead to an underprovision of public spending and a strong rise in expenditures when the implicit constraint on spending behavior is relaxed via incoming transfers.

[8] Relatedly, the very strong flypaper effect in Leduc and Wilson (2017) obtains in the midst of a severe economic recession when the 2009 American Recovery and Reinvestment Act has been implemented. The finding complements empirical work showing stronger effects of fiscal policy in periods of economic and fiscal distress relative to 'normal' times, c.f. Perotti (1999) and Auerbach and Gorodnichenko (2012).

[9] A rational government is expected to spend transfer income on both tax rate reductions and expenditure increases, with the exact split between these responses following constituents' preferences (Bradford and Oates, 1971).

[10] The exit and voice options might result from increased mobility of individuals at lower levels of government and stronger incentives to engage in the political process, thereby enhancing political

portant fiscal mechanism for strengthening 'voice and exit' options and securing optimal public service provision (Tiebout, 1956; Gadenne, 2017). 'Voice and exit' options are amply available at the local level in Switzerland. At the municipal level, mobility costs are quite low, given the small geographical scale of Swiss municipalities. Additionally, voters have various ways to politically influence policy-making. The municipalities in our sample have a parliamentary system with strong direct democratic elements in the form of referendums and initiatives voters can call for between parliamentary elections.

Finally, the transfer elasticity estimates capture the income effect of grants on tax rates and expenditures. The estimates help to quantify the welfare implications of grant policies toward subnational governments. For instance, based on estimates of the total effect of transfers on tax rates, the estimate of the income effect of transfers on tax rates is helpful in calculating the substitution effect (or tax price effect), which is relevant for quantifying the efficiency effect of formulaic transfers, such as matching grants and equalization transfers (Hoxby, 2001; Egger et al., 2010; Jackson et al., 2016). Similarly, the estimates are helpful to quantify the welfare effects of government policies targeted toward private households, such as education and job training programs (Hendren and Sprung-Keyser, 2020). These are frequently implemented through the help of local governments acting as fiscal middlemen. The non-response in tax rate suggests that there is no 'leakage' effect in the form of local tax responses that need to be accounted for when computing the policy's net effect, inclusive of effects on subnational budgets.

The transfer policy analyzed in our study does not favor expenditure increases over tax rate reductions or vice versa. Transfer payments have no strings attached. The transfer income can be spent freely according to the political preferences of a municipality. The transfer has no name attached to it, it is formulaic, and it is permanent. The transfer schedule design addresses concerns such as (i) misclassifying conditional transfers as unconditional transfers (Hines and Thaler, 1995; Inman, 2008); (ii) transfers carrying an implicit conditionality from donor institution that they are expected to be spent on certain programs (Besley and Case, 2000; Singhal, 2008)[11]; (iii) a transfer label leading to framing effects and mental accounts

accountability.

[11] In particular, this applies to discretionary transfers where political influence is strong and non-

that prompt transfer recipients to spend on the expenditure categories mentioned in the name of the transfer program[12]; (iv) governments shying away from tax rate reductions, which might have to be undone when a temporary transfer expires, and (v) public officials lobbying for transfers, thereby creating endogeneity concerns (Knight, 2002).[13]

To rule out potential estimation biases and provide a causal interpretation for our estimates, we use an institutional detail in Vaud's transfer formula. The amount of transfer income received by each municipality is solely a function of its population, and the transfer schedule exhibits kinks at fixed population thresholds. The per-capita amount of transfers for the population mass above the threshold increases, which provides is with a local, quasi-natural experiment that allows us to apply an RKD. We compare municipalities just above (treatment) and just below (control) the kinks to identify the causal effect of transfers on municipal expenditures and tax rates. The change in transfer income when a municipality crosses the population threshold is significant for the municipality, but has few aggregate fiscal implications, so adjustments in other fiscal flows between upper-level governments and the municipality are negligible. This feature addresses concerns that other changes in the fiscal system may bias the estimation results.

The paper is organized as follows. We lay out the theoretical hypothesis in Section 2 and explain the transfer system of the canton of Vaud in Section 3. We present our empirical approach in Section 4 and discuss the empirical results in Section 5. Finally, we draw some conclusions in Section 6.

2 Theoretical Hypothesis

In this section, we present a simple model to predict how a rational government responds to an increase in an unconditional transfer. Consider a representative household that derives utility from consuming private and public goods, c and g, respectively. The associated utility function $u(c, g)$ is quasi-concave, continuously

compliance with the implicit conditionality might impact transfer allocations in the future.

[12] See Kahneman and Tversky (1979) and Rabin (1998), among others.

[13] Knight (2002) looks at discretionary transfers. Incentives to lobby for these transfers are stronger as compared to formulaic transfers studied here. They are paid out according to the formula of the transfer scheme.

differentiable and exhibits a positive and declining marginal utility of private and public consumption, $u_i > 0 > u_{ii}$, $i = c, g$.[14] The household receives an income I and pays taxes T to the local government, which yields the private budget constraint $c = I - T$.[15] The local government finances public service provision out of its own-source tax revenues T and an unconditional transfer Tr from an upper-level government. Hence, the local public budget constraint is $g = T + Tr$.

The government chooses the tax T to maximize the utility of the household. Accounting for the private and public budget constraints, the first-order condition for T is

$$-u_c(c^*, g^*) + u_g(c^*, g^*) = 0, \tag{1}$$

where the superscript * denotes the optimal consumption values. When comparing the response in consumption to a higher level of private income I and transfers Tr, the optimal government behavior implies:

$$\frac{dg^*}{dTr} = \frac{dg^*}{dI} \quad \text{and} \quad \frac{dc^*}{dTr} = \frac{dc^*}{dI}. \tag{2}$$

As shown by the first equation in (2), the government's response in public consumption is independent of the source of funds. Independent of whether total local resources increase due to a higher private income or higher transfer, the government has enough flexibility in adjusting the tax payment to realize the same public consumption level. The only difference is the tax response necessary to realize it.[16] Similar reasoning holds in the case of the private consumption response.

Tax adjustment costs might be a potential reason why a government does not respond in line with (2). As documented below, tax adjustment costs are not overly significant for Swiss municipalities. However, government policy responses are not congruent with the responses in (2) in the presence of the flypaper effect. The flypaper effect entails that, following a rise in Tr, more money remains in the public

[14] Subscripts denote partial derivatives.

[15] For simplicity, the income tax is non-distortionary. Adding tax distortions does not fundamentally change the behavioral response of the government. Empirically, tax distortions less likely rationalize why transfers stick on the expenditure side of the public budget (Hines and Thaler, 1995).

[16] Following (2), the tax responses satisfy $dT/dI = 1 + dT/dTr$.

sector than predicted by the optimal choice (1), thus

$$\frac{dg^{fp}}{dTr} > \frac{dg^{*}}{dTr},$$

where g^{fp} denotes public consumption in the presence of the flypaper effect.

Identifying the flypaper effect is empirically challenging. In general, it requires exogenous variation in both I and Tr. Such variation is inherently difficult to find in practice, leaving many empirical papers relaying on variation in Tr only. In this situation, the missing variation in I needs to be substituted with adequate conditions to detect deviations from the responses in (2). For instance, observing only an increase in public spending following a rise in Tr, and no adjustment in taxes (and thereby private consumption) is not in line with the prediction (2) when the income elasticity of private consumption is strictly positive, a condition that receives support in empirical work (e.g., Hines and Thaler, 1995; Inman, 2008; Brückner et al., 2012).[17] Thus, observing the responses $dT/dTr = 0$ and $dg/dTr > 0$ is sufficient to conclude that the responses are inconsistent with rational government behavior. This prediction is used empirically to test for the presence of the flypaper effect.

3 Municipal Finance in the Canton of Vaud

In the empirical analysis, we use municipalities in the canton of Vaud as a testing ground. Municipalities in the canton of Vaud (as well as in other Swiss cantons) enjoy a huge degree of fiscal autonomy, both on the expenditure and tax revenue side. Municipalities are in charge of the provision of a variety of public services such as child care, primary schooling, public infrastructure, and social policy, among others. Municipalities have the authority to levy different types of taxes. They levy an income tax, a profit tax, a property tax, and an inheritance tax, for instance.[18] The income tax is an important source of revenue for municipalities. In 2011, in-

[17] The reason why the income elasticity is of relevance at this point is that, if a zero private consumption response following an increase in transfers Tr is optimal for a rational government, it must also be optimal to leave private consumption unchanged following an increase in private income I; c.f. (2). Brückner et al. (2012) estimate income elasticities of government spending below unity, which suggests that a response $dc/dI = 0$ is not in line with rational government decision-making.

