Homeowner Effect and Strategic Interaction in Local Property Taxation*

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Abstract

This paper investigates whether and how strongly the share of households owning their homes in a community affects residential property taxation by local governments. Homeowners bear full property tax burdens irrespective of local market conditions, and the tax is more salient to them. "Home owner communities" may hence oppose high property taxes in local elections in order to protect their housing wealth. Using granular spatial data from a complete housing inventory in the 2011 German Census and war-related housing damages as a source of exogenous variation in local homeownership, we provide empirical evidence confirming that otherwise identical jurisdictions choose significantly lower property tax multipliers when the share of homeowners in their population is higher. This result appears to be independent of local housing market conditions, which suggests tax salience as the key mechanism for this effect. We find strong positive spatial dependence in tax multipliers, indicative of property tax mimicking by local governments.

Keywords: *Homeownership rate; public financing; residential property tax; spatial tax mimicking; yardstick competition.*

JEL-Classification: *D*72, *H*20, *H*71, *H*72, *H*77

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1 Introduction

Property taxes form a main source of tax revenue for local governments.[1] Due to the immobility of the tax base even in the long run, they are moreover associated with low excess burdens. The property tax hence is usually considered to score high from a tax efficiency perspective. Its true efficiency however hinges critically upon the political economy of property taxation, the decisions of how, whom and how much to tax within the local institutional context (Wilson 2006). While property taxes are technically levied on both owner-occupiers and renters the same way[2], the perception and economic burden of the tax can differ substantially among these two basic groups of voters.

According to the "home voter hypothesis" first coined by Fischel (2001), especially owner-occupiers are expected to oppose high local property tax rates. Homeowners have strong incentives to promote high market values for the typically biggest wealth items in their portfolios. The level and popularity of a property tax has also been argued to depend on the salience of the tax (Brunner et al. 2015, Cabral and Hoxby, 2016). In many countries, including Germany, property taxes tend to be much more salient for homeowners than for renters. German homeowners annually receive a discrete property tax note directly from their municipality. For renters, the property tax amount usually appears among many other cost positions in the annual utilities statement, which they receive from their landlords.[3] As a consequence of differences in salience, renters have been documented to underlie the illusion of not paying property taxes at all, even if they do (Oates 2005). According to a political economy argumentation, "homeowner communities", i.e. municipalities with a dominant

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[1] Total revenue of German property tax type B (which is levied on non-agricultural property including improvements to land) amounted to 12.8 billion EUR in 2015. This corresponds to approximately 330 euros per housing unit and to about one-sixth of total municipal tax revenue. The relative importance of property taxes is even much higher in Anglo-Saxon and also many European countries.

[2] In Germany, landlords are statutorily allowed to completely shift the property tax to their tenants on a pro-rata basis. Of course, local market conditions may preclude that property taxes are fully shifted forward onto renters in many locations in economic terms.

[3] Other positions typically include insurance, waste collection, housekeeping, street-cleaning etc.

share of households owning their homes, should therefore be likely to tax property more lightly than otherwise comparable communities.

In this paper, we make us of a previously untapped detailed data set which enables us to investigate whether the share of owner-occupiers in local housing markets indeed affects the intensity of property taxation by local governments. The core of our analysis is exclusive data from the 2011 German Census, which included a complete inventory of all German residential real estate for the first time since 1987. The housing inventory collected information on the type of owner and the current state of use for each individual dwelling. We aggregate this data to the level of municipalities, which typically rank between U.S. Census Tracts and U.S. Census Block Groups in terms of population. We merge this data with local property tax multipliers and detailed information from fiscal accounts, income tax statistics, labor statistics, and federal elections. Our final data set covers more than 8,000 Western German municipalities and contains rich information on local fiscal conditions, socio-demographic structures, economic prosperity, and political tastes.[4]

In order to identify causality running from local homeownership rates to tax levels, our empirical analysis exploits two unique circumstances of the German housing market: the missing link between actual property market values and the size of the tax base in the German property tax system, and the extensive destruction of the German housing stock during the Second World War. The missing link between the size of the tax base and actual home market values ensures that the local tax multiplier is the one and only factor in the computation of the German property tax that can truly be influenced by local governments. The war-related destruction of residential buildings in German towns and villages, which led to large-scale provision of rental housing in areas heavily affected by warfare (Wolf and Galicia 2015), provides us with exogenous spatial variation in homeownership rates which

[4] We do not include Eastern German municipalities in the analysis due to data constraints on several important variables.

we exploit for causal inference about the homeowner effect. By controlling for spatial interdependence based on spatial autoregressive models, we simultaneously account for the possibility of strategic tax rate choice behavior among municipalities.

