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

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Abstract

Public debts capitalize into property prices. Therefore, property owners tend to favor tax over debt financing for government spending. In contrast, tenants do not suffer from debt capitalization. Thus, they tend to favor debt over tax financing. Our model of the resulting democratic fight between property owners and tenants over public debts and taxes predicts that the property ownership rate in a jurisdiction negatively effects the debt level. 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.

Key words: Public Debts, Homeownership, Taxes, Ricardian Equivalence.

JEL Classification: H74, R51, H00.

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1 Introduction

In open economies the price of housing reflects individual preferences for packages of public services and tax prices. Demand for property depends on the utility of the inhabitants which itself depends on the tax price. [1] These two variables are affected by the debt burden, the first negatively, the second positively. Therefore, demand for property and, thus, property prices are lower in communities with higher debts, i.e. government debts capitalize into property values. In a recent paper we showed that debt capitalization does indeed occur to a large extent (Stadelmann and Eichenberger 2008 and Banzhaf and Oates 2008). Debt capitalization has some significant consequences. Most importantly, government debts are not a burden to future generations but to the present one as it owns the devalued property. Consequently, debt capitalization results in a so far neglected form of Ricardian equivalence that works also with purely selfish individuals.[2] However, debt capitalization also provides a new explanation for the extent of government debt accumulation and thus for the level of public debts.

In the politico-economic literature, debt accumulation is often explained by disagreement between different interest groups or political parties in the decision-making process (Alesina and Drazen, 1991 and Drazen and Grilli, 1993). Debt capitalization provides a new argument that complements current thinking. With debt capitalization, the fight over deficits and debts is no longer an intergenerational conflict. Instead, it is an intra-generational conflict between today's property owners and today's tenants as property prices and rents are asymmetrically affected by debt capitalization. It is plausible that rents increase when governments are financed by debts rather than by taxes and it is also plausible that the adaptation of rents to the new equilibrium is, due to various regulations, slower than the adaptation of property prices to their new but lower level. Therefore, tenants tend to prefer debt over tax financing while property owners tend to prefer tax over debt financing.

In this paper we theoretically and empirically analyze the economic conflict between property owners and renters over debt versus tax financing of public expenditures. In a probabilistic voting model of the local debt/tax choice, property owners and tenants face

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1 See Oates (1969) and the subsequent literature on capitalization in general.

2 Barro (1974) and Barro (1989) model a Ricardian equivalence using generationally interdependent utility functions.

different tax costs per unit of local government expenditure due to capitalization of debts. These different costs effectively create disagreement in the political decision-making process. Property owners know that higher debts decrease the value of their property. If the respective decrease in property prices is not instantly matched by an equivalent increase in rents, e.g. because rent adjustment is slow due to government regulation or lobbing of pro-tenant groups, property owners will implicitly face higher tax costs in the future. Tenants, on the other hand, do not see their tax costs increase if debts rise as they do not suffer from losses in property values. Consequently, tenants prefer local debts to local taxes when financing public expenditures as the burden of the debts remains with current property owners. Communities with a higher fraction of property owners (a higher fraction of tenants) should accordingly have lower (higher) debts.

We analyze empirical data reflecting actual experience of Switzerland to test whether a higher fraction of property owners in a community has a negative impact on local public debts. Swiss jurisdictions are strongly autonomous from the federal government in determining their tax, spending and deficit policies and therefore form an ideal laboratory to investigate our hypothesis. Empirical results indicate a strong and robust negative effect of higher property ownership on debts per capita as well as the debt to tax ratio, thereby confirming our theory.

The remainder of this paper is organized as follows: Section 2 provides a 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 is presented in Section 3. Empirical estimation results from 171 Swiss communities in the canton of Zurich are presented in Section 4. Our model is extensively tested for robustness by considering differential hypotheses and using Bayesian Model Averaging to investigate the effect of variable selection. Section 5 offers some concluding remarks.

2 Theoretical Considerations

So far, debt capitalization has not yet been analyzed as a driving force of debt accumulation. 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). At the municipal level Feld and Kirchgässner (2001) argue that constitutional restrictions such as deficit referenda and direct democracy help against the debt bias inherent in political decision-making procedures.[3] 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.