[18] The property tax is paid by the owner or the usufructuary of a building, and its base is the value of the building. Revenues from the property tax represent around 5% of municipal revenues.

come tax revenues amount to roughly 65 percent of municipal own-source revenues and 35 percent of total municipal revenues. Municipalities raise via income taxation CHF18 billion, whereas the federal level 'only' raises CHF11 billion (i.e., 1.63 times more).[19] The fiscal environment provides a unique measure to estimate municipal tax responses. Municipalities levy a tax rate (tax multiplier) that shifts the progressive income and wealth tax schedule of upper-level governments. The tax base is defined by cantonal legislation. The tax rate thereby compactly summarizes tax policy choices at the municipal level.[20]

The income tax is a salient tax instrument. In addition to the size of the tax payment, the system of income tax collection contributes to tax salience. Income taxes are not directly deducted at the firm level. Rather, based on tax obligations in previous years, taxpayers are asked to make multiple installments during the tax year and to file an income tax declaration at the end of the year, which determines the actual tax obligation. This leaves taxpayers well-informed about their income tax payments and makes it a central topic in public debates and political campaigns.

Municipalities frequently adjust income tax rates. A municipality changes the income tax rate almost every three years. The resulting distribution of tax rate changes is concentrated closely around zero, as depicted in Figure 1. In 77 percent of the cases, municipalities change the tax rate by less than 10 percent. The observed tax setting behavior appears to be quite flexible, being inconsistent with the existence of major adjustment costs.

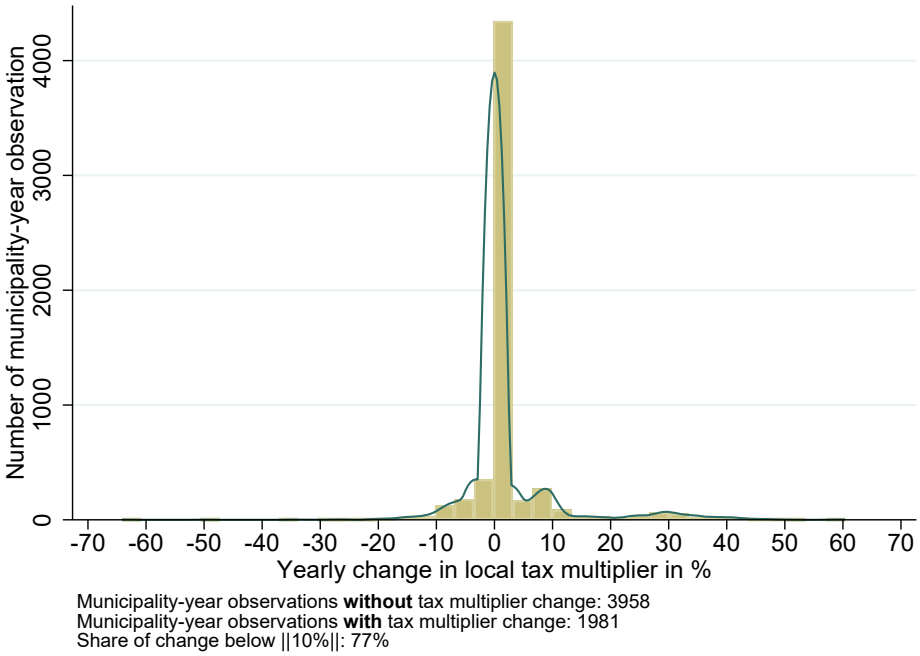
Despite own-source tax revenues, municipalities receive grant income from the cantonal government. The overall municipal grant system in Vaud is constituted of three *independent* grants: a solidarity, a social bill, and a population grant.[21] These grants represent on average 8%, 20% and 5%, respectively, of the overall municipal revenues. The first two grants aim at redistribution and at providing social bene-

[19] Cantons raise a total of CHF26 billion for income taxation. *Sources:* Swiss Tax Conference; Vaud Statistics.

[20] This is contrary to environments in which governments directly choose a progressive tax schedule in combination with tax exemptions. The associated tax policy responses are multi-dimensional and inherently difficult to identify.

[21] On top of these grants, municipalities with a geographical location inducing higher costs in terms of transport or forest maintenance receive additional funding that must be spent on these items. These funding represent on average 2% and 0.4%, respectively, of the overall municipal revenues.

Figure 1: Frequency of Tax Rate Changes



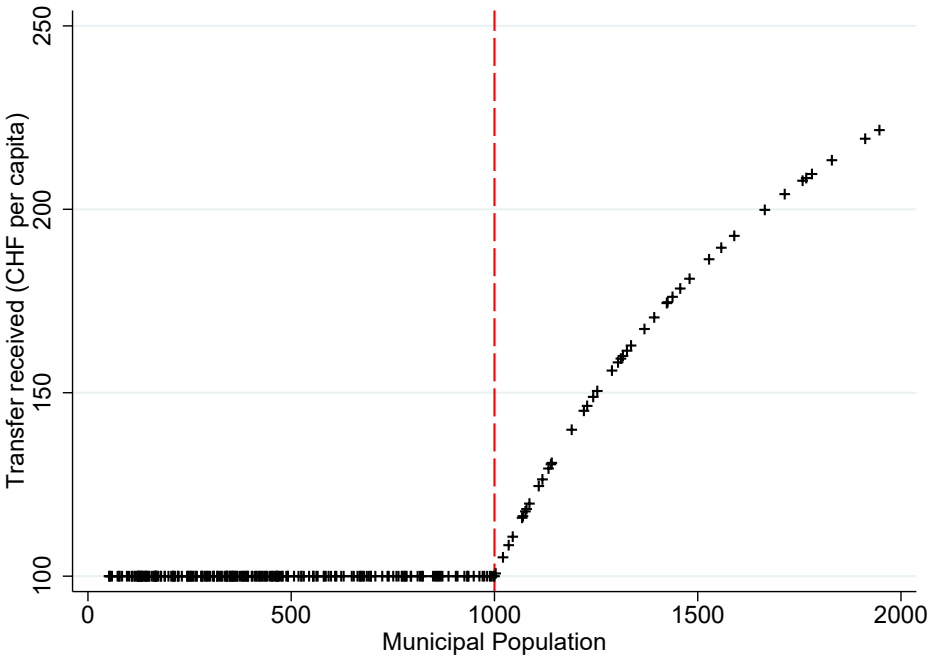
Notes: The figure depicts the frequency of yearly changes in the municipal income the tax rate (multiplier) over the period 2012 to 2020 (municipality-year observations).

fits, respectively. While the amount received from the two types of grants depends on several municipal factors (fiscal capacity and the level of taxes, for instance), it is a linear function of municipal population.

Contrary to the first two grants, the population grant depends on municipal population only. Importantly, the *marginal* schedule of this grant exhibits discontinuities at some fixed population thresholds.[22] For instance, for the first 1000 inhabitants a municipality receives a per-capita payment of CHF 100. The per-capital payment increases to CHF 350 for each inhabitant above 1000. For instance, a municipality with 2'154 inhabitants, receives 1'000 $\times$ CHF 100 + 1'154 $\times$ CHF 350 = CHF 503'900; which makes an overall per-capita amount of 503'900/2'154 = CHF 233.94 . The discontinuity in the marginal per-capita grant translates into a kink in the overall grant schedule. As illustrated in Figure 2, the per-capita amount received by all municipalities in Vaud in 2011 around the first kink sharply follows the grant policy. The transfer payments exhibit a kink at a population count of 1000 and tend to converge to the higher marginal per-capita payment as population in-

[22]Figure A1 shows the *marginal* amount that a municipality would receive for one additional inhabitant.

Figure 2: A kinked transfer schedule



Notes: Each black cross represents a municipality. The vertical axis displays the total *per capita* amount received by each municipality from the population grant in 2011. The full transfer schedule is presented in Figure A2.

creases. The key advantage of analyzing this grant is that the kinked schedule allows us to apply a quasi-experimental method that permits the estimation of the causal effect of grants on municipal expenditures and tax rates. The first kink will be central to our empirical analysis.[23] The focus on the first kink is related to the requirement of sufficient density of municipalities around the cutoff, as detailed in the next section.

4 Empirical Approach

We start out by describing the data used in this paper, discuss our identification strategy, and finally present validity tests of the empirical approach.

[23]The entire transfer schedule (per capita) is displayed in Figure A2.

