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Consequences of Debt Capitalization: Property Ownership and Debt versus Tax Choice

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Public debts capitalize into property prices. Thus, they are a burden to the present generation who owns the devalued property. This largely neglected fact has important consequences for the tax versus debt choice. Property owners suffer more from the debt burden and, thus, have a stronger preference for tax financing of government spending than tenants. As a consequence of the resulting democratic struggle between property owners and tenants, higher property ownership rates in a jurisdiction lead to less debt financing. We provide empirical support for this hypothesis by analyzing a cross section of the 171 communities in the Swiss Canton of Zurich in the year 2000.

JEL Classification: H74, R51, H00

1. Introduction

Property prices reflect the demand for different packages of public services and taxes across jurisdictions. This is the message of the literature on capitalization (starting with Oates 1969). Demand for property is negatively affected by the tax price, which in turn grows with the debt burden. Therefore, property prices are lower in communities with higher debts; that is, government debts capitalize into property values. While debt capitalization has been largely neglected in the literature (for an exception see Daly 1969), recent papers show that debt capitalization does indeed occur to a large extent (Banzhaf and Oates 2008; Stadelmann and Eichenberger 2008).[1] Debt capitalization has significant consequences. Most importantly, government debts are not a burden to future generations but to the present one because it owns the devalued property. Consequently, debt capitalization results in a so far neglected form of

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[1] Two earlier empirical studies try to investigate whether unfunded pension liabilities are rationally assessed by the population by analyzing their capitalization into property values (see Epple and Schipper 1981; Leeds 1985).

Ricardian equivalence that works also with purely selfish individuals.[2] Most importantly, debt capitalization also provides a new explanation for the extent of government debt accumulation.

In the politico-economic literature, debt accumulation is often explained by the strategic interaction of competing interest groups and political parties (Alesina and Drazen 1991; Drazen and Grilli 1993). Debt capitalization provides a new argument that complements these approaches. With full or partial debt capitalization, the fight over deficits and debts is no longer an intergenerational conflict. Instead, it is an intragenerational conflict between today's property owners and tenants as property prices and rents are asymmetrically affected by debt capitalization. In a jurisdiction in which the debt versus tax choice is tilted toward debt financing, property values drop as the debts have to be repaid by future taxes, which negatively capitalize into property prices. In contrast, tenants may benefit from increasing debt spending because they do not immediately suffer from the effects of debts on property prices. If both the markets for property and for renting houses were fully flexible, there would be no asymmetric effects of the debt versus tax choice on property owners and tenants. Property owners would be fully compensated for the losses in property values by higher present rents. However, the market for renting houses can be safely assumed to adapt slower to changes in the debt versus tax choice than the property market (e.g., because rent adjustment is slow due to government regulation, long-term contracts, or lobbying of pro-tenant groups). Thus, the debt versus tax choice affects rents only partly and slowly. Therefore, tenants have a stronger preference for debt financing than property owners. As a consequence, communities with a higher fraction of property owners (a higher fraction of tenants) tend to exhibit lower (higher) debts.

In this article we theoretically and empirically analyze the economic conflict between property owners and tenants over debt versus tax financing of public expenditures. We analyze Swiss data to test whether the fraction of property owners as measured by the share of owner-occupied housing negatively impacts communal financing choices toward accumulating debts. From a comparative perspective, Swiss municipalities are highly autonomous in determining their tax, spending, and deficit policies. They finance their expenditures mainly by their own income taxes. These municipal income taxes form an important fraction (about 30 to 40%) of the total individual tax load, which also includes cantonal as well as federal taxes. As income taxes directly burden both property owners and tenants, they are likely not to induce "renter illusion," which has been suggested to be a consequence of property taxes (Oates 2005). Therefore, Swiss jurisdictions form an ideal laboratory to investigate our hypothesis about the consequences of debt capitalization.

Empirical results indicate a strong and robust negative effect of higher property ownership on the debt-to-tax ratio as well as the deficit-to-tax ratio, thereby confirming our hypothesis. We also run instrumental variable estimates, using a unique policy reform in 1963 allowing for ownership of apartments (condominiums) as an exogenous shock, which lend further support to our results.

This article is organized as follows: section 2 provides a simple, stylized model and theoretical explanations for the negative effect of a higher fraction of property owners on debts due to debt capitalization. The data used for empirical tests of our theoretic implications and the econometric model specification are presented in section 3. Empirical results for 171 Swiss communities in the canton of Zurich are presented in section 4. Our model is extensively tested

[2] Barro (1974, 1989) models a Ricardian equivalence using generationally interdependent utility functions.

for robustness by considering differential hypotheses and using Bayesian model averaging to investigate the effect of variable selection. Section 5 offers concluding remarks.

2. Theoretical Considerations

Capitalization of debts has been largely neglected in the literature. To our knowledge no empirical tests have been performed for the capitalization of explicit government debts. However, two earlier empirical articles by Epple and Schipper (1981) and Leeds (1985) investigate whether citizens are able to unbiasedly evaluate implicit government debts. As a test they look at whether unfunded local pension liabilities capitalize into property values. In a sample of jurisdictions in the Pittsburgh metropolitan area, according to Epple and Schipper (1981, p. 170), the "results do not support the hypothesis of no capitalization." Leeds (1985) also examined the capitalization of unfunded liabilities in the Chicago area without clear significant results. Both studies suggest that determining the level of (unfunded) pension obligations may involve measurement problems concerning actuarial assumptions and that bailout expectations may be an issue.

Recently debt capitalization has been rediscovered by Eichenberger (2007), Banzhaf and Oates (2008), and Stadelmann and Eichenberger (2008), who show that local public debts, that is, explicit government debts, capitalize to a large extent. In contrast to this literature the present article does not test the existence and the extent of debt capitalization but focuses instead on its theoretical and empirical consequences. The presence of full or partial debt capitalization entails consequences for the choice between debt and tax financing. Debt capitalization induces a struggle between tenants and property owners that intensifies if debts capitalize at a higher rate.

So far, debt capitalization has not yet been analyzed as a driving force of debt accumulation. For instance, Alesina and Perotti (1994) provide a survey of theoretical explanations of public debts and conclude that only a few politico-economic models are in accordance with persistently high levels of public debts and with cross-country variances in debt levels within the OECD. However, models of the disagreement between different groups or parties in the decision-making process or models of distributional conflict contribute to the explanation of high levels of debts, as argued in the seminal work of Alesina and Drazen (1991) and supported by Drazen and Grilli (1993). In a large series of articles Feld, Kirchgässner, and Matsusaka (see, e.g., Feld and Kirchgässner 2001 or Feld and Matsusaka 2003) argue that constitutional restrictions such as popular referenda and debt brakes help against the debt bias inherent in political decision-making procedures. Mierau, Jong-A-Pin, and de Haan (2007) provide empirical evidence that fiscal adjustments are mainly driven by economic factors such as economic growth, the debt-to-GDP ratio, lagged deficits, and prior adjustments. All this literature on public debts and deficits does not mention debt capitalization.

To motivate the following empirical analysis with a simple theoretical model we look at the case of local public debts and assume that there are two groups of residents i in a community, those who live in their own home $i = H$ (i.e., property owners) and those who live in rented units $i = R$ (i.e., tenants). We analyze two periods 0 and 1. In the current period 0 property owners and tenants are assumed have the same constant tax costs, i.e., $t_0^H = t_0^R = t_0$, independent of the debt share d. Because of debt capitalization in the presence of imperfect

rental markets, the future tax costs $t_1^i(d)$ for a unit of government expenditure increase in the debt share d for property owners $i = H$. Property owners suffer from lower property prices when debts increase and cannot charge higher rents because of government regulation or the power of national pro-tenant lobby groups. Consequently their future tax costs increase with the debt share, i.e., $\partial t_1^H/\partial d > 0$. High debts usually lead to intensive discussions in communities, pressure from higher federal levels, or the application of fiscal rules. Moreover, when debts are high, sustainability becomes an issue and interest rates tend to increase, which leads to higher debt capitalization rates. We thus assume that $\partial^2 t_1^H/\partial d^2 \geq 0$ for property owners; that is, total cost as well as marginal cost of taxation increase with the debt share. Residents not holding property in the community $i = R$ are assumed to have constant tax costs in period 1 that are lower than those of property owners for any debt share $d \geq 0$, because they do not suffer from losses in property values due to debt capitalization, i.e., $t_1^R(d) = \bar{t}_1 \leq t_1^H(d)$.