Assume that the debt versus tax choice is determined by an elected local government representative who tries to minimize the cost per unit of public expenditures to the electoral group i. There are two groups in a community, property owners H and tenants R. Because of debt capitalization in the presence of imperfect rental markets, we assume that the future tax costs $t_1^i(d)$ for a unit of government expenditure increases in the debt share d for property owners H. Property owners suffer from lower property prices and cannot charge higher rents due to government restrictions or the power of national pro-tenant lobby groups. Consequently, their future tax costs increase with the debt share. We assume that $t_1^i(d)$ is strictly convex for property owners, i.e. the costs and the marginal costs of taxation increase with the debt share.[4] 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. Residents not holding property in the community are also assumed to have constant tax costs in period 1 which are lower then those of property owners for any debt share $d \geq 0$ as 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. In a two-period model, the price P^i of a unit of public expenditure to a resident of group i in any jurisdiction is written as[5]

[3] Feld and Matsusaka (2008) analyze the budget referendums and government spending at the Swiss cantonal level.

[4] Convexity can be motivated by the fact that especially high debt levels lead to intensive discussions in communities concerning sustainability and therefore debt capitalization rates increase.

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

$$P^{i} = (1-d)t_{0}^{i} + dt_{1}^{i}(d)(1-B)^{-1} \qquad (1)$$

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.

The politico-economic literature has shown different possibilities of modeling electoral competition in democracies. The two most commonly used models are the median voter framework („Downsian competition“) and the model of probabilistic voting (Persson and Tabellini, 2000 for an overview). Here we provide theoretical results under probabilistic voting, because it yields smooth outcomes instead of the „sink or swim“ approach of the median voter framework. In the probabilistic voting framework, political representatives differ in a policy dimension, here the debt share d they propose, and in another dimension which is commonly referred to as „ideology“. We assume that voters differ in their valuation of this „ideology“. 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. When elections take place, voters base their voting decision on the policy proposed by the electoral candidates on the one hand and on the candidates' ideologies on the other hand. More specifically, a voter in group $i = \{H, R\}$ prefers a candidate A to any other candidate k if

$$P_{A}^{i} - \sigma_{A}^{i} - \delta_{A} \leq P_{k}^{i} - \sigma_{k}^{i} - \delta_{k} \qquad (2)$$

Where σ_{j}^{i} is the individual ideological bias versus candidate j and δ_{j} measures the average (relative) unpopularity of candidate j. σ_{j}^{i} has a group specific distribution, whereas the distribution of δ_{j} is the same across both groups. Every candidate now maximizes their own probability of winning the election. Under the assumption that the distribution functions are continuous functions, the probability of winning is a smooth function of the distance between the electoral platforms represented by the price P^{i} of a unit of public expenditure for the individual i. The unique equilibrium is that all candidates converge to the same policy platform (Persson and Tabellini, 2000).

Consequently, candidates will minimize the average price of a unit of public expenditure, where the weights correspond to the group sizes.

More specifically the political candidates to be elected seek to choose the debt share d that minimizes

$$\min_{d}(1-d)t_0 + d\lambda^H t_1^H(d)(1-B)^{-1} + d\lambda^R \bar{t}_1(1-B)^{-1} \tag{3}$$

where the first term represent current (constant) tax costs for both groups, the second future tax costs for property owners and the last future tax costs for renters for public expenditures are financed by debts. The optimal debt share d^* is the value of d that equates the marginal costs of debt and tax finance, i.e.

$$(\lambda^H t_1^H(d) + d\lambda^H t_1^{H\,\prime}(d) + \lambda^R \bar{t}_1)(1-B)^{-1} = t_0 \tag{4}$$

The marginal cost of debt finance (the left-hand side above) incorporates the fact that property owners face higher future tax costs $t_1^H(d)$ due the capitalization of debts in their properties. Given the optimal debt share d^* implicitly by (4), we are interested in how this share varies with changes in the fraction of property owners in the population. Therefore, we apply the inverse function theorem to (4) considering that $\lambda^R = 1-\lambda^H$ and obtain

$$\frac{\partial d}{\partial \lambda^H} = -\frac{(t_1^H(d) + dt_1^{H\,\prime}(d) - \bar{t}_1)}{(2\lambda^H t_1^{H\,\prime}(d) + d\lambda^H t_1^{H\,\prime\prime}(d))} \tag{5}$$

which is negative as $\bar{t}_1 \le t_1^H(d)$ 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

For the purpose of evaluating the influence of homeownership on the debt/tax choice by local governments, 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 29321 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 km² in the canton.[6]

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 a significant autonomy with respect to public expenditures and the choice between debt versus tax financing.