4.1 Data Description

The data used in this paper is provided either by the Federal Statistical Office (OFS) and by the Cantonal Statistical Office of Vaud (SV). All variables are gathered at the municipal level. We study the period from 2011 to 2020. The beginning of the sample period is due to the implementation of the population grant in 2011, following a 2009 cantonal law. Table A1 provides descriptive statistics of the transfer data and some covariates. We report the mean of each variable both overall, as well as for municipalities below and above the cutoff of 1000 with a population size in the interval $[800, 2000]$. In the table, we do not include very small municipalities since they are subject to a different electoral system, which is explained in more detail below. The difference between what municipalities above and below the cutoff receive from the population grant represents the intensity of the treatment. Overall, municipalities above the cutoff receive on average 32.39% more from the population grant, which amounts to CHF 48.59 more per capita. Moreover, Table A1 reveals that municipalities above and below the cutoff are quite similar in terms of the selected covariates.[24]

4.2 Identification Strategy: Regression Kink Design

To identify the causal effect of transfers on local policy choices, we adopt a sharp RKD (Lee and Lemieux, 2010; Card et al., 2015; Calonico et al., 2014). Following the notation by Calonico et al. (2020), we can express the estimation approach as follows. Consider a random sample $(Y_i, T_i, X_i)'$, $i = 1, 2, ..., n$. Y_i denotes the local policy variable of interest, T_i denotes treatment status, and X_i denotes the observed population, i.e., the continuous running random variable, which determines treatment assignment for each unit in the sample. Further, denote by $c = 1000$ the sharp cutoff above which municipalities are treated, such that: $T_i = \mathbb{1}(X_i \geq c)$. Using the potential outcomes framework, $Y_i = Y_i(0) \cdot (1 - T_i) + Y_i(1) \cdot T_i$, with $Y_i(1)$ and $Y_i(0)$ denoting the potential outcomes with and without treatment, respectively, for each unit. The parameter of interest in a sharp RKD is the derivative of the policy variable at the cutoff, which is:

[24] A statistical analysis of the smoothness of covariates around the cutoff is presented below, also including a larger set of covariates.

$$\tau = \frac{\partial}{\partial x}\mathbb{E}[Y_i(1) - Y_i(0)|X_i = x]\Big|_{x=c}. \tag{3}$$

In estimating the treatment effect, we use observations in the interval $[c-h, c+h]$ around the cutoff c. We select an optimal bandwidth h that minimizes an approximation to the mean squared error (MSE) of the point estimator $\tau(h)$. To control for the direct effect of population on the outcome variable, we employ local population polynomials whose order is optimally chosen.[25]

We estimate the treatment effect of transfers on local policy choice with and without covariates. When including covariates, we follow the approach in Calonico et al. (2019). Two types of covariates are considered: First, we test the robustness of our results to the inclusion of year dummies and, second, we include municipal socio-economic covariates.

4.3 Validity of the RKD Approach

A key identifying assumption of the RKD is that all variables (except treatment and the outcome variable) vary smoothly at the threshold. Using a wide range of observables, this assumption is empirically testable.

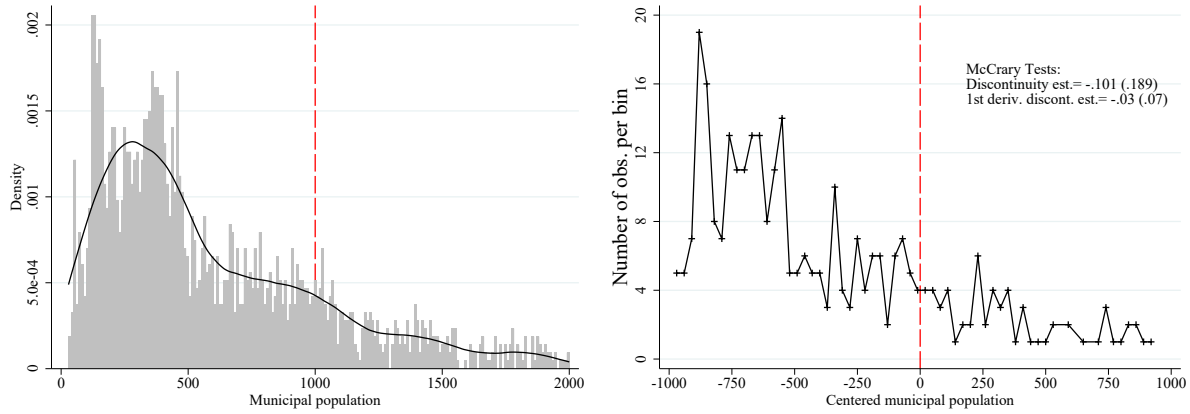
Validity test 1: Smooth running variable

We begin by plotting the distribution of the assignment variable, as displayed in Figure 3a. Based on simple eyeballing, the figure does not reveal any irregular patterns at the cutoff value of 1000. To confirm this initial diagnosis, we perform a McCrary test following McCrary (2008) and its extension by Landais (2015) to assess the smoothness of the variable and of its first derivative around the threshold. The results of both tests, displayed in Figure 3b, reject the existence of both a discontinuity and a kink.

[25] For a thorough discussion, as well as precise examples, on bandwidth choice and the selection of the order of polynomials, see Imbens and Kalyanaraman (2011); Calonico et al. (2014); Cattaneo and Vazquez-Bare (2017).

Figure 3: Variation of municipal population around the kink

(a) p.d.f. of assignment variable (b) Extended McCrary test



Notes: Panel (a) shows the result of a McCrary test following McCrary (2008). Panel (b) presents its extension by Landais (2015) to assess the smoothness of the variable and of its first derivative around the threshold. Municipal population constitutes the running variable, with the sharp cutoff at 1000 inhabitants.

Validity test 2: Smooth covariates around the kink

Table 1 displays the results of the test for the smooth variation of a large array of covariates (including covariates on demography, income, economic activity, land use, as well as public finance) at the threshold. The data covers the sample period 2011 to 2020, except for the public finance data which covers the period 2006 to 2010, i.e. prior to the implementation of the population grant.[26] As shown in Table 1, the covariates appear to vary smoothly around the threshold and, thus, do not exhibit kinks at the threshold.

Validity test 3: Endogeneous sorting and municipal mergers

The transfer schedule in itself might lead to strategic sorting of municipalities. The kinked schedule was partly designed to incentivize municipal mergers. Strategic sorting would pose a problem for our estimation strategy when municipalities merged to have a population just above the transfer threshold. Figure A3 shows no concentration of newly created municipalities (which we label merger 'output') as well as pre-merging municipalities (which we label merger 'input') just above or

[26] As noted above, the transfer mechanism was implemented in 2011, following a cantonal law passed in 2009.

Table 1: Smooth covariates around the kink

	(1)	(2)	(3)	(4)	(5)
Specification	RKD	RKD	RKD	RKD	RKD
Bandwidth	Opt.	Opt.	Opt.	Opt.	Opt.
Pol. order	Opt.	Opt.	Opt.	Opt.	Opt.
	Demography and income				
	(a) Share of people . <20 yo	(b) Share of people 20 $\leq$. < 65 yo	(c) Share of female	(d) Net migration (p.c.)	(e) Median income (p.c.)
Treatment	-0.012	-0.011	0.002	0.005	-0.056
	(0.034)	(0.030)	(0.009)	(0.039)	(0.164)
Obs. left	190	190	252	252	156
Obs. right	154	154	450	463	129
	Economic activity				
	(f) # of firms (p.c.)	(g) # of agriculture workers (p.c.)	(h) # of industry workers (p.c.)	(i) # of service workers (p.c.)	(j) # of public workers (p.c. in 2000)
Treatment	0.001	0.008	-0.044	-0.160	0.002
	(0.009)	(0.009)	(0.080)	(0.098)	(0.002)
Obs. left	230	199	196	225	247
Obs. right	399	373	369	409	450
	Land use				
	(k) Surface (ha)	(l) Urban coverage (ha)	(m) Agriculture coverage (ha)	(n) Forest coverage (ha)	
Treatment	6.682	0.278	1.086	4.173	
	(8.328)	(0.299)	(3.879)	(4.360)	
Obs. left	190	190	190	190	
Obs. right	154	154	154	154	
	Municipal council	**Other fiscal transfers**			
	(o) Number of members	(p) Social bill (CHF pc)	(q) Solidarity grant (CHF pc)	(r) Special grant for forests (CHF pc)	(s) Special grant for transport (CHF pc)
Treatment	-0.055	1.476	-1.095	0.123	0.268
	(0.053)	(6.753)	(0.839)	(0.275)	(1.875)
Obs. left	23	252	252	252	252
Obs. right	17	458	465	458	454
	Past public finance (2006-2010)				
	(t) Income tax rate	(u) Yearly deficit (CHF pc)	(v) Total spending (CHF pc)	(w) Municipal goods spending (CHF pc)	(x) Personnel spending (CHF pc)
Treatment	-0.004	9.476	30.911	4.557	-1.976
	(0.004)	(18.883)	(22.134)	(3.669)	(2.382)
Obs. left	111	111	111	111	111
Obs. right	191	180	195	195	196

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). Optimal bandwidth is estimated for each outcome. Data is provided by the Federal Statistical Office (OFS) and the Cantonal Statistical Office of Vaud (SV). All variables are gathered at the municipal level. The data covers the period 2011 to 2020, except of the public finance data, which covers the period 2006 to 2010, prior to the implementation of the population grant.

below the kinks. This in line with our findings in Table 3 where we find no evidence

for population sorting at the kink.[27]

Validity test 4: Local political organization

Municipalities above 1'000 inhabitants are required to have an elected council, while municipalities below can have an assembly or a council. However, the threshold for having a council was increased from 800 to 1'000 inhabitants in 2005. The lower pre-2005 threshold implies that municipalities that pass the population threshold of 1'000 over the sample period already have a parliamentary system in place. In fact, all municipalities in the sample have a parliament for the full time, except of one that has an assembly for the full time.[28]

Moreover, municipal council size depends on the population size. The rule is not sharp, but prescribes permissible intervals of council size, which range from 25 to 45 members for municipalities below 1'000 inhabitants to 35 to 70 members for those above the cutoff. This allows the municipal council size to vary smoothly around the cutoff, with no discontinuity or kink. Indeed, the empirical result in Table 1 (panel o) does not reveal a discontinuity or kink in the number of council members. Descriptive statistics in Figure A4 support the conclusion.