The optimal debt share schedule is a function of current tax costs t_0 and expected future tax costs $t_1^H(d)$ and $\bar{t}_1$ for property owners H and tenants R, respectively. Suppose for simplicity that the price P^i of a unit of public expenditure to a resident of group i in any jurisdiction is written as[3]

$$P^i = (1-d)t_0^i + dt_1^i(d)(1-B)^{-1}. \tag{1}$$

The first part of Equation 1 gives the influence of current tax costs on the unit price of government expenditure, and the second part gives the influence of future tax costs when debt finance is used. $(1 - B)^{-1}$ is a discount factor used to calculate the present value of future tax costs.

In our framework the population consists of two distinct groups, property owners H and tenants R, who represent a fraction of λ^H and $\lambda^R = 1 - \lambda^H$ of the local population, respectively. Assume that the debt versus tax choice is determined in a town meeting or by the municipal parliament, which tries to minimize the cost per unit of public expenditures to the residents of the jurisdictions. More specifically, the communal parliament seeks to choose the debt share d that minimizes

$$\min_d (1-d)t_0 + d\lambda^H t_1^H(d)(1-B)^{-1} + d\lambda^R \bar{t}_1(1-B)^{-1}, \tag{2}$$

where the first term represents current (constant) tax costs for both groups, the second future tax costs for property owners, and the last future tax costs for renters when public expenditures are financed by debts. A similar optimization problem could be obtained with a probabilistic voting model with simplifying assumptions. Political candidates would then seek to maximize their chances of being reelected by maximizing average utility of voters, which is equivalent in this simple setting to minimizing tax costs. If property owners and tenants have the same degree of political clout, Equation 2 can be interpreted as the optimization problem of a probabilistic voting model.[4] The optimal debt share d^* is the value of d that equates the marginal costs of debt and tax finance, i.e.,

$$(\lambda^H t_1^H(d) + d\lambda^H t_1^{H'}(d) + \lambda^R \bar{t}_1)(1-B)^{-1} = t_0. \tag{3}$$

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[3] See Temple (1994) for a similar formulation without the effect of debt capitalization on tax prices.

[4] A median voter framework would yield in this case a "sink or swim" result in which communities with a majority of property owners would not opt at all for debts.

The marginal cost of debt finance (the left-hand side of Eqn. 3) incorporates the fact that property owners face higher future tax costs $t_1^H(d)$ due to the capitalization of debts in their properties. Given the optimal debt share d^* implicitly by Equation 3, we are interested in how this share varies with changes in the fraction of property owners in the population. Therefore, we apply the implicit function theorem to Equation 3 considering that $\lambda^R = 1 - \lambda^H$ and obtain

$$\frac{\partial d}{\partial \lambda^H} = -\frac{(t_1^H(d) + dt_1^{H'}(d) - \bar{t}_1)}{(2\lambda^H t_1^{H'}(d) + d\lambda^H t_1^{H''}(d))}, \tag{4}$$

which is negative as $\bar{t}_1 \leq t_1^H(d)$ for all values of d. Increasing property ownership λ^H in a community consequently decreases the debt share chosen to finance public expenditure. Property owners know that they bear the burden of additional debts. As public debts decrease property values, they have a strong incentive to vote for lower debts to preserve the initial values.

3. Data and Estimation Strategy

To empirically evaluate the influence of debt capitalization and homeownership on the municipal debt versus tax choice, we analyze data from the year 2000 of communities in the metropolitan area of Zurich, Switzerland.

The Canton of Zurich is the largest of all 26 Swiss cantons and has approximately 1.3 million inhabitants. The city of Zurich is the center of the largest urban agglomeration in Switzerland with over one million people living and working there. The metropolitan area consists of 171 communities (including the city of Zurich and the city of Winterthur). Heterogeneity is driven by, among other factors, the widely differing size of the communities (from 251 to 29,321 inhabitants, excluding Zurich and Winterthur), their distance to the economic centers, and their proximity to the Zurichsee, a lake covering an area of 88.66 km^2 in the canton.[5]

The tax system of the Canton of Zurich is typical for Switzerland. Each community raises its own income taxes by annually fixing a communal tax multiplier on the state tax (*allgemeine Staatssteuer*), which is a progressive income tax schedule at the cantonal level. Municipal tax multipliers are set either by the citizens in a town meeting or by the communal parliament. Thus, communal income tax multipliers differ to a large extent among the 171 communities in the metropolitan area. With respect to international standards, the communities also have significant autonomy regarding public expenditures and the choice between debt versus tax financing. But note that personal income taxes are also a source of local government revenue in the United States, which is known to capitalize (see Stull and Stull 1991), although U.S. local income taxes are less important when compared to property taxes.

In 1982 the canton's communities introduced a harmonized public accounting system for budgeting and bookkeeping. These standards require all communities to follow the same legal framework concerning their current and capital accounts. In addition, they demand an annual financial statement and a balance sheet. The balance sheet, as well as other bookkeeping

[5] Supplementary information is available in the *Statistisches Jahrbuch des Kantons Zürich 2007,* 17th edition, Statistisches Amt des Kantons Zürich, Zurich.

standards, distinguishes the Swiss communal finance framework from most other countries. The harmonized public accounting system is based on a functional division, each representing local responsibilities. Swiss communities have full autonomy from higher government levels in domains such as the acquisition, use, or disposition of these financial assets.[6]

While homeownership rates as measured by owner-occupied housing are comparatively low in Switzerland, a large proportion of Swiss rental units are owned by institutional investors (see Bourassa, Hoesli, and Scognamiglio 2009). In the Canton of Zurich average rates of owner-occupied housing are close to 50% with large heterogeneity across municipalities. Rental units are mostly apartments, which are either held by institutional investors or individual landlords. Of course, it would be interesting to analyze whether it makes a difference if the landlords are absent (i.e., either individuals who live in another municipality or institutional investors) or present (i.e., individuals who live in the same municipality). Unfortunately, we have no data on the extent of landlord absenteeism at the communal level. However, as our data on homeownership reflect owner-occupied housing, our homeowners are all inhabitants of the respective community, i.e., they have full political rights provided they are Swiss. Thus, there may indeed be a political struggle between property owners and tenants.

We analyze the choice between debts and local income taxes, which allows us to distinguish debt capitalization from fiscal illusion. In the case of property taxes, tenants may suffer from ''renter illusion'' (Oates 1988, 2005). Tenants do not pay property taxes directly and never see a tax bill. Although evidence suggests that property taxes are shifted at least partly onto rents, other evidence suggests that tenants are not fully aware that they indirectly pay for property taxes (see Oates 2005 for a discussion). We suppose that the consequences of debt capitalization on local finance decisions are also present when communities levy property taxes but that such consequences may be difficult to distinguish from renter illusion. In contrast, Swiss municipal income taxes are paid by both tenants and property owners and are easily observable for both groups. Thus, our results are likely to be independent of, and not affected by, tax illusion effects. Consequently, the metropolitan area of Zurich is the ideal test case to gauge the impact of property ownership on the local public debt versus tax choice due to debt capitalization as implied by our theory.

To test the implications of debt capitalization regarding its effects through property ownership on the debt versus tax choice, we develop an econometric model based on the empirical models of de Haan and Sturm (1994), Feld and Kirchgässner (2001), and Ashworth, Geys, and Heyndels (2005), which intend to explain fiscal policy choices. The dependent variables are, first, the ratio of total debt to total tax revenue from individual taxpayers (DebtToTax) and, second, new debts to total tax revenue from individual taxpayers (NewDebtToTax). Our econometric model is as follows:

$$(\text{New})\text{DebtToTax} = \alpha_0 + \alpha_1 \text{PropertyOwners} + \sum_j \alpha_j x_j + \varepsilon. \tag{5}$$

Equation 5 is theoretically motivated by the negative impact of a higher fraction of property owners λ^H on local debts d as shown in Equation 4. In equilibrium, communities with a higher fraction of property owners λ^H should have a smaller debt-to-tax ratio as they accumulated lower debts in the past. Moreover, these communities should also continue to accumulate lower

[6] Communities associate local self-rule in financial matters with autonomy, which makes it almost a sacred issue.

new debts with respect to tax revenues. Thus, theory predicts $\alpha_1 < 0$ for both measures, that is, DebtToTax and NewDebtToTax.[7]

In common with the empirical literature, we include a number of economic and political control variables in the model. Their different impacts are assumed to be linearly additive and are represented by the coefficients α_j. As our dependent variables reflect the debt versus tax choices of communities, our estimations do not necessarily suffer from unobserved preferences for public goods and public service demand. While a higher preference for public services plausibly leads to both higher debts and higher taxes, we have no clear idea about whether a higher demand for public services tilts the tax versus debt choice toward the latter or the former. Here ε is an error term with mean of zero conditional on the explanatory variables. We suppose that our main variable of interest, PropertyOwners, as well as the other control variables are independent of the error term. This assumption will be relaxed later when we estimate two-stage least-squares and instrument the property ownership rate.