In 1982 the canton's communities introduced a harmonized public accounting system for budgeting and book-keeping. 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 book-keeping standards distinguish the Swiss communal finance framework from most other countries (see Oster, 2006). 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, the use or the

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

disposition of these financial assets.[7] The performance of the harmonized Swiss public accounting system has exceeded its original expectations.[8]

As a result, the metropolitan area of Zurich is the ideal test case to gauge the impact property ownership on the local public debt/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/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 variable is firstly the log of the communal debts per capita and secondly the ratio of total debt to total tax revenue by natural persons.[9] Our econometric model for the logarithm of debts per capita and the debt to tax ratio is as follows:

$$Debts = \alpha_0 + \alpha_1 PropertyOwners + \sum_j \alpha_j x_j + \varepsilon \qquad (6)$$

Equation (6) is theoretically motivated by the negative impact of a higher fraction of property owners λ^H on local debts d. The theory predicts $\alpha_1 < 0$ for both measures of local debts.

In common with the empirical literature, we include a number of economic and political control variables in the model. Their different impacts are represented by the coefficients α_j. ε is an error term. Data for the independent control variables were obtained from the Statistical Office of the Canton of Zurich, the Secretary for Education of the Canton of Zurich, the Financial Statistics of the Canton of Zurich, the Swissvotes Database and the Cantonal Bank of the Canton of Zurich.

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 a lower level of public debts. Moreover, if the inhabitants of rich communities have a preference for socioeconomic heterogeneity of their neighborhood, they will strategically prefer tax over debt financing as it deters potential poor immigrant

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7 Communities associate local self-rule in financial maters with autonomy which makes it almost a holy issue.

8 For a more detailed discussion concerning the harmonized public accounting system see Dafflon (2006).

9 Both choices of the dependent variables for debt measures are consistent with the theoretical model.

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. 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. They propose that the higher the ratio of mean to median income, the higher the level of redistribution. Redistribution financed by issuing public debts may thus lead to a positive coefficient of the ratio of mean to median income.

In Switzerland interest rates for debt serving 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 introduction of the tax multiplier also follows from the theoretical model. It is supposed that the tax multiplier enters the estimations with a negative sign as governments might substitute taxes for debts. However, if voters of both groups have strong preferences for future taxes as, for example, current tax costs are higher than future tax costs for property owners and tenants, higher mean tax multipliers could also lead to higher public debts.

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. To further test the robustness of our theory we also look at the effects of population growth as well as population squared. Similarly, the population density measures congestion effects on local public debts.

From a politico-economic perspective, features such as the effectiveness of direct democratic instruments at the local level must be considered as argued by Eichenberger and Schelker (2007). Therefore, we include various indicators for democracy in our model. Democratic institutions at the local level are captured by an identifier of communities have a communal parliament. We also employ a unique measure of conservatism by including the fraction of people in a community who agreed to the bilateral treaties with the European Union in a nationwide referendum. Furthermore, we take into account whether or not the community has a separate school community or not (Frey and Eichenberger, 2002) and for the fraction of leftist parties in cantonal elections.

The main specifications include the (log) price of a standardized and comparable single family house for each community. According to capitalization theory (Yinger et al. 1988) public goods appreciation of individuals reflects itself in house prices. Consequently, we use house prices of comparable houses per community as an indicator for the combined effects of public goods on local public debts not captured by other variables.

As a final test of robustness, 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 is especially true regarding elderly people in society. Thus, we include the fraction of elderly in a community as a control. Furthermore, net immigration to the community might have an impact on local public debts as the community has to assimilate new arrivals. The employment structure, access to the rail network and average rents are included as further controls in additional robustness tests.

Our dataset 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 differ from each other with respect to mean and median incomes, house prices, etc. although they have the same tax multiplier, benefit from the same public expenditures and suffer the same debt burden. All variables, their sources, and a number of descriptive statistics are given in Table 1.

< Table 1 here >

4 Empirical Results

4.1 Baseline results

Table 2 presents our main empirical results for the (log) of debts per capita in specifications (1) to (4) and the debt to tax ratio in specifications (5) to (8).