Validity test 5: Location of treatment and control groups within Vaud

Finally, when analyzing municipal expenditures, it is important to take the location of municipalities into account. If treated or non-treated municipalities were, for example, located around a large urban area, our estimation results could be biased. Figure A5 does not display a systematic geographical pattern, supporting the hypothesis that both groups are as good as randomly located in space.

[27] In general, it might be difficult to fine-tune the population of the newly-created municipality, given the small number of neighboring municipalities, which are potential counterparts in the merger process, and the observation that structural determinants, such as pre-existing fiscal policies, are an important element in the selection of a long-term merging partner (Koethenbuerger and Stettler, 2022). The latter might well be more relevant as compared to the distance to the cutoff.

[28] Results presented in Section 5 hold when controlling for municipality fixed effects. See Table A7.

5 Results

5.1 Full sample analysis

Before turning to the RKD approach, it is possibly interesting to estimate local fiscal response to additional transfers using a log-log specification on the full sample. The corresponding results are presented in Table 2. Columns (1) and (2) study the response in overall municipal spending (in CHF per capita), whereas columns (3) and (4) focus on the income tax rate. Within each pair, the second column includes covariates as well as municipality- and year-fixed effects, whereas the first column does not. We find that municipalities react to additional transfers by additional spending, and not by a lower income tax rate. The estimated effect of transfers on spending is large in magnitude: a 1% increase in transfers per capita leads to a 1.8% increase in overall municipal spending. The finding is in line with the flypaper effects, i.e. 'money sticks where it hits'.

The results might suffer from an estimation bias. Municipalities far away from the population threshold at which transfers change are included in the estimation. For these municipalities, unobservable factors might change as well, which biases the estimation. The potential omitted variable bias might in fact masquerade a downward adjustment in tax rates, i.e. the expenditure estimate might be upward biased and so might be the tax rate estimate due to budget balance. To eliminate such bias, we resort to the RKD approach and focus the analysis on municipalities close to the population threshold.

5.2 RKD approach

Table 3 presents estimations of the treatment effect in equation (3) using municipal expenditures and tax rates as outcomes. It reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). A flypaper effect is likely to be present when transfers are spent on additional municipal expenditures (Table 3, Panel a), while leaving the tax rates unchanged (Table 3, Panel b). In presenting the main findings, we focus on the income tax multiplier as it is the most salient

Table 2: Results using log-log specification

	(1)	(2)	(3)	(4)
	Overall municipal spending (log CHF pc)		Income tax rate (log %)	
Transfers (log CHF pc)	2.028***	1.825***	0.004	0.074
	(0.021)	(0.278)	(0.007)	(0.066)
Obs.	1414	1414	1414	1414
Municipality fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Covariates	No	Yes	No	Yes

Notes: Table reports a log-log model using the amount received in transfers in year t to determine the outcomes, as well as covariates and municipality, and year fixed effects. The dependent variable is the overall municipal spending (log CHF pc, panel a) and the income tax rate (log %, panel b). *Covariates* include municipal population, municipal area, urban coverage, agricultural coverage, and forest coverage. The unit of analysis is the municipality. Robust standard errors are included.

municipal tax instrument and raises most municipal own-source revenues.[29] Column (1) report the results without covariates or year fixed effects. Columns (2) and (3) present results including year fixed effects, with the latter including covariates as well. Finally, Column (4) is similar to Column (1), but uses the full sample for completeness.[30]

Overall, fiscal transfers appear to be almost entirely directed towards higher overall municipal spending. We estimate that an additional Franc in transfer leads to a municipal spending increase between CHF0.59 and CHF0.91. Using the point estimate in Column II, this implies a total increase in municipal spending by municipalities around the threshold of CHF15,850,076. The income tax rate appears unaffected by treatment with an effect below CHF0.01. The effect of the grant in the case of the income tax rate is computed assuming the tax base to be fixed. Hence, an effect of CHF0.01 means that an additional Swiss Franc in transfers leads to a tax rate reduction implying a CHF0.01 reduction in tax revenue.

Even though municipal area (in ha) is balanced around the threshold (Table 1), including it in the set of control variables explains the drop in the point estimate

[29]The fiscal importance goes beyond municipal income tax revenues since the tax multiplier is also used for municipal wealth taxation and profit taxation. Figure 4 and Table A2 present results for less salient tax instruments.

[30]The full sample refers to municipalities between 800 and 2000 residents. Below 800 residents, municipalities host an assembly as legislative body. Above 2000 residents, municipalities are then closer to the third transfer bracket (i.e., from 3000 inhabitants).

Table 3: Results using the RKD approach

	(1)	(2)	(3)	(4)
Specification	RKD	FE-RKD	FE-RKD	RKD
	(a) Overall municipal spending (CHF pc)			
Treatment	44.007***	44.244***	28.606**	41.994***
	(15.169)	(15.156)	(13.355)	(15.189)
Obs. left	252	252	252	252
Obs. right	458	463	458	497
Implied effect of +CHF1 in grant	CHF0.91	CHF0.91	CHF0.59	CHF0.86
	(b) Income tax rate (%)			
Treatment	-0.0002	-0.00004	-0.002	0.00002
	(0.002)	(0.002)	(0.002)	(0.002)
Obs. left	252	252	252	252
Obs. right	467	465	463	497
Implied effect of +CHF1 in grant*	< CHF0.01	< CHF0.01	CHF0.01	< CHF0.01
Bandwidth	Opt.	Opt.	Opt.	Full sample
Opt. pol. order	Opt.	Opt.	Opt.	Opt.
Covariates	No	No	Yes	No

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). The dependent variable is the overall municipal spending (CHF pc, panel a) and the income tax rate (%, panel b). FE refers to year-fixed effects. *Covariates* include municipal population, municipal area, urban coverage, agricultural coverage, and forest coverage. The unit of analysis is the municipality. Robust standard errors are included.
*: The effect of the grant in the case of the income tax rate is computed assuming the tax base to be fixed. An implied effect of CHF0.01 means that an additional Swiss Franc in transfers leads to a tax rate reduction implying a CHF0.01 reduction in tax revenue.

in Column (3). The strong relationship between municipal area and municipal need for spending might explain this. For instance, municipalities with larger sizes will have *ceteris paribus* higher costs of providing basic public services (e.g., roads, water, electricity, etc) than smaller municipalities.[31]

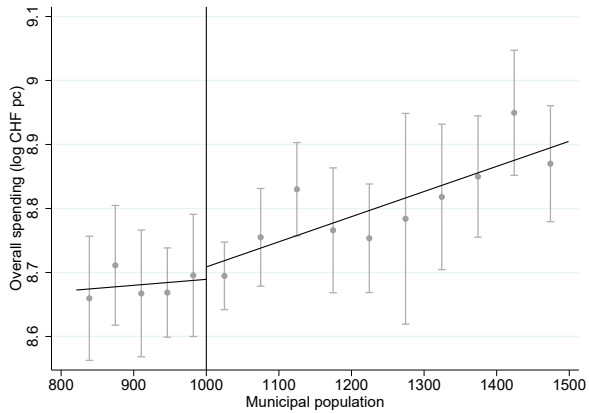
Figure 4 provides a graphical illustration of our results by way of regression kink (RK) plots. In line with the results in Table 3, we observe a clear kink when studying the effect of additional transfers on overall municipal spending (Panel a). Differently, the income tax rate does not exhibit any pronounced different trend above the threshold relative to below (Panel b). Moreover, Panels (c) and (d) conduct the same analysis, but on the pre-reform period (2006-2010). During this period,

[31] In fact, when including municipal fixed effects, which absorb the time-invariant size effect, point estimates are quite aligned across specifications. See the robustness analysis in Section 5.7.

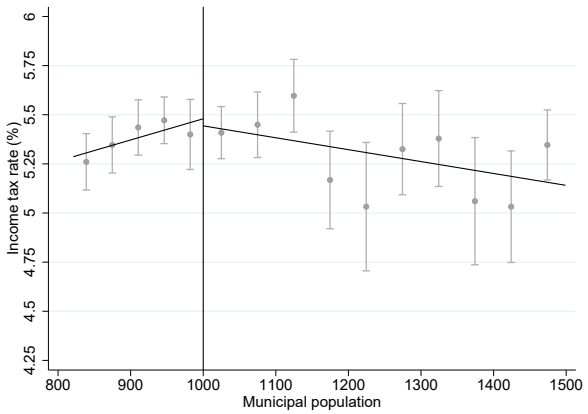
the transfer schedule did not exhibit any kinks at 1000 inhabitants. As expected, we do not observe a kink in the overall spending schedule before 2011.