In addition to property ownership, we analyze the impact of higher mean incomes on public debts. For liquidity reasons, higher mean incomes can be assumed to be accompanied by lower debts. Moreover, if the inhabitants of rich communities have a preference for lower socioeconomic heterogeneity of their neighborhood, they will strategically prefer tax over debt financing because it deters potential poor immigrant tenants. On the other hand, jurisdictions with high incomes have to contribute higher sums to fiscal equalization systems and consequently may have an incentive to increase their debts (Feld and Kirchgässner 2001).

Debts might be issued to finance public investment projects that cannot be financed by current taxation. Thus, we include the (log of) local investment expenditure per capita for the construction of roads, public transport, communication, and waste disposal facilities as an explanatory variable. We expect a positive coefficient for this variable.

As described in the influential article by Meltzer and Richard (1981), the income distribution plays a significant role in redistributive matters. Although it is unclear whether the respective expenditures are financed with debts rather than taxes, we nevertheless include the ratio of mean to median income as a control.

In Switzerland interest rates for municipal debts vary little between communities. Moreover, public institutions and the Swiss banks do not provide any data on default risks (Feld and Kirchgässner 2001). Therefore, we cannot control for the costs of raising capital in a community for the year analyzed. Nevertheless, we introduce the mean income tax multiplier to consider the price citizens have to pay for public goods. The role of the tax multiplier is also mirrored in the theoretical model. It is supposed that the tax multiplier enters the estimations with a negative sign as governments might substitute present taxes for new debts (i.e., higher deficits). As total debts represent only past substitution between past deficits and past taxes, we do not expect a systematic relationship between the total debts and present taxes.

As in the literature (see, for example, Ashworth, Geys, and Heyndels 2005) we introduce the size of the population of a community. Larger communities may profit (suffer) from economies (diseconomies) of scale, which may result in lower (higher) debt financing. To further test the robustness of our theory we also look at the effects of a quadratic term of this variable.

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[7] In a previous working version of this article we analyzed the impact of the property owners on the total debt level. Results confirm a strong negative impact of property owners on debt levels, too. However, the total debt level may also be driven by the demand for public goods, while the debt versus tax choice is likely to be less driven by it.

Communities near the center of the canton may have higher costs when providing public infrastructure. On the other hand, communities in rural areas at the border of the canton may also face different needs for infrastructure expenditure. We control for such possible impacts by including dummy variables for communities close to the center (bordering at Zurich or Winterthur) and at the cantonal border.

From a politico-economic perspective, institutional and political aspects that are known to affect expenditures must be considered (see, e.g., Eichenberger and Schelker 2007). Therefore, we include various institutional and political indicators in our model. Differences in the democratic institutions at the local level are captured by a dummy that distinguishes communities with town meetings from communities with a parliament, conservative fiscal preferences of the population are measured by the fraction of people in a community who agreed to a debt brake at the federal level in a nationwide referendum, we control for the fraction of leftist parties in cantonal elections, and we take into account whether or not a community has a separate school district (Frey and Eichenberger 2002).

Our dependent variables focus on financing choices between debt financing and tax financing for public spending demands. Consequently, public expenditure per se is unlikely to influence our dependent variables unless large spending demands have to be financed by debts. Nevertheless, we include the log of schooling expenditure per capita and the fraction of the population between ages 0 and 14 as additional controls because schooling is a major demand factor for public good demand.[8]

The main specifications also include the (log) communal equity of each community, which serves as an indicator for the combined effects of public goods on local public debts not captured by other variables.

Finally, we analyze a number of additional variables. As Tabellini (1991) argued, the bequest motive of altruism between generations may not be sufficient to prevent the current generation from accumulating debts. This argument is especially relevant with regard to the elderly. The elderly may also increase the demand for public services with uncertain effects on taxes and debt financing. Thus, we control for the fraction of elderly in a community. Banzhaf and Oates (2008) suggest that renters are transient members of the community and thus prefer to defer payment of capital projects to the future. We control for this possibility in some estimations by including migration. Migration may also have an impact on local public debts as the community has to integrate new arrivals. The employment structure, access to the rail network, and average rents are included as further controls in additional robustness tests.

Our data set contains these variables for all communities in the canton. We include a dummy variable for the cities of Zurich and Winterthur. In contrast to the other communities, they both consist of various separate districts, which widely differ from each other with respect to socioeconomic characteristics but have the same tax multiplier, benefit from the same public expenditures, and suffer the same debt burden. All variables, their sources, and descriptive statistics are given in Table 1.

Data for the main dependent variables and independent variables were obtained from the Statistical Office of the Canton of Zurich, the Secretary for Education of the Canton of Zurich, and the Financial Statistics of the Canton of Zurich, as well as the Swissvotes Database, and matched accordingly.

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[8] District (school community) schooling expenditure is distributed to each political community according to the number of pupils it sends to the school district.

Table 1. Data Description and Sources

Variable	Description and Source	Range	Mean	SD
DebtToTax	Debt-to-tax ratio, i.e., official indicator of total communal obligations divided by total tax revenue by individuals in community. GEFIS Financial Statistics of the Canton of Zurich.	[0.039, 8.941]	2.051	1.486
NewDebtToTax	Increase in total communal obligations (five-year average) divided by total tax revenue by individuals in community. GEFIS Financial Statistics of the Canton of Zurich.	[−0.554, 0.517]	−0.037	0.165
PropertyOwner	Property owners in community (i.e., owner-occupied housing, homeownership rate). Statistical Office of the Canton of Zurich.	[0.071, 0.733]	0.469	0.156
logMeanIncome	Log mean income to tax of individuals in community. Statistical Office of the Canton of Zurich.	[10.57, 11.89]	10.97	0.209
logInvest	Log investments per capita in community (five-year average). GEFIS Financial Statistics of the Canton of Zurich.	[0, 9.76]	4.858	1.878
logMeanMedian	Log mean to median income. Statistical Office of the Canton of Zurich.	[0.06, 0.883]	0.227	0.122
TaxRate	Mean income tax multiplier (without churches). Statistical Office of the Canton of Zurich.	[78, 132]	117.9	14.437
logPop	Log population. Statistical Office of the Canton of Zurich.	[5.58, 12.72]	7.984	1.135
CommunityCenter	Community has common border with cities of Zurich or Winterthur. Statistical Office of the Canton of Zurich (GIS).	{0; 1}	0.181	0.386
CommunityBorder	Community is at the cantonal border. Statistical Office of the Canton of Zurich (GIS system).	{0; 1}	0.363	0.482
Parliament	Dummy if community has communal parliament (value = 1). Statistical Office of the Canton of Zurich.	{0; 1}	0.07	0.256
DebtBrakeYes	Agreement to debt break in percent: *Bundesbeschluss über eine Schuldenbremse.* Swissvotes Database.	[0.723, 0.936]	0.868	0.031

Table 1. Continued

Variable	Description and Source	Range	Mean	SD
ElecLeft	Part of left parties in cantonal elections (sum of EVP, GP, and SP). Statistical Office of the Canton of Zurich.	[0.163, 0.479]	0.302	0.065
NoSchoolComm	Dummy if the school is managed by the community itself (value = 1) or a separate school community (value=0). Secretary for Education of the Canton of Zurich.	{0; 1}	0.199	0.4
Children	Fraction of population between age 0 and 14. Secretary for Education of the Canton of Zurich.	[0.122, 0.253]	0.1848	0.027
logSchoolExp	Log of schooling expenditure per capita (school community expenditure distributed according to number of pupils per community). Secretary for Education of the Canton of Zurich.	[6.630, 7.599]	7.194	0.157
logEquity	Log equity per capita according to communal balance sheets. GEFIS Financial Statistics of the Canton of Zurich.	[0, 9.569]	8.083	0.941
Elderly	Fraction of population over 65 years. Statistical Office of the Canton of Zurich.	[0.065, 0.237]	0.125	0.031
ImmigSaldo	Relative immigration rate minus emigration rate in community. Statistical Office of the Canton of Zurich.	[−0.039, 0.073]	0.01	0.018
PopSquared	Population per 1000 persons squared. Statistical Office of the Canton of Zurich.	[0.07, 111800]	744.1	8560.43
Employed3sector	Fraction of labor force employed in third sector. Statistical Office of the Canton of Zurich.	[0.294, 0.954]	0.648	0.127
AccessFasttrain	Indicator for access to fast train railroad network (S-Bahn) as a fraction of the population. Statistical Office of the Canton of Zurich (GIS).	[0, 99]	32.4	32.78
logAvgRent	Log average rent per month. Statistical Office of the Canton of Zurich.	[6.873, 7.556]	7.18	0.133
City	Dummy if community is Zurich or Winterthur.	{0; 1}	0.012	0.108

Table 1. Continued

Variable	Description and Source	Range	Mean	SD
Density1960	Population density in 1960 before law reform in December 1963. Federal Census (Bern 1963).	[0.019, 0.865]	0.53	0.176
PropertyOwner1960	Share of property owners in community in 1960 before law reform in December 1963. Federal Census (Bern 1963).	[41.6, 5017]	352.5	557.253

The range, mean, and standard deviations are based on 171 observations.