< Table 2 here >

The fraction of property owners in a community has a negative and significant influence on debts per capita as well as the debt to tax ratio as suggested by the theoretical discussion. A higher (log) mean income in a community is significantly associated with lower debts for both measures. Higher investments increase debts per capita but have no significant effect on the debt to tax ratio. If the mean income increases with respect to the median income additional redistribution takes place which results in significantly higher debts and a significantly higher debt to tax ratio. The mean tax multiplier on the other hand has no significant impact over all estimations. Apart form specification (1) and (4) the size of the population decreases debts per capita as well as the debt to tax ratio significantly. Population density never has any significant impact. The coefficient of the city dummy is always positive and significant.

In specification (2) and (6) in addition to the economic controls, we include a number of political variables. While the economic variables still work well, none of the political variables is significant at the 10 percent level. There is also no evidence that openness and conservatism measured by the agreement to the bilateral treaties with the European Union has any significant impact on debts. House prices enter the estimations negatively but insignificantly in specifications (3) and (7).

The size of coefficient of interest is similar across specifications (1) to (3). It suggests a rather large quantitatively effect of an increase in the property ownership rate on the log of per capita debts. For instance, with a coefficient size of 2.7 (lower bound), an increase in the property ownership rate by one percent implies that debts per capita fall by approximately 2.7 percent.

So far, we reported only results from OLS estimations. However, such estimates could suffer from possible simultaneity bias. Even though property ownership only changes slightly over time it is not necessarily exogenously given but might be the result of fiscal preferences of citizens concerned with debts. It could be argued that because of debt capitalization property owners choose to live in jurisdictions which can be assumed 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 model. This, of course, would leave our results biased upwards. To address this problem, we estimate 2SLS regressions with a full specification for debts per capita in column (4) and for the debt to tax ratio in column (8). As an instrument, we use the fraction of farming land in a community. Indeed, bequests in farming areas usually include the farm and the property related to it. The correlation between property ownership and farming area is approximately 50 percent. Farming area itself, on the other hand, has no directly discernible influence on the debt versus tax choice when controlling for measures of conservatism such as agreement to bilateral treaties with the European Union. As shown in specifications (4) and (8) the F-Test for the first stage is highly significant concerning the quality of the instrument. The coefficient of the property ownership variable in the second stage is significant and rises (absolutely) with respect to the OLS regressions for debts per capita as well as the debt to tax ratio. That is, the point estimates suggest that examining the link between property ownership and debts using OLS understates rather than overstates the theoretical effect.

So far we have shown that the level of property ownership affects local debts per capita as well as the debt to tax ratio negatively which provides support for the theoretical mechanism. Local public debts result from a disagreement between property owners and renters. As debts increase property owners suffer from lower property values whereas rents remain stable. 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.

4.2 Robustness

All robustness tests are reported in Table 3.

< Table 3 here >

Debt capitalization plausibly occurs at about the same rate in all communities as there are no differences with respect to property market regulations. It can therefore be assumed that the upward adjustment of rents as a consequence of a high share of debt financing is slower in large communities, as there is a larger fraction of the tenement houses owned by the government and cooperatives which are known to adjust rents only slowly to market demand. 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 increases with population size. In specifications (1) and (2) we estimate an interaction term with property owners and a measure of 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 of DiffPop and the property ownership rate is negative and significant. The larger the population size the more negative is the impact of the property ownership on debts per capita in estimation (1) as well as on the debt/tax choice measure in estimation (2) as predicted by theory.

In specifications (3) and (4) we include the fraction of elderly as an additional test of robustness. Property owners in the Canton of Zurich are often the elderly and at the same time the elderly might prefer debts to taxes, especially if debts do not capitalize at 100 percent.[10] The inclusion of this variable has a minor effect on the size of the coefficient of property ownership. The impact of our variable of interest remains negative and significant at the 1 percent level for debts per capita and the debt to tax ratio.

Next, we include two measures of changes in the communal population in estimations (5) and (6). Neither net immigration nor growth in population size has a significant impact. The coefficient for property ownership is negative and significant for both measures of the communal debt situation.