Figure 4: Regression kink plots

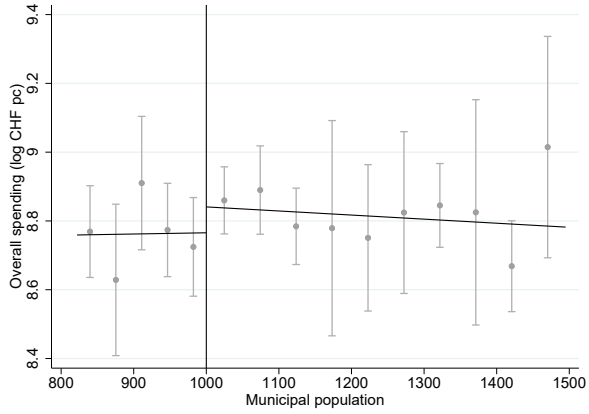
(a) Overall municipal spending



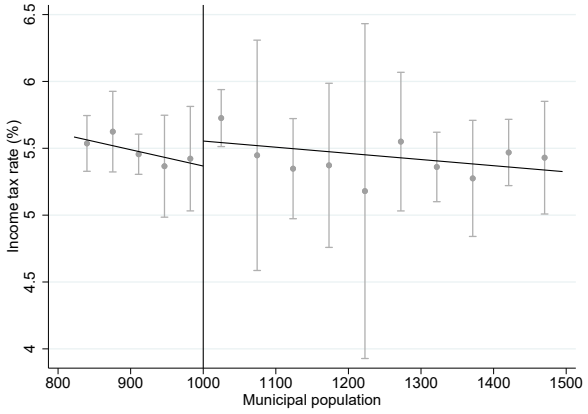
(b) Income tax rate



(c) Overall municipal spending (2006-2010)



(d) Income tax rate (2006-2010)



Notes: Data-driven regression-discontinuity plots following Calonico et al. (2014). 95% confidence intervals are presented. Year-dummies and covariates are included. Municipalities below 800 inhabitants are excluded as their institutional organization differs from municipalities above that threshold.

5.3 Are less prominent local tax rates similarly unaffected?

Local policy-makers may strategically decide to reduce the tax rate on smaller tax bases; thus, allowing them to advertise a decrease in taxes without affecting the municipal budget. Hence, one could expect the income tax rate to remain unaffected while other local tax rates respond to the increase in transfers. Focusing on the property tax rate (Panel a), the inheritance tax rate (Panel b), and the dog tax rate

(Panel c), Table A2 reveals that the increase in fiscal transfers appears not to be associated with an increase in the rates of these local taxes.[32]

5.4 Are all spending categories equally affected?

In Table A3, we study how higher transfers affect different sub-categories of overall municipal spending. Panel (a) focuses on current spending, which includes (among other spending sub-categories) spending on personnel (Panel b) and spending on municipal goods (Panel c). Panel (d) reports investment expenditures. All spending categories are measured in CHF per capita. The estimated coefficients are positive and statistically significant at conventional levels. The finding indicates that the spending response is not concentrated in one sub-category of spending, but spreads out through all three spending categories.

Instead of looking at current and capital spending categories, as done in Table A3, one may look at the effect of transfers on local spending by functional categories. In Table A4, we study the effect on spending on administration (Panel a), public infrastructure (Panel b), public education (Panel c), police (Panel d), social spending (Panel e), and full-time public municipal employment (Panel f). All spending categories are measured in CHF per capita. We find that additional transfer spending does not increase functional spending uniformly. Instead, they are mostly directed at three administrative categories: administration, infrastructure, and police. The findings are in line with those in Table A3. Investment spending will most likely correspond to higher infrastructure spending, whereas the rise in spending on personnel and municipal goods is consistent with the higher spending on administration and police.[33] The non-significant results for public education and social spending might be related to the widespread use of cantonal mandates in these spending areas. Municipalities might well direct the higher expenditures to areas that are less affected by fiscal mandates and that can be flexibly adjusted.

[32] A dog tax is paid by dog owners on a yearly basis. The amount of the tax, which is generally between CHF100 and CHF200, differs from one municipality to another. Farm dogs, guide dogs and rescue dogs are often exempt from the tax.

[33] Unfortunately, the data does not allow for a direct analysis of current and capital spending for different government functions.

5.5 How is public employment impacted?

In Table A5, we analyze how public sector employment is affected by additional transfers. Panel (a) of Table A5 presents the effect on overall public employment at the municipal level, measured in full-time equivalent. Panels (b) and (c) focus on public employment in and outside the general public administration.

We observe a statistically significant and positive effect on overall public-sector employment. The employment effect mirrors the rise in spending on personnel reported in Table A3. The finding differs from Lundqvist et al. (2014). Also exploiting kinks in transfer policies, they find no statistically significant effects on total local public employment in economically-distressed municipalities in Sweden and can exclude even moderate effects.[34] We observe statistically significant effects for both administrative and non-administrative personnel. The findings suggest that grants are effective in stimulating public employment in 'normal' times.

5.6 Do transfers crowd in or crowd out debt finance?

Table 4 tests whether the increase in fiscal transfers affects local debt financing. A negative (positive) effect would hint at a crowding-out (crowding-in) of own financing via local public debt, i.e., higher transfers substitute (complement) the use of public debt to finance spending programs at the municipal level. The results in Table 4 point to a positive effect. Receiving additional transfers is associated with an increase in mid- to long-term debt, whereas short-term debt remains unaffected. The finding is in line with the widespread use of the so-called golden rule of public budgeting, which allows local public debt to finance only investment spending. The rule also exists at the municipal level in the canton of Vaud. Given the institutional background, the crowding-in effect is consistent with the observation that investment spending increases in response to higher transfers, c.f. Table A3.

[34] Looking at sub-categories of public employment, Lundqvist et al. do find a positive and statistically significant effect of grants on administrative personnel.

Table 4: Municipal deficit by length of loan

	(1)	(2)	(3)	(4)
Specification	RKD	FE-RKD	FE-RKD	RKD
	(a) Debt finance via mid- to long-term loans (CHF pc)			
Treatment	32.730**	34.832**	18.818	34.498**
	(15.610)	(15.609)	(14.843)	(15.577)
Obs. left	252	252	252	252
Obs. right	432	434	450	497
	(b) Debt finance via short-term loans (CHF pc)			
Treatment	-4.866	-5.190	-6.123**	-4.127
	(3.163)	(3.192)	(3.072)	(3.061)
Obs. left	252	252	252	252
Obs. right	455	452	451	497
Bandwidth	Opt.	Opt.	Opt.	Full sample
Opt. pol. order	Opt.	Opt.	Opt.	Opt.
Covariates	No	No	Yes	No

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). The dependent variable is debt finance via mid- to long-term loans (CHF pc, panel a) and via short-term loans (CHF pc, panel b). FE refers to year-fixed effects. *Covariates* include socio-economic and geographic variables such as population, municipal area, urban coverage, agricultural coverage, etc. The unit of analysis is the municipality. Robust standard errors are included.

5.7 Robustness analysis

Placebo analysis. The RKD employed in the empirical analysis allows us to run a set of robustness checks to insure that we indeed estimate the treatment effect of higher transfers on fiscal outcomes. In Table A6, we first present a placebo test in which we arbitrarily move the population threshold by +/- 100. The analysis allows us to test whether the kinked transfer schedule is indeed at the origin of the effects observed in the main analysis. Table A6 is organized similarly to Table 3, now with the results being reported for each placebo population threshold separately. We observe no systematic treatment effects in the placebo analysis. The results from both placebo population thresholds support the conclusion that we are estimating the treatment effect of additional grants on municipal spending in our main regressions.

Municipal fixed-effects. To identify the flypaper effect in our baseline results (Table 3), we remain as close as possible to the standard RKD identification strategy, deviating from it at most by including covariates and year-fixed effects. Yet, given the panel setting at hand, we test for the robustness of our results to the inclusion of municipal fixed effects. Naturally, this implies that the flypaper effect is then identified on switchers, i.e., municipalities that grew over the 1000 population threshold between 2011 and 2020. This represents about 20% of the sample of municipalities between 800 and 1000 inhabitants in 2011. Given the kinked nature of the treatment, it is reasonable to expect smaller *per-capita* treatment effects when including municipal fixed effects as many switchers did not grow far from the 1000 inhabitants threshold. The results are presented in Table A7. Overall, the baseline conclusion is supported. As expected, we observe statistically significant spending coefficients of smaller magnitude. The change in the income tax rate is statistically insignificant and similar in magnitude to the baseline results.

Rolling regressions. Finally, we test the sensitivity of our baseline results to specific years in the sample. Formally, Figure A6 presents rolling regressions excluding every year from 2011 to 2020 separately. Excluding a year after the other does not change the finding we observe in the main analysis. As such, the results do not appear to be driven by any specific year, such as the COVID-19 pandemic in 2020.

6 Concluding Summary

Income tax responses to transfers are central elements of analyses in public economics and beyond. Although transfers are important in practice, it is challenging to estimate income tax responses as well as other tax responses due to the absence of significant local tax autonomy in most federations. Swiss municipalities thus provide an ideal testing ground, as Swiss municipalities enjoy wide fiscal autonomy, including tax authority over income taxes. In such a setting, estimates of tax responses are not constrained by a missing opportunity to adjust taxes for a wide range of the population.