The debt-to-tax ratio takes the official amount of total communal obligations and divides it by total tax revenue of individual taxpayers in the community. It can be interpreted as the number of years it takes a community to pay back its debts by tax revenues of communal citizens. The variable ranges from 0.039 to almost 9, with a mean of 2.051. The new debts-to-tax ratio is measured by the five-year average increase (decrease) in total communal obligations divided by total tax revenue of individual taxpayers. On average communities repaid part of their debts; the mean of the variable is −0.037.

Our main independent variable of interest, property owners, ranges from 7.1% (City of Zurich) to more than 70% for less populous communities. The mean property ownership rate is about 47% with a large albeit not fully symmetric variance around the mean. Consequently, the Canton of Zurich provides a good case for studying the political struggle of how property ownership affects the debt versus tax choice.

Figure 1 represents histograms of the variables debt-to-tax ratio, new debts-to-tax ratio, and property ownership rate. The boxplots below the histograms in the figure motivate our central hypothesis. The debt-to-tax ratio in the sample of communities with a low share of property owners (upper boxplot) is generally higher than the debt-to-tax ratio in communities with a high share of property owners (lower boxplot). Even the third quartile of the debt-to-tax ratio in communities with a high share of property owners is lower than the median of the debt-to-tax ratio in communities with a low share of property owners without holding constant other intervening variables such as income, inequality, and debt preferences. A similar but less pronounced pattern can be observed for the new debt-to-tax ratio. Thus, the debt-to-tax ratio and the new debt-to-tax ratio seem to be lower in communities with a high share of property owners.

4. Empirical Results

Baseline Results

Table 2 presents our main empirical results for the debt-to-tax ratio, and Table 3 presents the results for the new debts-to-tax ratio. For all estimates we report robust standard errors using a White heteroskedasticity adjusted sandwich estimator.

Turning to the specifications in column 1 of Table 2 and Table 3 first, we find that the fraction of property owners in a community has a negative and significant influence on the debt-to-tax ratio (DebtToTax) and the new debts-to-tax ratio (NewDebtToTax) as suggested by the

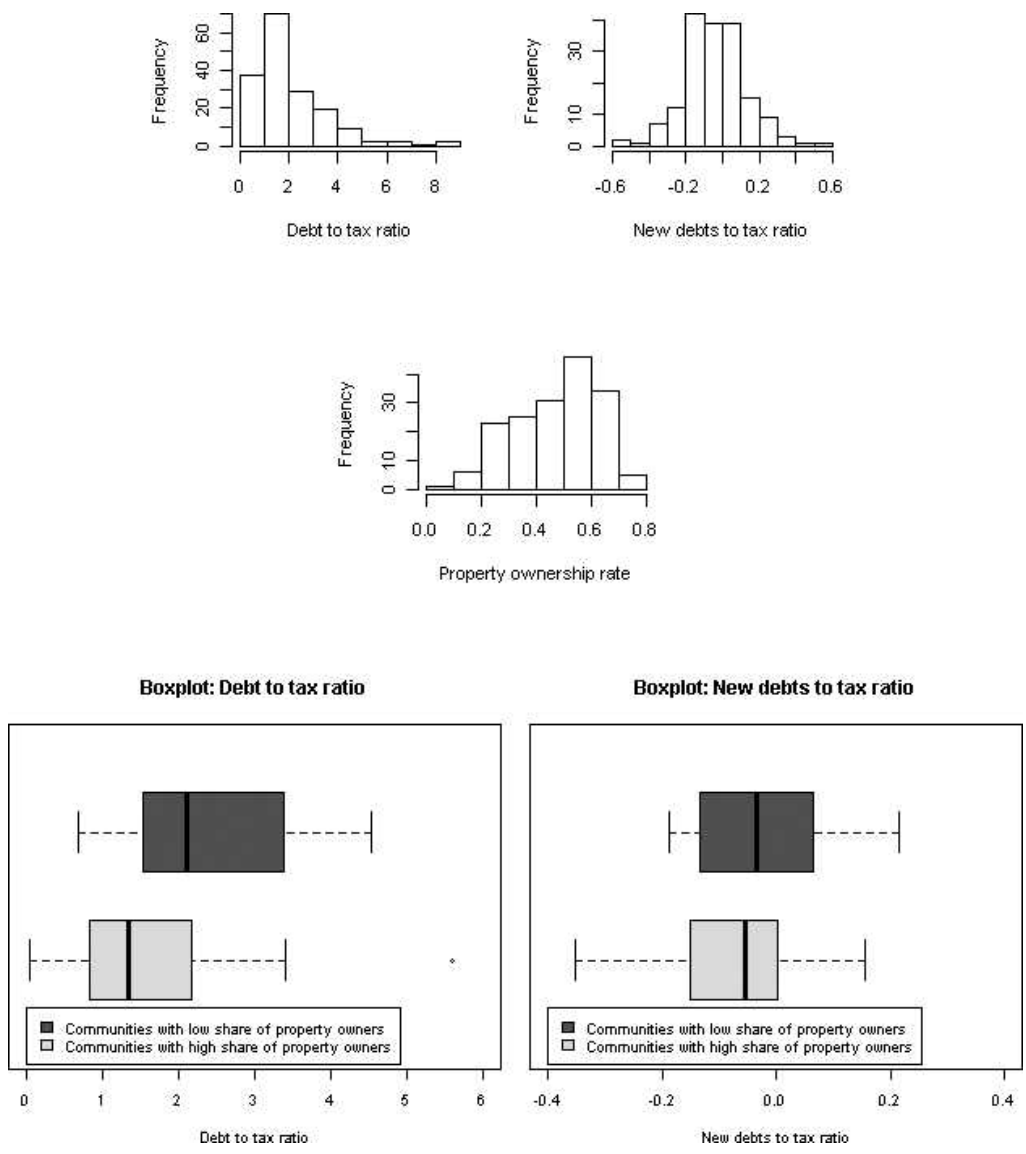

Figure 1. Debt-to-tax ratio, new debts-to-tax ratio, and property ownership rate. Histograms are based on a full sample of communities. Boxplots are based on the 30 communities with the lowest share of property owners (red/darker boxplot) and the 30 communities with the highest share of property owners (yellow/lighter boxplot). The whiskers of the boxplot extend to the most extreme data point, which is no more than 1.5 times the interquartile range from the box. Dots represent observations outside the interquartile range.

theoretical discussion. With both measures, a higher (log) mean income in a community is significantly associated with lower debts. Higher investments have no significant effect. If the mean income increases with respect to the median income, additional redistribution takes place, which results in a significantly higher debt-to-tax ratio and significantly more new debts to taxes. On the other hand, the mean tax multiplier has as expected no significant impact on the debt-to-tax ratio. However, it has a large negative impact on the new debts-to-tax ratio, which indicates that taxes and new debts are substitutes to some extent. Population size significantly decreases

Table 2. Effects of Property Ownership on Debt-to-Tax Ratio (DebtToTax) because of Debt Capitalization