The basic methodology to analyze different variables on debts levels and other fiscal variables consists of running cross-section (or panel) regressions including the main variable of interest and a number of other controls (see de Haan and Sturm 1994, Feld and Kirchgässner, 2001 or 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 thought, that regressor selection can have an important effect on the results and missing out explanatory variables might introduce considerable bias. In final robustness tests, we deal with the problem of variable selection by performing Bayesian Model Averaging (see Raftery, 1995 and 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

[10] Stadelmann and Eichenberger (2008) show that debt capitalization is significant and that capitalization rates are around 60 percent.

might have an impact on the debt measure. The Bayesian approach is feasible and has been applied to various problems in economics by other authors such as Fernandez, Ley and Steel (2001) or 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 as 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.[11]

Columns (7) to (9) present the results of BMA for the dependent variable (log) debts per capita.[12] We include all variables of our dataset for the BMA procedure, i.e. population squared, employment in the third sector, rail network access and (log) average rents enter the estimation too. The conditional mean of the variable for property ownership is negative and significant. This indicates that the average effect of property ownership on debts per capita regarding all estimates over the whole model space is negative. The economic variables have the same signs concerning the conditional mean in BMA as they have in the OLS estimates. They are also significant. Concerning the additional control variables, only the fraction of elderly and the population growth turn out to be significant when looking at the whole model space.[13] 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 in some specific models but a negative impact in others and on average. We test for this possibility and present the resulting p-values in column (8), i.e. we test whether the coefficients of the diverse models have the same sign as the reported posterior conditional mean. At the 1 percent level we can reject that the property ownership enters other models of the whole model space positively. Finally, we calculate the posterior inclusion probability of all variables. The inclusion probability of the property ownership rate is 43.7 percent indicating that property ownership is at least as important as

[11] Further explanations concerning BMA and applications can be found in the literature (Raftery, Madigan and Hoeting, 1997 and the follow up literature). We stipulate 1/2 as the prior probability of including any variable in the model.

[12] Note that we exclude the cities of Zurich and Winterthur from the dataset as we do not want to include models without a city dummy in the model space.

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

mean income and other economic variables when analyzing local public debts. Only the population growth rate has a higher inclusion probability with 80 percent.

Finally, columns (10) to (12) present BMA results when the dependent variable is the debt to tax ratio. The results are very similar to the BMA estimations for the dependent variable (log) debts per capita. The posterior mean conditional on inclusion for property ownership is negative and significant at the 10 percent 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 1 percent level. The posterior inclusion probability is 41.6 percent and again within the range of most economic variables. For the debt to tax ratio only the mean income, the population size, the fraction of leftist parties, the fraction of elderly and the population growth have a higher inclusion probability.

5 Conclusion

Communities with higher debts face lower property values (Stadelmann and Eichenberger, 2008). The capitalization of debts in property prices is a form of Ricardian equivalence. Therefore, the fight over deficits and debts is no intergenerational conflict. It is an intra-generational political conflict between today's property owners and today's tenants.

Due to debt capitalization property owners suffer from lower property prices when debts rise. If rent markets are not perfect the burden of higher debts remains with current property owners but not with current renters. Future tax costs of property owners increase in the debt to tax share whereas debts have no influence on a tenants future tax costs. In the political process, property owners therefore have an incentive to vote for political platforms proposing lower local debts. Communities with a high fraction of property owners should consequently have lower debts.

We have modeled theoretical mechanism outline above and provided empirical evidence to support it. Using a dataset of 171 communities in the Swiss Canton of Zurich we showed that higher property ownership rates are indeed related to lower levels of debts per capita as well as a lower debt to tax ratio. Robustness results using Bayesian Model Averaging strongly confirm the negative impact of property owners on taxes.

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Table 1
Data Description and Sources