Our analysis shows that unconditional transfer income stays on the expenditure side of the budget and is not used to lower income or other taxes at the municipal level. The finding obtains although potential reasons for why tax responses tend to be muted and transfer income stays on the expenditure side of the public budget are absent. For instance, the transfer is formulaic, there is no label attached to the transfer, and municipalities are not in economic distress.

Our finding is in line with the flypaper effect, for which we provide a comprehensive empirical underpinning, including addressing the central issue of how income taxes respond to transfers. Different explanations for the flypaper effect have been explored in the literature (Hines and Thaler, 1995; Inman, 2008). One potential explanation for our finding is that voters are not fully informed about the transfer income and therefore do not demand tax rate reductions. Municipalities receive higher transfer income 'silently', by crossing a population threshold, which may go unnoticed by the electorate.[35] This might be different in the context of a fundamental reform of the intergovernmental transfer system; knowledge would likely diffuse among voters in public discourse, the consequence being that the electorate pays more attention to transfer policy and advocates for tax rate reductions in elections to 'mortgage' part of the higher transfer income.[36]

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[35] As analyzed in Filimon et al. (1982), public officials might prevent voters from learning, and use the informational advantage to fund their preferred public projects.

[36] The empirical finding in Lutz (2010) is in line with this reasoning. Voters in New Hampshire favored significant property tax rate reductions following a fundamental change in intergovernmental transfers in 1999. The reform was highly politicized and a central issue in political discussions.

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Appendix for

"*Tax Responses in Local Public Finance: The Flypaper Effect at Work*"

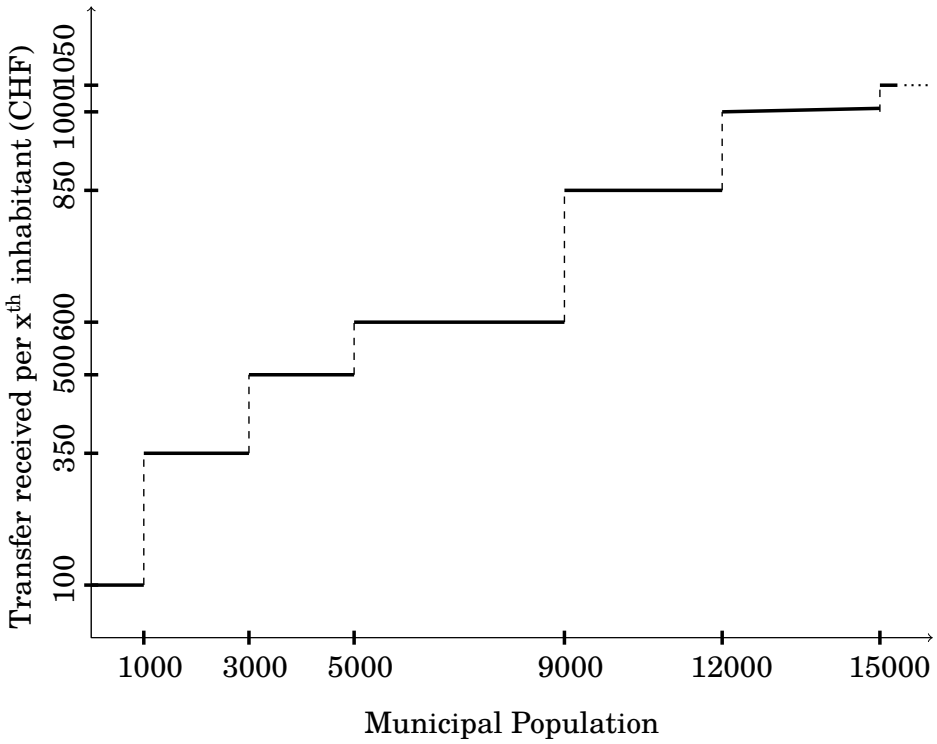
(for online publication only)

M. Koethenbuerger and G. Loumeau

A Supporting material

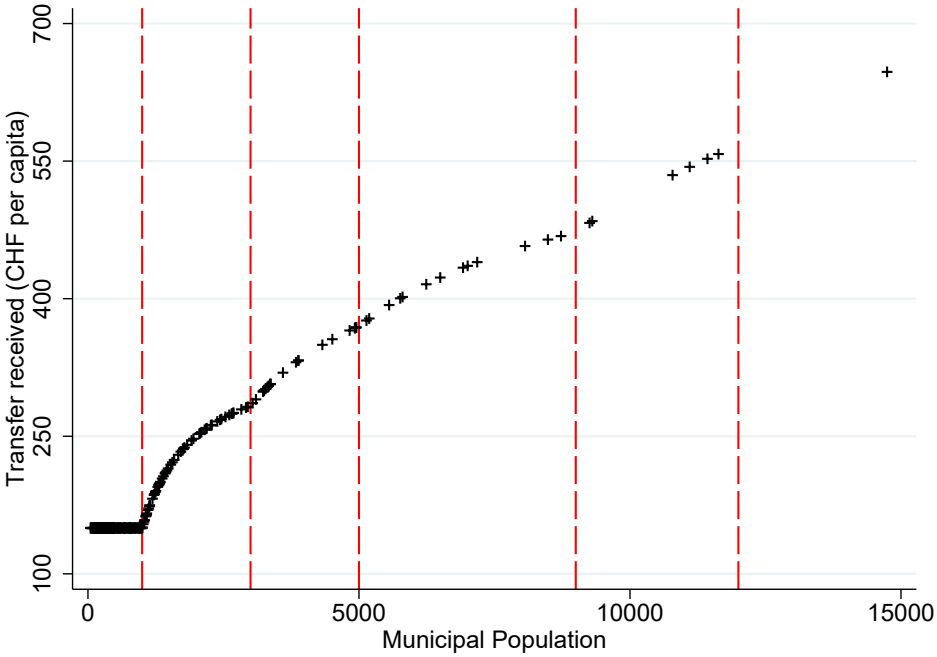
A.1 Figures

Figure A1: Marginal transfer schedule



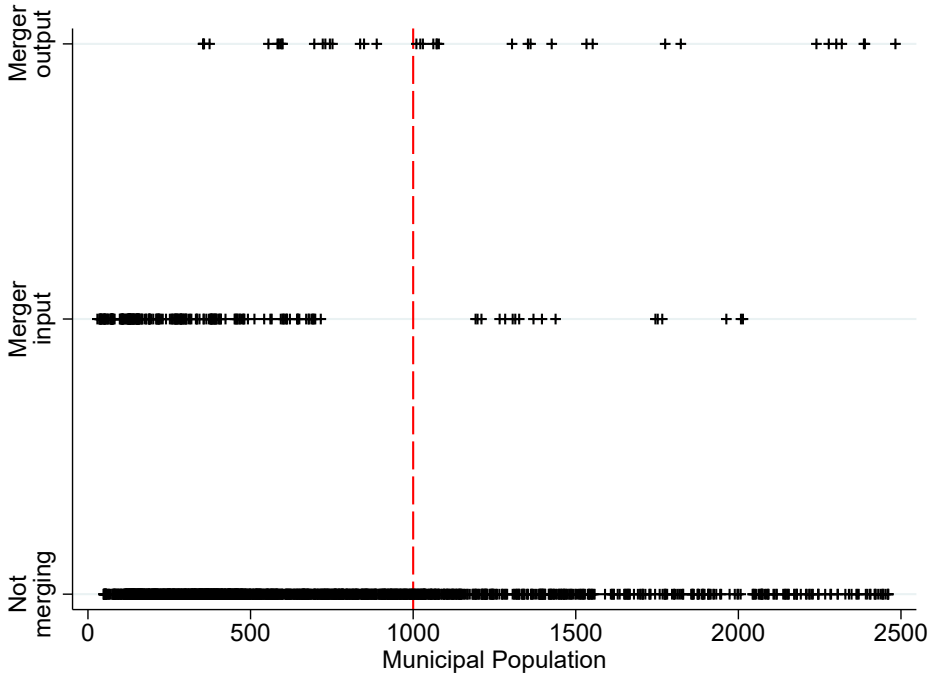
Notes: Figure shows the *marginal* transfer schedule in place in Vaud between 2011 and 2020.