	OLS				2SLS	
Variable	(1)	(2)	(3)	(4 Weighted)	(5 Weighted)	(6 Weighted)
PropertyOwner	−2.4799***	−1.6313**	−1.6331**	−1.5116**	−9.0291***	−5.6662***
	(0.7272)	(0.8151)	(0.8192)	(0.7802)	(2.7484)	(2.0632)
logMeanIncome	−6.2293***	−5.7931***	−5.7872***	−5.8575***	−6.2210***	−5.3880***
	(1.5320)	(1.4869)	(1.4501)	(1.4087)	(1.4308)	(1.3823)
logInvest	0.0589	0.0267	0.0268	0.0285	0.0740	0.0234
	(0.0797)	(0.0745)	(0.0749)	(0.0751)	(0.0794)	(0.0742)
logMeanMedian	7.0901***	6.9443***	6.9445***	6.9584***	8.2089***	6.1144***
	(1.7840)	(1.7565)	(1.7584)	(1.7339)	(1.8458)	(1.6677)
TaxRate	0.0062	0.0068	0.0068	0.0056	−0.0016	0.0063
	(0.0097)	(0.0108)	(0.0108)	(0.0101)	(0.0113)	(0.0101)
logPop	−0.5455***	−0.5018***	−0.5019***	−0.4806***	−1.1559***	−0.8124***
	(0.1567)	(0.1807)	(0.1817)	(0.1837)	(0.3235)	(0.2106)
CommunityCenter	0.2005	0.1752	0.1754	0.1890	0.3410**	0.2501
	(0.1771)	(0.1880)	(0.1883)	(0.1636)	(0.1636)	(0.1625)
CommunityBorder	0.2177	0.1897	0.1887	0.1645	0.2573	0.2273
	(0.2040)	(0.1957)	(0.1997)	(0.1921)	(0.1942)	(0.1960)
Parliament		0.0541	0.0539	0.0306	−0.3807	−0.2683
		(0.3084)	(0.3082)	(0.2464)	(0.2478)	(0.2677)
DebtBrakeYes		−6.7275*	−6.7402*	−7.7934**	−3.1372	−4.8543
		(3.5290)	(3.5367)	(3.4983)	(4.0547)	(3.6134)
ElecLeft		1.3199	1.3214	0.3539	0.9237	0.3780
		(1.9570)	(1.9682)	(2.0231)	(2.0940)	(2.0121)
NoSchoolComm		0.1957	0.1955	0.1893	−0.0408	0.0919
		(0.1993)	(0.1990)	(0.1661)	(0.1985)	(0.1825)
Children		−5.2388	−5.2316	−5.0260	12.7377	2.7947
		(5.5661)	(5.6010)	(5.6335)	(9.1059)	(7.3443)
logSchoolExp		0.6384	0.6405	0.3687	−0.4673	0.0255
		(0.7213)	(0.7258)	(0.7298)	(0.7527)	(0.7656)
logEquity			−0.0036	0.0103	−0.0010	0.0125
			(0.0876)	(0.0816)	(0.0814)	(0.0806)
City	4.1811***	3.6507***	3.6448***	3.7369***	5.3094***	4.5399***
	(1.1655)	(1.0996)	(1.0976)	(0.7242)	(0.7848)	(0.6757)
(Intercept)	73.1346***	69.5111***	69.4706***	73.1583***	85.0253***	71.1883***
	(17.7303)	(18.0120)	(17.7713)	(17.3119)	(18.2142)	(16.8308)
N	171	171	171	171	171	171
R^2	0.407	0.433	0.433	0.460	0.467	0.465
F-test (first stage)					28.300	34.580
J-test						0.387
Instruments					*Density1960*	*Density1960, Property-Owner1960*

Dependent variable: DebtToTax. *** indicates a significance level of below 1%; ** indicates a significance level between 1% and 5%; * indicates significance level between 5% and 10%. Robust standard errors using a White heteroskedasticity adjusted sandwich estimator are given in parentheses. Specifications 4 to 6 are weighted with logPop. Column 5 uses the population density in 1960 (before law reform) as an instrument. Column 6 uses the population density and the rate of property owners in 1960 (both before law reform) as instruments.

Table 3. Effects of Property Ownership on New Debt-to-Tax Ratio (NewDebtToTax) because of Debt Capitalization

	OLS				2SLS	
Variable	(1)	(2)	(3)	(4 Weighted)	(5 Weighted)	(6 Weighted)
PropertyOwner	−0.2780***	−0.3199***	−0.3230***	−0.3544***	−1.0158***	−1.0688***
	(0.1008)	(0.1228)	(0.1225)	(0.1197)	(0.3193)	(0.3046)
logMeanIncome	−0.8840***	−0.8989***	−0.8886***	−0.8843***	−0.9173***	−0.9164***
	(0.1790)	(0.1769)	(0.1757)	(0.1794)	(0.1954)	(0.1889)
logInvest	0.0068	0.0052	0.0053	0.0058	0.0098	0.0101
	(0.0074)	(0.0074)	(0.0074)	(0.0078)	(0.0079)	(0.0075)
logMeanMedian	0.9798***	1.0267***	1.0271***	1.0290***	1.1388***	1.1483***
	(0.2235)	(0.2233)	(0.2241)	(0.2280)	(0.2599)	(0.2486)
TaxRate	−0.0040***	−0.0038***	−0.0038***	−0.0037***	−0.0043***	−0.0044***
	(0.0013)	(0.0014)	(0.0014)	(0.0014)	(0.0015)	(0.0014)
logPop	−0.0883***	−0.0781***	−0.0783***	−0.0833***	−0.1427***	−0.1474***
	(0.0200)	(0.0217)	(0.0216)	(0.0223)	(0.0363)	(0.0330)
CommunityCenter	0.0452*	0.0540*	0.0543*	0.0532*	0.0666**	0.0678**
	(0.0273)	(0.0303)	(0.0302)	(0.0287)	(0.0284)	(0.0282)
CommunityBorder	−0.0359	−0.0382	−0.0399	−0.0411	−0.0328	−0.0328
	(0.0298)	(0.0299)	(0.0307)	(0.0311)	(0.0299)	(0.0305)
Parliament		−0.0199	−0.0202	−0.0210	−0.0572	−0.0602
		(0.0682)	(0.0679)	(0.0557)	(0.0582)	(0.0580)
DebtBrakeYes		0.5861	0.5642	0.5059	0.9184	0.9409*
		(0.4459)	(0.4538)	(0.4850)	(0.5691)	(0.5534)
ElecLeft		0.2419	0.2445	0.1782	0.2281	0.2328
		(0.2587)	(0.2596)	(0.2765)	(0.2702)	(0.2709)
NoSchoolComm		−0.0308	−0.0310	−0.0294	−0.0496**	−0.0513**
		(0.0221)	(0.0220)	(0.0197)	(0.0221)	(0.0228)
Children		0.0512	0.0637	0.1626	1.7246	1.8531*
		(0.7140)	(0.7151)	(0.7673)	(1.1449)	(1.0871)
logSchoolExp		0.1557*	0.1592*	0.1361	0.0621	0.0577
		(0.0901)	(0.0917)	(0.0948)	(0.0890)	(0.0947)
logEquity			−0.0062	−0.0062	−0.0066	−0.0089
			(0.0097)	(0.0097)	(0.0104)	(0.0105)
City	0.2613***	0.2670***	0.2569**	0.2752***	0.4146***	0.4218***
	(0.0798)	(0.1009)	(0.1050)	(0.0869)	(0.1013)	(0.0941)
(Intercept)	10.7211***	9.0870***	9.0170***	9.2273***	10.2777***	10.3386***
	(2.0267)	(1.9950)	(1.9932)	(2.0391)	(2.2558)	(2.1566)
N	171	171	171	171	171	171
R^2	0.244	0.271	0.272	0.268	0.249	0.274
F-test (first stage)					28.3	34.58
J-test						0.956
Instruments					*Density 1960*	*Density 1960, Property Owner 1960*

Dependent variable: NewDebtToTax. *** indicates a significance level of below 1%; ** indicates a significance level between 1% and 5%; * indicates significance level between 5% and 10%. Robust standard errors using a White heteroskedasticity adjusted sandwich estimator are given in parentheses. Specifications 4 to 6 are weighted with logPop. Column 5 uses the population density in 1960 (before law reform) as an instrument. Column 6 uses the population density and the rate of property owners in 1960 (both before law reform) as instruments.

both debt measures. Whether a community is in the center or at the border of the canton has no impact on the debt-to-tax ratio.

In specifications in column 2 of Tables 2 and 3 we control for a number of political variables (communal parliament, left parties), debt preference measures (agreement to debt brake), and public goods demand for schools (an indicator for whether the community has a separate school community, the number of children, and the log of school expenditure). However, as our dependent variable is the debt versus tax choice, we have no clear expectation about the effect of public good demand. For the debt-to-tax ratio in Table 2, of all these additional controls only conservative fiscal preferences (i.e., the share of voters who voted in favor of a debt break at the federal level) have a statistically significant negative influence at the 10% level. In Table 3 higher schooling expenditure seems to tilt financing choices slightly toward taxes. The introduction of these additional controls reduces the size of the coefficient of the property ownership rate by approximately a third for the debt-to-tax ratio in column 2 of Table 2. By contrast, the effect of property owners on new debts to taxes in column 2 of Table 3 increases slightly. In both specifications property ownership remains significant at the 5% and 1% level, respectively.

Communal equity presents an indicator for combined effects of public goods demand and the possibility to implement more flexible financing choices. We include it as an additional control in specifications (column 3) of Tables 2 and 3. It affects neither the debt versus tax choice nor the size and significance of the effect of property owners on the debt versus tax choice.

To ensure that our results are not driven by a number of small communities, we estimate weighted least-squares models in column 4 of Tables 2 and 3. The regressions are weighted by the communal log population. While weighting slightly decreases the effect of the property ownership rate on the debt-to-tax ratio in Table 2, it slightly increases the effect of the property ownership rate on the new debts-to-tax ratio in Table 3. However, in both specifications the coefficient for property ownership remains significant.