Variable	*Description and source*	*Range*	*Mean*	*S.d.*
logDebtPc	Log communal debt per capita. GEFIS Financial Statistics and Statistical Office of the Canton of Zurich.	[1.081, 9.993]	7.866	1.072
DebtToTax	Debt to tax ratio, i.e. total communal debts divided by total tax revenue by natural persons. GEFIS Financial Statistics and Statistical Office of the Canton of Zurich.	[0.001, 7.964]	1.522	1.242
PropertyOwner	Share of property owners in community (homeownership rate). Statistical Office of the Canton of Zurich.	[0.071, 0.733]	0.469	0.156
logMeanIncome	Log mean income to tax of natural persons. Statistical Office of the Canton of Zurich.	[0, 9.76]	4.858	1.878
logInvest	Log investments per capita in construction of roads, public transport, communication and waste disposal facilities in community per capita (5 year average). GEFIS Financial Statistics and Statistical Office of the Canton of Zurich.	[0.06, 0.883]	0.227	0.122
logMeanMedian	Log mean to median income. 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
TaxRate	Mean income tax multiplier (without churches). Statistical Office of the Canton of Zurich.	[10.57, 11.89]	10.97	0.209
Density	Population per square kilometer. Statistical Office of the Canton of Zurich.	[39.89, 3810]	612.8	640.789
Parliament	Dummy if community has communal parliament (value=1). Statistical Office of the Canton of Zurich.	[0, 1]	0.07	0.256
BilateralYes	Agreement to bilateral treaties with European Union in percent. Swissvotes Database.	[0.383, 0.807]	0.629	0.098
ElecLeft	Part of left parties in cantonal elections (sum of EVP, GP and SP). Statistical Office of the Canton of Zurich.	[16.27, 47.85]	30.22	6.542
SchoolComm	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
logHousePrice	Log price in Swiss Francs of standardized and comparable single family house. Cantonal Bank of Zurich.	[13.23, 14.05]	13.56	0.156
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 minus emigration in community. Statistical Office of the Canton of Zurich.	[-0.039, 0.073]	0.01	0.018
PopG	Relative population growth (5 year averages). Statistical Office of the Canton of Zurich.	[-0.121, 0.26]	0.058	0.059
PopSquared	Population per 1000 persons squared. Statistical Office of the Canton of Zurich.	[0.07, 111800]	744.1	8560.432
Employed3sector	Fraction of labor force employed in third sector. Statistical Office of the Canton of Zurich.	[0.294, 0.954]	0.648	0.127
AccessRailRoad	Indicator for access to fast train railroad network (S-Bahn) as a fraction of the population. Statistical Office of the Canton of Zurich (GIS system).	[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

Source: as mentioned in table
The range, mean and standard deviations are based on 171 observations.

Table 2
Effects of Property Ownership because of Debt Capitalization

	Debts per Capita (logDebtPc)				*Debt Tax Ratio (DebtToTax)*			
Variable	*OLS* *(1)*	*OLS* *(2)*	*OLS* *(3)*	*2SLS* *(4)*	*OLS* *(5)*	*OLS* *(6)*	*OLS* *(7)*	*2SLS* *(8)*
PropertyOwner	-2.707^{a}	-2.715^{a}	-2.724^{a}	-5.379^{c}	-2.159^{a}	-1.957^{a}	-2.161^{a}	-6.003^{b}
	(0.763)	(0.771)	(0.874)	(3.040)	(0.801)	(0.739)	(0.817)	(2.668)
logMeanIncome	-3.147^{a}	-3.550^{a}	-3.530^{a}	-2.994^{b}	-5.672^{a}	-5.836^{a}	-5.399^{a}	-4.624^{a}
	(1.119)	(1.149)	(1.240)	(1.434)	(1.256)	(1.274)	(1.274)	(1.441)
logInvest	0.099^{c}	0.102^{c}	0.102^{c}	0.112^{c}	0.078	0.070	0.070	0.085
	(0.056)	(0.056)	(0.055)	(0.064)	(0.066)	(0.058)	(0.057)	(0.061)
logMeanMedian	6.357^{a}	6.701^{a}	6.705^{a}	6.716^{a}	6.710^{a}	7.009^{a}	7.098^{a}	7.114^{a}
	(1.654)	(1.658)	(1.668)	(1.687)	(1.476)	(1.451)	(1.487)	(1.521)
TaxRate	0.012	0.009	0.009	0.009	0.003	-0.002	-0.002	-0.002
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
logPop	-0.151	-0.235^{b}	-0.233^{b}	-0.365	-0.392^{b}	-0.498^{a}	-0.465^{a}	-0.655^{a}
	(0.102)	(0.095)	(0.104)	(0.221)	(0.161)	(0.165)	(0.155)	(0.194)
Density	-8.5E-5	-1.1E-4	-1.1E-4	-3.6E-4	4.4E-5	5.29E-8	2.7E-5	0.000
	(1.6E-4)	(1.9E-4)	(1.8E-4)	(3.2E-4)	(1.7E-4)	(2.1E-4)	(2.2E-4)	(0.000)
Parliament		0.192	0.191	-0.013		0.415	0.388	0.093
		(0.221)	(0.228)	(0.272)		(0.282)	(0.281)	(0.366)
BilateralYes		1.334	1.338	1.950^{c}		0.680	0.780	1.665
		(1.022)	(1.062)	(1.104)		(1.323)	(1.311)	(1.381)
ElecLeft		0.008	0.008	0.002		0.024	0.023	0.014
		(0.013)	(0.013)	(0.017)		(0.022)	(0.021)	(0.022)
SchoolComm		-0.102	-0.102	-0.092		0.109	0.121	0.134
		(0.195)	(0.197)	(0.186)		(0.191)	(0.193)	(0.186)
logHousePrice			-0.048	-1.193			-1.036	-2.692
			(1.260)	(1.469)			(1.524)	(1.908)
City	1.086^{a}	1.113^{b}	1.115^{b}	1.754^{b}	3.758^{a}	3.561^{a}	3.602^{a}	4.527^{a}
	(0.401)	(0.432)	(0.439)	(0.856)	(0.820)	(0.940)	(1.002)	(1.040)
(intercept)	41.602^{a}	45.847^{a}	46.269^{a}	58.107^{a}	65.593^{a}	67.463^{a}	76.519^{a}	93.648^{a}
	(12.482)	(12.760)	(17.345)	(17.994)	(14.570)	(14.630)	(22.013)	(24.412)
N	171	171	171	171	171	171	171	171
Adj. R2	0.228	0.2419	0.2421	0.2145	0.3803	0.4042	0.4062	0.3995
F-Test (1st stage)				38.54				38.54