Figure A2: Full Transfer Schedule (pc)



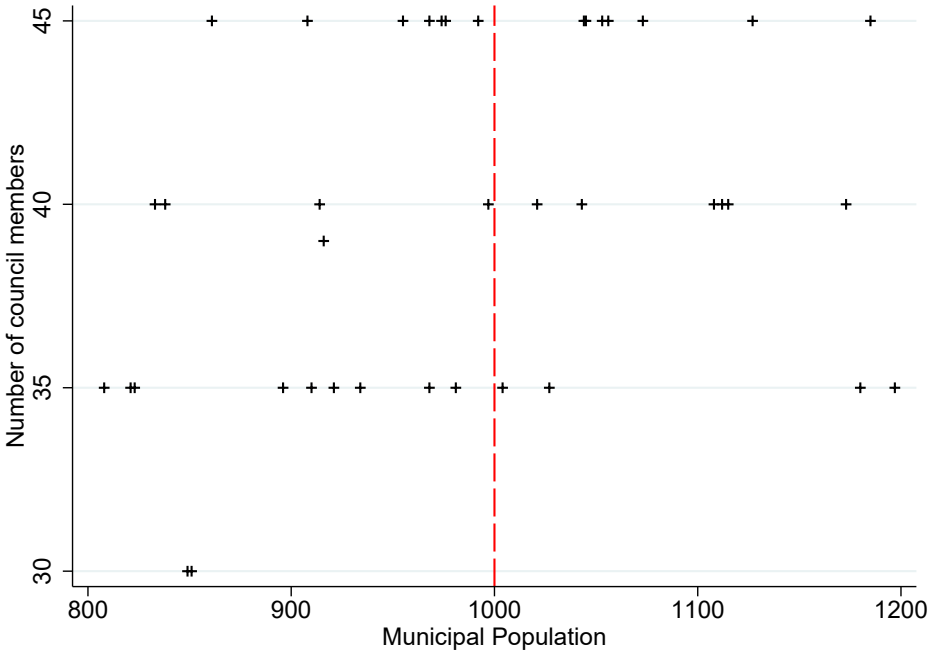
Notes: Figure presents the full yearly transfer schedule per capita for all municipalities in the Canton of Vaud between 2011 and 2020. Figure 2 shows a zoom on the first kink (which is used in the RKD approach adopted in the paper).

Figure A3: Municipal mergers (2011-2020)



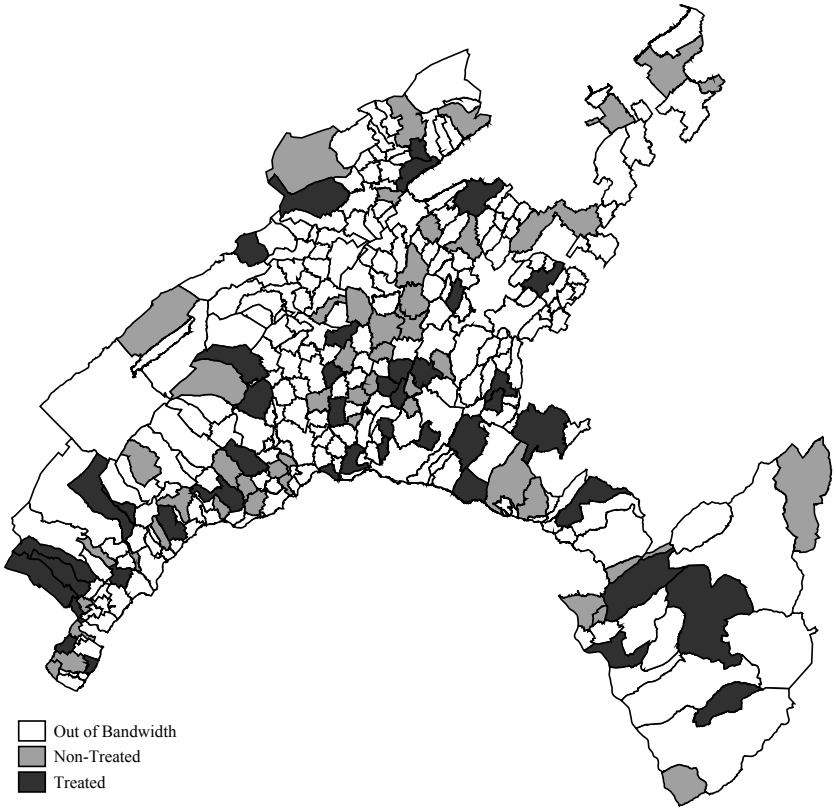
Notes: Figure shows the size of municipalities involved in a municipal merger between 2011 and 2020. Two angles are presented: municipalities pre-merger (labeled *Merger input*) and municipalities post-merger (labeled *Merger output*). Category *Not merging* depicts municipalities that did not engage in a merger during the period studied.

Figure A4: Council Sizes



Notes: The Figure shows the size of municipal councils for municipalities between 800 and 1200 inhabitants. A formal RD test for smoothness of council size is presented in Table 1, panel (o).

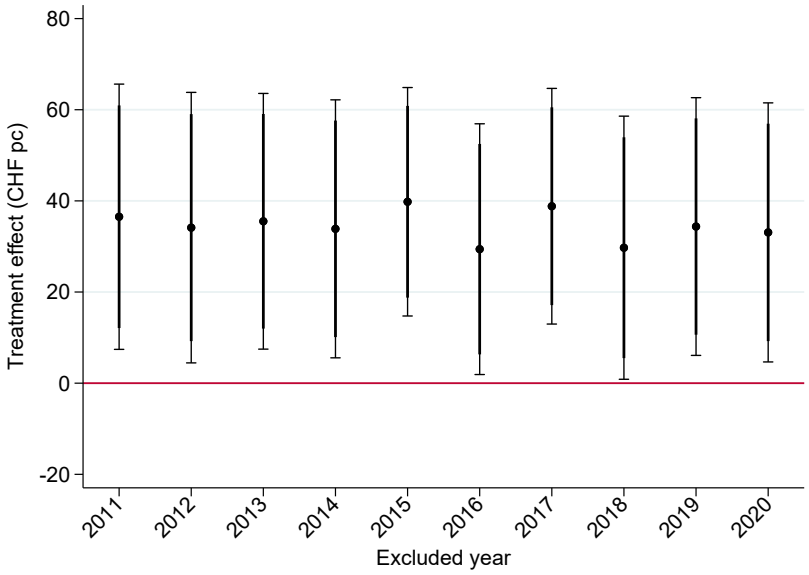
Figure A5: Geography of the treatment and control status (2011)



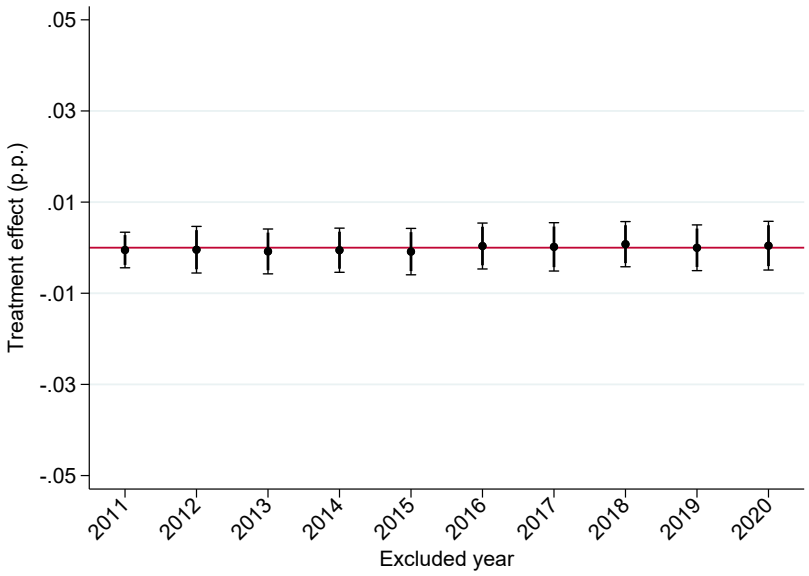
Notes: Bandwidth selection following Calonico et al. (2014). Municipal delineation of 2011 is presented.

Figure A6: Rolling regressions by year

(a) Overall municipal spending
(CHF per capita)



(b) Income tax rate
(percentage point)



Notes: Figures report local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014), excluding each year within the sample period 2011 to 2020 successively.

A.2 Tables

Table A1: Descriptive statistics

Sample	Variable	N	Mean	SD
Total	Population	1405	1200.48	319.01
	Grant (per capita)	1405	180.91	32.91
	Municipal area	1405	1103.45	1284.18
	Number of firms	1405	85.69	32.07
	Net migration (per capita)	1405	0.03	0.14
	Share of female	1405	0.51	0.07
	Share of people < 20yo	1405	0.25	0.06
	Share of people > 65yo	1405	0.17	0.12
Control	Population	511	898.79	56.36
	Grant (per capita)	511	150	0.00
	Municipal area	511	1092.07	1199.38
	Number of firms	511	64.66	20.31
	Net migration (per capita)	511	0.01	0.16
	Share of female	511	0.51	0.09
	Share of people < 20yo	511	0.25	0.08
	Share of people > 65yo	511	0.18	0.14
Treatment	Population	894	1372.93	276.28
	Grant (per capita)	894	198.59	29.04
	Municipal area	894	1109.95	1330.83
	Number of firms	894	96.60	31.64
	Net migration (per capita)	894	0.03	0.13
	Share of female	894	0.51	0.06
	Share of people < 20yo	894	0.25	0.05
	Share of people > 65yo	894	0.16	0.11

Notes: Data is provided by the Federal Statistical Office (OFS) and the Cantonal Statistical Office of Vaud (SV). All variables are gathered at the municipal level. We study the period from 2011 to 2020. Sample comprise all municipalities used in the empirical analysis, i.e., all municipalities between 800 and 2000 residents.