The size of our coefficient of interest is similar across specifications (columns 2 to 4) in Table 2. It suggests that the property ownership rate has a rather large effect on the total debts. For instance, with an absolute coefficient size of 1.512 (lower bound), an increase in the property ownership rate by one percentage point implies that total debts fall by approximately 0.827% for an average community [1.512 $\times$ 0.01 $\times$ 2712.12 avg(Taxes per Capita)/4958.19 avg(Debts per capita)]. For new debts in Table 3 the effect is even stronger: With an absolute coefficient size of 0.278 [lower bound of specification (1)] a one percentage point increase in property owners decreases new debts by 5.5% for an average community [0.278 $\times$ 0.01 $\times$ 2712.12 avg(Taxes per Capita) / 136.37 avg(New debts per capita)].[9]

Endogeneity Issues

So far, we reported only results from ordinary least-squares (OLS) estimations. However, such estimates could suffer from potential simultaneity bias, resulting in a correlation between the error term and property ownership rate. Even though property ownership changes only slightly and slowly over time, it is not necessarily exogenously given but might be the result of

[9] The difference between the size of the impact of new debts and the size of the impact of total debts is no concern. It is plausible that property ownership shifts deficits by some absolute amount. As the level of new debts was historically quite low at the date of our cross section, the relative impact of property ownership was sizeable at that time.

fiscal preferences of citizens concerned with debts. It could be argued that because of debt capitalization property owners choose to live in jurisdictions that can be expected to accumulate less debt in the future. Then, property ownership could emerge endogenously without having an influence on the debt versus tax choice as postulated by our theoretical reasoning. To address this problem, we estimate 2SLS regressions with a full specification in columns 5 and 6 of Table 2 for the debt-to-tax ratio and in columns 5 and 6 for the new debt-to-tax ratio in Table 3. For identification we use an institutional reform in 1963: Until then property ownership could not flexibly react to debts because it was virtually impossible for a large majority of the population to become property owners in dense urban settings since the civil code prohibited changes in construction of parts of a building such as apartments, which made it difficult to market condominiums. On December 19, 1963, the national government made it possible for citizens to own and reconstruct apartments (condominiums) in Switzerland, which brought about a huge home ownership boom.[10] Thus, population density and the homeownership rate before the law change may serve as instruments. When explaining today's ownership rates with density and ownership rates before the law reform, we rule out the effects of property owners entering a community after 1963 due to its low debt-to-tax ratio. We use data from the population census in 1960. Population density and the homeownership rate in 1960 are highly correlated with the fraction of property owners today. Density and ownership in 1960, on the other hand, have no directly discernible influence on the debt versus tax choice today apart from their influence on the fraction of property owners. As shown in specifications (columns 5 and 6) of Table 2 for the debt-to-tax ratio and in specifications (columns 5 and 6) of Table 3 for the new debts-to-tax ratio, the F test for the significance of all coefficients in the first stage is highly significant concerning the quality of the instrument. In column 5 of Tables 2 and 3 we use only population density in 1960 as an instrument, while in column 6 of both tables we also use the 1960 ownership rate as an instrument in the first stage. In the second stage, the coefficient of the property ownership variable remains significantly negative in all specifications. Compared to the OLS regressions, its absolute size is increasing with both debt measures. This would be consistent with the hypothesis that OLS estimates are biased upward (i.e., the absolute size of the coefficients is too small) because the reform in 1960 allowed for more systematic sorting of property owners and tenants afterward. Thus, the point estimates suggest that in absolute terms examining the link between property ownership and debt financing using OLS understates rather than overstates the theoretical effect. None of the J statistics in column 6 of Tables 2 and 3, which deal with the over-identifying restrictions, point to problems with the instruments; that is, the residuals of the regressions seem to be uncorrelated with the exogenous variables.

So far we have shown that the level of property ownership affects the debt-to-tax ratio and the new debts-to-tax ratio negatively, which provides support for the theoretical mechanism. Local public debts result from a political struggle between property owners and renters. As debts increase, property owners suffer from lower property values, whereas rents do not fully react or react only slowly. Thus property owners try to avoid additional debts and prefer taxes instead. We will analyze this relationship more closely by providing robustness tests, considering differential hypotheses following from debt capitalization, additional variables, and performing a Bayesian averaging of different estimation results.

[10] Introduction of §712a-712t ZGB (Zivilgesetzbuch, Civil Law) concerning *Stockwerkeigentum* (condominiums).

Robustness

All robustness tests are reported in Table 4.[11]

It is plausible that the upward adjustment of rents as a consequence of a high share of debt financing decreases with municipalities' size, because in large municipalities a larger fraction of the tenement houses are owned by the government and cooperatives, which are known to adjust rents more slowly to market demand than private owners. Thus, tenants in larger communities tend to favor debt over tax financing even more than tenants in small communities. Therefore, we expect that the negative effect of property owners on debt financing increases with population size. In the specifications in columns 1 and 2 we estimate the interaction term between property owners and population size. The population variable is expressed as the population of a community in thousands minus average population in thousands over all communities, denoted as DiffPop. This allows us to analyze changes in property ownership rates with respect to an average communal population. The impact of property ownership itself remains negative and significant. The interaction term (IntPropertyPop) is negative and significant. The larger the population size, the more negative is the impact of the property ownership on the debt versus tax choice in the estimation in column 1 as well as on the new debts-to-tax ratio in the estimation in column 2, as predicted by theory.

Debt capitalization may not occur at the same rate in all communities. In communities close to the center where land for construction is scarce, capitalization is more pronounced, while at the urban edge close to the cantonal border capitalization is less so (as also suggested by Brasington 2002). Thus we include two interaction terms with property ownership and the dummies, indicating which communities are in the center and which communities are at the cantonal border. We expect that the negative effect of property ownership is larger in the center, and smaller at the cantonal border, than on average. Thus, we expect that the interaction term for property owners and center communities (IntPropertyCenter) tends to be negative, while the interaction term between property owners and border communities (IntPropertyBorder) tends to be positive. Empirical estimates in specifications in columns 3 and 4 confirm these hypotheses for both debt measures, but the interaction terms do not reach significance.[12] Base effects of property ownership are comparable to Table 2.

Property owners in the Canton of Zurich are often the elderly; at the same time, the elderly might prefer debts to taxes, especially if debts do not capitalize at 100%.[13] In the specifications in columns 5 and 6 we include the fraction of elderly and net immigration to the community as additional tests of robustness. Net immigration to the community accounts for changes in the population and the possible impact of short-term interests of tenants. The inclusion of these variables has a minor effect on the size of the coefficients of property ownership. The impact of our variable of interest, property ownership, remains negative and significant. We also split net immigration into gross immigration and gross emigration. The inclusion of these variables had no noticeable effect on the results for homeownership, which stayed statistically significant.

[11] We report unweighted specifications here. Weighting usually does not change the significance of the coefficients.

[12] Whether capitalization is really lower when more land is available such as in communities at the urban edge is still a discussion in the literature (see Gustely 1976 for an early assessment of the literature on capitalization or Brasington 2002 on the specific issue of land availability and capitalization).

[13] Stadelmann and Eichenberger (2008) and Stadelmann (2010) show that debt capitalization is significant and that capitalization rates are usually above 60%.

While gross immigration had a positive, and gross emigration a negative, effect on debts, these variables did not reach statistical significance (not reported in tables).

The basic methodology to analyze different variables on debts and other fiscal variables consists of running cross-sectional (or panel) regressions including the main variable of interest and numerous other controls (see de Haan and Sturm 1994; Feld and Kirchgässner 2001; Goeminne, Geys, and Smolders 2008). The problem with this approach is that empirical economists might not exactly know which independent control variables should be included in their regressions. Clearly the choice should be guided by theory. It is also clear, though, that regressor selection can have an important effect on the results, and missing out explanatory variables might introduce considerable bias. In our final robustness tests we deal with the problem of variable selection by performing Bayesian model averaging (see Raftery 1995; Raftery, Madigan, and Hoeting 1997).