Source: own calculations
^{a} indicates a significance level of below 1 %; ^{b} indicates a significance level between 1 and 5 %; ^{c} indicates significance level between 5 and 10 %. In columns (4) and (8) the fraction of farming area is used as an instrument.

Table 3

Effects of Property Ownership because of Debt Capitalization - Robustness Tests and Bayesian Model Averaging

	Interaction logDebtPc	*Interaction DebtToTax*	*Robustness logDebtPc*	*Robustness DebtToTax*	*Robustness logDebtPc*	*Robustness DebtToTax*	*BMA (logDebtPc)*			*BMA (DebtToTax)*		
Variable	*OLS (1)*	*OLS (2)*	*OLS (3)*	*OLS (4)*	*OLS (5)*	*OLS (6)*	*BMA (7)*	*Sign Test (8)*	*Incl. Proba (9)*	*BMA (10)*	*Sign Test (11)*	*Incl. Proba (12)*
PropertyOwner	-2.996[a]	-2.763[a]	-2.827[a]	-2.344[a]	-2.406[a]	-1.796[b]	-1.620[b]	0.000	43.7	-1.704[c]	0.000	41.6
	(0.958)	(0.928)	(0.864)	(0.861)	(0.870)	(0.874)	(0.752)			(0.985)		
DiffPop	0.005[b]	0.016[a]										
	(0.003)	(0.003)										
IntPropertyPop	-0.098[c]	-0.184[a]										
	(0.053)	(0.068)										
logMeanIncome	-3.275[b]	-4.653[a]	-2.781[b]	-4.074[a]	-2.237[c]	-3.379[b]	-3.210[b]	0.000	32.8	-2.821[b]	0.000	80.5
	(1.281)	(1.291)	(1.270)	(1.340)	(1.321)	(1.462)	(1.309)			(1.306)		
logInvest	0.086	0.036	0.092[c]	0.052	0.090[c]	0.053	0.096[b]	0.000	44.5	0.050	0.000	11.6
	(0.052)	(0.054)	(0.054)	(0.055)	(0.054)	(0.054)	(0.042)			(0.046)		
logMeanMedian	6.757[a]	7.072[a]	5.131[a]	4.311[a]	4.359[b]	3.287[c]	5.219[b]	0.000	35.4	3.258[c]	0.000	35.2
	(1.712)	(1.480)	(1.941)	(1.597)	(2.039)	(1.788)	(2.259)			(1.946)		
TaxRate	0.010	0.010	0.011	0.002	0.010	-1.9E-4	0.015[c]	0.000	15.6	0.007	0.000	6.8
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(8.1E-3)	(0.009)			(0.010)		
logPop			-0.206[b]	-0.417[a]	-0.150	-0.347[b]	0.030	0.834	4.4	-0.268[c]	0.000	53.7
			(0.101)	(0.150)	(0.107)	(0.146)	(0.145)			(0.141)		
Density	-1.8E-4	-1.8E-4	-2.3E-4	-1.8E-4	-2.4E-4	-1.8E-4	-3.6E-4	0.014	6.9	0.000	0.000	33.2
	(2.3E-4)	(2.2E-4)	(1.8E-4)	(2.0E-4)	(1.8E-4)	(2.0E-4)	(2.5E-4)			(0.000)		
Parliament	0.156	0.272	0.150	0.315	0.111	0.262	0.297	0.371	1.6	0.317	0.000	7.5
	(0.235)	(0.293)	(0.225)	(0.290)	(0.230)	(0.294)	(0.336)			(0.378)		