Table A2: Effect on less prominent local tax rates

	(1)	(2)	(3)	(4)
Specification	RKD	FE-RKD	FE-RKD	RKD
	(a) Property tax rate (p.p.)			
Treatment	0.002	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Obs. left	210	210	210	210
Obs. right	393	393	399	425
	(b) Inheritance tax rate (p.p.)			
Treatment	-0.233	-0.225	-0.301*	-0.174
	(0.167)	(0.167)	(0.159)	(0.166)
Obs. left	210	210	210	210
Obs. right	393	393	393	425
	(c) Dog tax rate (p.p.)			
Treatment	-0.244	-0.234	-0.316*	-0.244
	(0.190)	(0.191)	(0.191)	(0.189)
Obs. left	210	210	210	210
Obs. right	398	398	399	425
Bandwidth	Opt.	Opt.	Opt.	Full sample
Opt. pol. order	Opt.	Opt.	Opt.	Opt.
Covariates	No	No	Yes	No

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). The dependent variable is the property tax rate (p.p., panel a), the inheritance tax rate (p.p., panel b), and the dog tax rate (p.p., panel c). FE refers to year fixed effects. *Covariates* include socio-economic and geographic variables such population, municipal area, urban coverage, agricultural coverage, etc. The unit of analysis is the municipality. Robust standard errors are included. The property tax is paid by the owner or the usufructuary of a building, and its base is the value of the building.

Table A3: Effect on spending by spending category

	(1)	(2)	(3)	(4)
Specification	RKD	FE-RKD	FE-RKD	RKD
	(a) Current municipal spending (CHF pc)			
Treatment	34.578**	34.726**	21.606*	33.047**
	(13.453)	(13.503)	(12.063)	(13.464)
Obs. left	252	252	252	252
Obs. right	458	458	458	497
	(a.1.) ... from which spending on personnel (CHF pc)			
Treatment	6.559***	6.522***	3.674***	6.607***
	(1.452)	(1.453)	(1.079)	(1.443)
Obs. left	252	252	252	252
Obs. right	431	438	439	497
	(a.2.) ... from which spending on municipal goods (CHF pc)			
Treatment	6.838**	6.650**	2.318	7.955***
	(2.730)	(2.739)	(2.040)	(2.702)
Obs. left	252	252	252	252
Obs. right	429	429	430	497
	(b) Investments (CHF pc)			
Treatment	9.484***	9.672***	7.259**	8.947**
	(3.657)	(3.645)	(3.477)	(3.653)
Obs. left	252	252	252	252
Obs. right	465	458	451	497
Bandwidth	Opt.	Opt.	Opt.	Full sample
Opt. pol. order	Opt.	Opt.	Opt.	Opt.
Covariates	No	No	Yes	No

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). The dependent variable is the current municipal spending (CHF pc, panel a), the sub-categories of spending for personel and municipal goods (CHF pc, panels a.1 and a.2, respectively), and investments (CHF pc, panel b) FE refers to year fixed effects. *Covariates* include socio-economic and geographic variables such population, municipal area, urban coverage, agricultural coverage, etc. The unit of analysis is the municipality. Robust standard errors are included.

Table A4: Effect on spending by government functional categories

	(1)	(2)	(3)	(4)
Specification	RKD	FE-RKD	FE-RKD	RKD
	(a) Administration (CHF pc)			
Treatment	9.476***	9.743***	5.618***	10.148***
	(2.615)	(2.613)	(1.968)	(2.640)
Obs. left	252	252	252	252
Obs. right	432	439	429	497
	(b) Public infrastructure (CHF pc)			
Treatment	10.599***	10.515***	6.222***	10.449***
	(2.393)	(2.410)	(1.826)	(2.377)
Obs. left	252	252	252	252
Obs. right	452	452	468	497
	(c) Public education (CHF pc)			
Treatment	-0.012	0.019	0.059	-0.491
	(0.572)	(0.568)	(0.611)	(0.553)
Obs. left	252	252	252	252
Obs. right	450	445	449	497
	(d) Police (CHF pc)			
Treatment	1.503***	1.462***	1.306***	1.326***
	(0.430)	(0.403)	(0.374)	(0.426)
Obs. left	252	252	252	252
Obs. right	458	458	453	497
	(e) Social spending (CHF pc)			
Treatment	8.074	8.209	6.417	7.352
	(5.483)	(5.507)	(5.311)	(5.466)
Obs. left	252	252	252	252
Obs. right	456	458	458	497
Bandwidth	Opt.	Opt.	Opt.	Full sample
Opt. pol. order	Opt.	Opt.	Opt.	Opt.
Covariates	No	No	Yes	No

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). The dependent variable is administrative spending (CHF pc, panel a), infrastructure spending (CHF pc, panel b), public education spending (CHF pc, panel c), police spending (CHF pc, panel d), and social spending (CHF pc, panel e). FE refers to year fixed effects. *Covariates* include socio-economic and geographic variables such population, municipal area, urban coverage, agricultural coverage, etc. The unit of analysis is the municipality. Robust standard errors are included.

Table A5: Effect on full-time equivalent public employment

	(1)	(2)	(3)	(4)
Specification	RKD	FE-RKD	FE-RKD	RKD
	(a) Full-time equivalent public employment			
Treatment	0.061***	0.060***	0.039***	0.057***
	(0.012)	(0.012)	(0.010)	(0.012)
Obs. left	247	247	247	247
Obs. right	454	456	458	497
	(b) ... of which *administrative* public employment			
Treatment	0.042***	0.042***	0.037***	0.041***
	(0.008)	(0.008)	(0.008)	(0.008)
Obs. left	247	247	247	247
Obs. right	463	469	465	497
	(c) ... of which *non-administrative* public employment			
Treatment	0.019**	0.018**	0.002	0.016*
	(0.009)	(0.009)	(0.008)	(0.009)
Obs. left	247	247	247	247
Obs. right	456	456	458	497
Bandwidth	Opt.	Opt.	Opt.	Full sample
Opt. pol. order	Opt.	Opt.	Opt.	Opt.
Covariates	No	No	Yes	No

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). The dependent variable are the full-time equivalent public municipal employment (jobs, panel a), of which are employed in the public administration (jobs, panel b), and outside of the public administration (jobs, panel c). FE refers to year fixed effects. *Covariates* include socio-economic and geographic variables such population, municipal area, urban coverage, agricultural coverage, etc. The unit of analysis is the municipality. Robust standard errors are included.

Table A6: Placebo analysis (kink +/- 100 residents)

	(1)	(2)	(3)	(4)
Placebo	+100	+100	-100	-100
Specification	RKD	FE-RKD	RKD	FE-RKD
	(a) Overall municipal spending (CHF pc)			
Treatment	10.394	8.201	-7.470	-14.780
	(44.111)	(44.081)	(16.756)	(16.869)
Obs. left	139	139	229	229
Obs. right	555	562	123	123
	(b) Income tax rate (p.p.)			
Treatment	-0.005	-0.006	-0.011*	-0.010
	(0.006)	(0.006)	(0.006)	(0.006)
Obs. left	139	139	229	229
Obs. right	544	547	123	123
Bandwidth	Opt.	Opt.	Opt.	Opt.
Opt. pol. order	Opt.	Opt.	Opt.	Opt.

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). The threshold is artificially moved up by 100 inhabitants (i.e., to 1100) in Columns (1) and (2), and down by 100 inhabitants (i.e., to 900) in Columns (3) and (4). The dependent variables are the overall municipal spending (CHF pc, panel a) and the income tax rate (p.p., panel b). FE refers to year fixed effects. The unit of analysis is the municipality. Robust standard errors are included.

Table A7: Estimates with municipal fixed effects

	(1)	(2)	(3)	(4)
Specification	RKD	FE-RKD	FE-RKD	RKD
	(a) Overall municipal spending (CHF pc)			
Treatment	34.532**	36.743**	36.743**	32.974**
	(15.265)	(15.440)	(15.440)	(15.433)
Obs. left	145	145	145	145
Obs. right	443	443	443	482
Implied effect of +CHF1 in grant	CHF0.7	CHF0.75	CHF0.75	CHF0.68
	(b) Income tax rate (%p)			
Treatment	-0.003	-0.002	-0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Obs. left	145	145	145	145
Obs. right	477	477	477	482
Implied effect of +CHF1 in grant*	<CHF0.01	<CHF0.01	CHF0.01	<CHF0.01
Bandwidth	Opt.	Opt.	Opt.	Full sample
Opt. pol. order	Opt.	Opt.	Opt.	Opt.
Municipal FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No
Covariates	No	No	Yes	No

Notes: Table reports local polynomial regression-discontinuity estimation with robust bias-corrected confidence intervals and inference procedures following Calonico et al. (2014). Municipal fixed effects are modelled following Mundlak (1978). To avoid unwanted composition effects, we restrict the sample to a balanced panel. The dependent variable is the overall municipal spending (CHF pc, panel a) and the income tax rate (%p, panel b). *Covariates* include socio-economic and geographic variables such as population, municipal area, urban coverage, agricultural coverage, etc. The unit of analysis is the municipality. Robust standard errors are included. *: The effect of the grant in the case of the income tax rate is computed assuming the tax base to be fixed. An implied effect of CHF0.01 means that an additional Swiss Franc in transfers leads to a tax rate reduction implying a CHF0.01 reduction in tax revenue.