The main idea behind Bayesian model averaging (BMA) is to estimate the distribution of unknown parameters of interest across a large number of different models (model space). In contrast to classical estimation, model averaging copes with model uncertainty by allowing for all possible models to be considered, which consequently reduces the bias of the parameters of interest. BMA asks the researcher to specify possible regressors that might have an impact on the debt measure. The Bayesian approach is feasible and has been applied to various problems in economics by, for example, Fernandez, Ley, and Steel (2001) and Sala-i-Martin, Doppelhofer, and Miller (2004). Hoeting et al. (1999) give various other examples and mention possible applications. The interpretation of the estimates from BMA is straightforward because we can calculate conditional means and standard deviations, which can be interpreted similarly to standard OLS coefficients and standard errors. Furthermore, a posterior inclusion probability for any variable can be calculated, which gives the probability that any specific variable is included in a model.[14]

Columns 7 to 9 of Table 4 present the results of BMA for the dependent variable debt-to-tax ratio.[15] We include the largest set of possible variables from earlier specifications for the BMA procedure and add population squared, employment in the third sector, rail network access, and (log) average rents into the estimation. The conditional mean of the variable for property ownership is negative and significant (column 7). This indicates that the average effect of property ownership on the debt-to-tax ratio regarding all estimates over the whole model space is negative. The economic variables have the same signs for their conditional means in BMA as they have in the OLS estimates. Apart from investments and the tax rate, they are also statistically significant. Concerning the additional control variables, only the agreement to the debt brake and the fraction of elderly turn out to be significant when looking at the whole model space.[16] In column 8 we perform a Wilcoxon signed-rank test for the sign of the posterior mean conditional on inclusion. In the averaging procedure of BMA different models are estimated. In each of these models the sign of the variable under consideration is taken. It might be the case, for example, that the property ownership has a positive impact on debts to taxes in some specific models but a negative impact in others and on average. We test for this

[14] Further explanations concerning BMA and applications can be found in the literature (Raftery, Madigan, and Hoeting 1997 and the follow-up literature).

[15] Note that we always include an intercept an the city dummy for Zurich and Winterthur by construction for the whole model space.

[16] The population growth rate is not significant in the OLS estimations. Its significance in the BMA results points to possible problems with multicolinearity regarding this variable and other controls.

Table 4. Effects of Property Ownership because of Debt Capitalization: Robustness Tests and Bayesian Model Averaging

	DebtToTax	NewDebtToTax	DebtToTax	NewDebtToTax	DebtToTax
Variable	(1)	(2)	(3)	(4)	(5)
PropertyOwner	−1.6620*	−0.4910***	−2.0761**	−0.4080***	−1.6004*
	(0.9196)	(0.1381)	(0.9136)	(0.1569)	(0.8415)
DiffPop	0.0140***	0.0013***			
	(0.0022)	(0.0003)			
IntPropertyPop	−0.2342***	−0.0541***			
	(0.0848)	(0.0129)			
IntPropertyCenter			−0.0523	−0.2693	
			(1.0349)	(0.1897)	
IntPropertyBorder			2.0660	0.0348	
			(1.4676)	(0.2100)	
logMeanIncome	−5.8404***	−0.9555***	−5.5666***	−0.8845***	−4.5096***
	(1.4483)	(0.1779)	(1.4321)	(0.1718)	(1.3943)
logInvest	−0.0119	0.0022	0.0309	0.0041	0.0157
	(0.0697)	(0.0066)	(0.0772)	(0.0075)	(0.0706)
logMeanMedian	7.2615***	1.1631***	6.6668***	1.0326***	3.9328**
	(1.7730)	(0.2275)	(1.7399)	(0.2177)	(1.8846)
TaxRate	0.0115	−0.0034**	0.0083	−0.0037***	0.0080
	(0.0102)	(0.0014)	(0.0107)	(0.0014)	(0.0111)
logPop			−0.4804***	−0.0785***	−0.4844***
			(0.1749)	(0.0226)	(0.1660)
CommunityCenter	0.1655	0.0493	0.2191	−0.0579	−0.0209
	(0.1876)	(0.0302)	(0.4264)	(0.0792)	(0.1932)
CommunityBorder	0.1592	−0.0505	−0.8791	−0.0487	0.0415
	(0.2050)	(0.0309)	(0.7495)	(0.1117)	(0.1944)
Parliament	−0.0037	−0.0092	−0.1187	−0.0039	0.0363
	(0.3221)	(0.0612)	(0.3116)	(0.0714)	(0.3068)
DebtBrakeYes	−7.1848*	0.4728	−6.6431*	0.5055	−5.5413
	(3.6790)	(0.4330)	(3.5555)	(0.4644)	(3.4491)
ElecLeft	1.2709	0.2764	1.4544	0.2041	1.3945
	(2.0457)	(0.2483)	(2.0353)	(0.2719)	(1.8401)
NoSchoolComm	0.1365	−0.0443**	0.1541	−0.0282	0.1284
	(0.2071)	(0.0209)	(0.1926)	(0.0210)	(0.2097)
Children	−6.0327	−0.0912	−4.9955	0.0336	−0.0380
	(5.6189)	(0.7171)	(5.6742)	(0.7253)	(6.0256)
logSchoolExp	1.1014	0.1863**	0.4742	0.1721*	0.6418
	(0.7315)	(0.0886)	(0.7027)	(0.0920)	(0.7151)
logEquity	0.0013	−0.0041	−0.0218	−0.0058	0.0095
	(0.0873)	(0.0105)	(0.0922)	(0.0099)	(0.0836)
Elderly					11.9076**
					(5.1388)
ImmigSaldo					−3.2723
					(5.9964)
PopSquared					
Employed3sector					
AccessFasttrain					
logAvgRent					

Table 4. Extended

NewDebtToTax	BMA (DebtToTax)			BMA (NewDebtToTax)		
(6)	BMA (7)	Sign Test (8)	Incl. Prob. (9)	BMA (10)	Sign Test (11)	Incl. Prob. (12)
−0.3221***	−1.655*	0	23.3	−0.288**	0	58.3
(0.1209)	(0.929)			(0.118)		
−0.8547***	−4.095***	0	99.9	−0.765***	0	99.4
(0.1769)	(1.425)			(0.202)		
0.0050	0.019	0.003	3	0.007	0	5.4
(0.0075)	(0.056)			(0.007)		
0.9469***	4.309**	0	44.5	0.858***	0	98.5
(0.2389)	(1.981)			(0.244)		
−0.0038***	0.014	0	7.8	−0.004***	0	83.7
(0.0014)	(0.011)			(0.001)		
−0.0779***	−0.381***	0	99	−0.064***	0	93.4
(0.0217)	(0.129)			(0.022)		
0.0491	−0.058	0.037	2.8	0.058*	0	23.5
(0.0309)	(0.259)			(0.032)		
−0.0437	0.037	0.014	2.7	−0.048*	0	20.3
(0.0325)	(0.215)			(0.028)		
−0.0207	0.144	0.008	2.7	−6.31E−03	0.183	2.6
(0.0675)	(0.437)			(5.90E−02)		
0.5965	−8.332**	0	68.7	0.381	0.001	4.7
(0.4588)	(3.260)			(0.441)		
0.2465	2.236	0	9.3	0.149	0.006	3.6
(0.2586)	(1.724)			(0.205)		
−0.0328	0.146	0.004	3.1	−0.017	0.009	3.1
(0.0218)	(0.245)			(0.033)		
0.2017	1.546	0.045	3.1	−0.521	0.006	5.2
(0.7307)	(5.576)			(0.835)		
0.1591*	0.725	0	5.7	0.182*	0	25.8
(0.0921)	(0.737)			(0.099)		
−0.0059	0.025	0.004	2.7	−1.65E−03	0.021	2.5
(0.0099)	(0.101)			(1.31E−02)		
0.3163	13.722***	0	99.3	0.365	0.003	3.8
(0.4214)	(3.792)			(0.524)		
−0.0921	−6.356	0	7.8	−0.172	0.013	2.8
(0.5999)	(5.122)			(0.669)		
	0.000	0	17.3	1.18E−06	0.006	3.3
	(0.000)			(2.04E−06)		
	1.191	0	15.5	0.053	0.014	3.5
	(0.760)			(0.109)		
	−2.92E−03	0	4.8	1.63E−04	0.009	3
	(3.33E−03)			(4.18E−04)		
	−0.008	0.756	2.7	−0.103	0.001	4.1
	(1.092)			(0.139)		

Table 4. Continued

	DebtToTax	NewDebtToTax	DebtToTax	NewDebtToTax	DebtToTax
Variable	(1)	(2)	(3)	(4)	(5)
City	4.0697***	0.8162***	3.5241***	0.2941***	3.4366***
	(1.2421)	(0.2086)	(1.0782)	(0.1095)	(1.0563)
(Intercept)	62.5137***	8.9569***	68.1250***	8.9732***	52.4115***
	(16.8865)	(2.0179)	(17.4613)	(1.9294)	(17.1150)
N	171	171	171	171	171
R^2	0.416	0.273	0.436	0.265	0.460
BIC					

*** indicates a significance level of below 1%; ** indicates a significance level between 1% and 5%; * indicates significance level between 5% and 10%. Robust standard errors using a White heteroskedasticity adjusted sandwich estimator are given in parentheses. For the Bayesian model averaging (BMA) results in columns 7 and 10, the coefficent and standard deviation are conditional on inclusion of the variable in the model. The sign test in columns 8 and 11 is the p-value of a Wilcoxon signed-rank test for the sign of the variable over all models. The p-value of the sign tests indicates whether the coefficient is on the same side zero as its posterior mean conditional on inclusion. Columns 9 and 12 give the posterior inclusion probability of all variables. "INC" denotes variables that are included by construction in the Bayesian model averaging procedure. BMA results were obtained using the software of the R Project for Statistical Computing with the BMA package (Raftery et al. 2009).

possibility and present the resulting p values in column 8; that is, we test whether the coefficients of the diverse models have the same sign as the reported posterior conditional mean. We can reject the hypothesis at the 1% level that the property ownership enters other models of the whole model space with a positive coefficient. Finally, we calculate the posterior inclusion probability of all variables in column 9. The inclusion probability of the property ownership rate is 23.3%, indicating that property ownership is more important than most political and demographic control variables when analyzing local public debts.