BilateralYes	1.130	0.447	1.247	0.618	0.938	0.190	0.640	0.100	2.3	-0.363	0.077	5.7
	(1.141)	(1.449)	(1.075)	(1.276)	(1.076)	(1.288)	(0.929)			(1.461)		
ElecLeft	0.009	0.023	0.007	0.021	0.007	0.022	0.018	0.009	8.7	0.025[c]	0.000	53.7
	(0.014)	(0.023)	(0.013)	(0.020)	(0.013)	(0.019)	(0.013)			(0.013)		
SchoolComm	-0.108	0.131	-0.112	0.102	-0.099	0.118	0.002	1.000	0.7	0.158	0.000	6.8
	(0.204)	(0.195)	(0.196)	(0.187)	(0.196)	(0.186)	(0.194)			(0.210)		
logHousePrice	-0.440	-2.175	-0.037	-1.016	-0.043	-1.034	-0.336	1.000	1.3	-2.765[b]	0.000	40.9
	(1.310)	(1.716)	(1.227)	(1.480)	(1.231)	(1.460)	(1.007)			(1.373)		
Elderly			0.055[c]	0.097[b]	0.045	0.087[b]	6.187[c]	0.000	26.7	9.835[a]	0.000	99.6
			(0.029)	(0.042)	(0.030)	(0.041)	(3.254)			(3.184)		
ImmigSaldo					1.599	-0.025	4.631	0.371	1.7	0.129	0.306	4.2
					(4.136)	(4.912)	(4.809)			(5.167)		
PopG					-2.260	-2.642	-5.117[a]	0.000	80.0	-4.204[a]	0.000	88.1
					(1.490)	(1.682)	(1.686)			(1.580)		

PopSquared							0.001	0.181	3.0	0.001	0.000	17.0
							(0.001)			(0.001)		
Employed3sector							0.301	1.000	0.8	0.056	0.164	3.9
							(0.618)			(0.677)		
AccessRailRoad							0.001	0.789	1.9	-0.003	0.000	12.4
							(0.003)			(0.003)		
logAvgRent							-0.536	0.181	2.0	0.274	0.004	4.5
							(0.592)			(1.002)		
City	1.517[c]	3.308[a]	0.994[b]	3.388[a]	0.951[b]	3.338[a]						
	(0.863)	(1.088)	(0.465)	(1.056)	(0.446)	(1.024)						
(intercept)	47.032[a]	80.422[a]	37.380[b]	60.787[a]	31.575	53.555[a]	18.971	0.000	99.0	41.441[a]	0.000	99.0
	(17.956)	(23.086)	(18.827)	(19.108)	(19.133)	(19.092)	(18.333)			(15.027)		
N	171	171	171	171	171	171		169			169	
Adj. R2	0.2331	0.3964	0.2556	0.4381	0.263	0.4475						
BIC of best model								-679.9167			-673.548	

Source: own calculations

[a] indicates a significance level of below 1 %; [b] indicates a significance level between 1 and 5 %; [c] indicates significance level between 5 and 10 %. For the Bayesian Model Averaging (BMA) results in columns (7) to (12), the conditional mean and standard deviation are conditional on inclusion of the variable in the model. The sign-test in columns (8) and (11) is 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.