Finally, columns 10 to 12 of Table 4 present BMA results when the dependent variable is the new debts-to-tax ratio. The posterior mean conditional on inclusion for property ownership is negative and significant at the 5% level. Moreover, the Wilcoxon signed-rank test for the sign of the posterior mean conditional on inclusion indicates that the negative sign is not just a statistical artifact of aggregation. We can reject the hypothesis that the conditional mean is positive at the 5% level. The posterior inclusion probability is 58.3% and again within the range of most important economic variables. For the new debt-to-tax ratio only the mean income, mean to median income, tax rate, and population size have a higher inclusion probability.

5. Conclusion

Public debts capitalize into property prices. Thus, they are a burden to the present generation who owns the devalued property (Stadelmann and Eichenberger 2008). Therefore, the fight over deficits and debts is not an intergenerational conflict. It is an intragenerational political conflict between today's property owners and tenants.

If rental markets are less flexible than property markets, new debts asymmetrically burden property owners. In politics, property owners therefore have an incentive to vote for political platforms proposing lower local debts-to-tax ratios when financing public expenditures. Communities with a high fraction of property owners consequently should have lower debt-to-tax ratios.

Table 4. Continued

NewDebtToTax	BMA (DebtToTax)			BMA (NewDebtToTax)		
(6)	BMA (7)	Sign Test (8)	Incl. Prob. (9)	BMA (10)	Sign Test (11)	Incl. Prob. (12)
0.2514**	3.242***	0	INC	0.234*	0	INC
(0.1068)	(1.150)			(0.134)		
8.5641***	52.359***	0	INC	8.743***	0	INC
(2.0478)	(15.270)			(2.800)		
171						
0.258						
	−683.145			−681.010		

We have modeled the theoretical mechanism outlined above and provided empirical evidence to support it. Using a full data set of all 171 communities in the Swiss Canton of Zurich we showed that higher property ownership rates are indeed related causally to lower debt-to-tax levels for total and new debts. Robustness results with differential hypotheses and using Bayesian model averaging strongly confirm the systematically negative impact of property owners on the debt versus tax choice.

References

Alesina, Alberto, and Allan Drazen. 1991. Why are stabilizations delayed? *American Economic Review* 81:1170–88.

Alesina, Alberto, and Roberto Perotti. 1994. The political economy of budget deficits. NBER Working Paper No. 4637.

Ashworth, John, Benny Geys, and Bruno Heyndels. 2005. Government weakness and local public debt development in Flemish municipalities. *International Tax and Public Finance* 12:395–422.

Banzhaf, H. Spencer, and Wallace E. Oates. 2008. On Ricardian equivalence in local public finance. Accessed November 10, 2011. Available at SSRN: http://ssrn.com/abstract=1248002.

Barro, Robert J. 1974. Are government bonds net wealth? *Journal of Political Economy* 82:1095–1117.

Barro, Robert J. 1989. The Ricardian approach to budget deficits. *Journal of Economic Perspectives* 3:37–54.

Bourassa, Steven C., Martin Hoesli, and Donato F. Scognamiglio. 2009. Housing finance, prices, and tenure in Switzerland. Swiss Finance Institute Research Paper No. 09-16.

Brasington, David M. 2002. Edge versus center: Finding common ground in the capitalization debate. *Journal of Urban Economics* 52:524–41.

Daly, George G. 1969. The burden of the debt and future generations in local finance. *Southern Economic Journal* 36:44–51.

de Haan, Jakob, and Jan-Egbert Sturm. 1994. Political and institutional determinants of fiscal policy in the European Community. *Public Choice* 80:157–72.

Drazen, Allan, and Vittorio Grilli. 1993. The Benefit of crises for economic reforms. *American Economic Review* 83:598–607.

Eichenberger, Reiner. 2007. Staaten in der Schuldenfalle—Schnitt ins eigene Fleisch. *Schweizer Monatshefte* 9:28–9.

Eichenberger, Reiner, and Mark Schelker. 2007. Independent and competing agencies: An effective way to control government. *Public Choice* 130:79–98.

Epple, Dennis, and Katherine Schipper. 1981. Municipal pension funding: A theory and some evidence. *Public Choice* 37:141–78.

Feld, Lars P., and Gebhard Kirchgässner. 2001. Does direct democracy reduce public debt? Evidence from Swiss municipalities. *Public Choice* 109:347–70.

Feld, Lars P., and John G. Matsusaka. 2003. Budget referendums and government spending: Evidence from Swiss cantons. *Journal of Public Economics* 87:2703–24.

Fernandez, Carmen, Eduardo Ley, and Mark F. Steel. 2001. Model uncertainty in cross-country growth regressions. *Journal of Applied Econometrics* 16:563–76.

Frey, Bruno S., and Reiner Eichenberger. 2002. *The new democratic federalism for Europe: Functional, overlapping, and competing jurisdictions*. Cheltenham, UK: Edward Elgar Publishing.

Goeminne, Stijn, Benny Geys, and Carine Smolders. 2008. Political fragmentation and projected tax revenues: Evidence from Flemish municipalities. *International Tax and Public Finance* 15:297–315.

Gustely, Richard D. 1976. Local taxes, expenditures and urban housing: A reassessment of the evidence. *Southern Economic Journal* 42:659–65.

Hoeting, Jennifer A., David Madigan, Adrian E. Raftery, and Chris T. Volinsky. 1999. Bayesian model averaging: a tutorial (with discussion). *Statistical Science* 14:382–417.

Leeds, Michael A. 1985. Property values and pension underfunding in the local public sector. *Journal of Urban Economics* 18:34–46.

Meltzer, Allan H., and Scott F. Richard. 1981. A rational theory of the size of government. *Journal of Political Economy* 89:914–27.

Mierau, Jochen O., Richard Jong-A-Pin, and Jakob de Haan. 2007. Do political variables affect fiscal policy adjustment decisions? New empirical evidence. *Public Choice* 133:297–319.

Oates, Wallace E. 1969. The effects of property taxes and local public spending on property values: An empirical study of tax capitalization and the Tiebout hypothesis. *Journal of Political Economy* 77:957–71.

Oates, Wallace E. 1988. On the nature and measurement of fiscal illusion: A survey. In *Taxation and fiscal federalism: Essays in honour of Russell Mathews*, edited by Geoffrey Brennan, et al. (1988). Sydney: Australian National University Press, pp. 65–82.

Oates, Wallace E. 2005. Property taxation and local public spending: The renter effect. *Journal of Urban Economics* 57:419–31.

Raftery, Adrian E. 1995. Bayesian model selection in social research. *Sociological Methodology* 25:111–63.

Raftery, Adrian E., Jennifer A. Hoeting, Chris Volinsky, Ian Painter, and Ka Y. Yeung. 2009. BMA: Bayesian model averaging. R package version 3.10. Accessed November 10, 2011. Available at http://CRAN.R-project.org/package=BMA.

Raftery, Adrian E., David Madigan, and Jennifer A. Hoeting. 1997. Bayesian model averaging for linear regression models. *Journal of the American Statistical Association* 92:179–91.

Sala-i-Martin, Xavier, Gernot Doppelhofer, and Ronald I. Miller. 2004. Determinants of long-term growth: A Bayesian averaging of classical estimates (BACE) approach. *American Economic Review* 94:813–35.

Stadelmann, David. 2010. *Effects of fiscal policies on house prices: New evidence, persistence, consequences*. Baden-Baden: Nomos-Verlag.

Stadelmann, David, and Reiner Eichenberger. 2008. Debt capitalization: A new perspective on Ricardian equivalence. CREMA Working Paper Series 2008-30. Center for Research in Economics, Management and the Arts (CREMA).

Stull, William J., and Judith C. Stull. 1991. Capitalization of local income taxes. *Journal of Urban Economics* 29:182–90.

Tabellini, Guido. 1991. The politics of intergenerational redistribution. *Journal of Political Economy* 99:335–57.

Temple, Judy. 1994. The debt/tax choice in the financing of state and local capital expenditures. *Journal of Regional Science* 34:529–47.