The potential role of property rights in local housing stocks in driving local tax rates has been subject to a very limited number of studies. These have moreover been plagued by issues of identification and statistical control (see, e.g., Roche, 1986; Oates, 2005; Brunner et al. 2015). We contribute to this strand of literature by asking whether and how the local rate of homeownership causally affects property taxation in a very large sample of local jurisdictions. By yielding evidence supportive of spatial dependence in municipal property tax multipliers, our study also contributes to the literature on spatial interaction in property tax setting. Germany is a prime field to study how homeownership affects local property tax setting because homeowners are not always the most numerous shareholders in local communities, which helps creating a counterfactual experiment. Different from the U.S. and many other industrialized countries, municipal homeownership rates are often below 50 per cent.[5]

We approach the questions of a homeowner effect in the presence of strategic interaction in property tax rates between jurisdictions along two dimensions: We first develop a yardstick competition model of local property taxation, which serves as basis for the formulation of three key research hypotheses. We subsequently test these hypotheses in an integrated spatial framework by linking local property tax multipliers to local proportions in owner-occupied housing units. Simultaneously, we use an extensive set of confounding variables to control for local fiscal conditions, political tastes, and neighbourhood tax rates. In our identification strategy, we explicitly account for the endogeneity problem between property tax and the share of homeowners by using alternative instrumental variables.

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[5] The aggregate homeownership rate in Germany is 43 per cent. For a discussion of reasons for this low rate, see Voigtländer (2009).

Our empirical evidence suggests that homeowner communities are indeed taxed differently compared to otherwise identical communities. Depending on specification, a rise in the municipal homeownership rate by ten percentage points decreases the local property tax multiplier by 2-3 points. For a standard home of 80,000 euros tax value evaluated at the mean multiplier of 340 points, this is equivalent to a roughly one per cent decrease in the annual tax burden. This key result withstands several robustness tests, in particular controlling for spatial dependence and endogeneity arising among homeownership and property taxes.

Our results have practical implications to local policy makers in providing an evidence-based possibility to judge their actual tax rate choices against a benchmark. The findings also indicate that actual levels of property taxation may not be efficient in terms of social welfare. If homeowners manage to successfully oppose high property taxation relative to other sources of local fiscal revenue, property taxation will tend to be too low in homeowner communities, while other local fees and taxes will tend to be too high. The latter effect could unfold adverse repercussions on the access to local public and quasi-public goods.

The remainder of the paper is organized as follows: Section 2 provides a review of previous research concerning the political economy of property taxation as well as spatial property tax dependence, including a discussion the concepts of home voting and tax illusion. Section 3 links this review to a yardstick competition model of local property taxation, which serves to derive our key hypotheses to be tested. Section 4 serves to introduce the data set, discuss our identification strategy, and present the empirical results. Section 5 concludes.

2 Home-Voting, Renting, and Spatial Property Tax Interaction

The understanding that local voters are the key underlying agents that ultimately influence residential property and other taxes goes back to Tiebout (1956). Tiebout's "vote with your feet" model still dispensed completely with political behaviour in local government. Fischel (2001) was among the first to articulate the idea that among local voters, owner-occupiers (homeowners) may differ substantially with respect to their attitudes towards desired levels of local public spending and the structure of financing by local governments. The core reading of his “home-voter hypothesis” goes that taxation (and other) decisions by local governments are driven by the desire of resident homeowners to maximize the values of their houses. Local governments are viewed within this concept as municipal corporations whose shareholders are homeowners, who in turn are motivated to control their governments because its services and taxes directly affect the values of their largest assets (Fischel 2001). Fischel’s hypothesis has now been investigated in the context of numerous local public referenda, usually with corroborating results (see, e.g., Dehring et al. 2008, Ahlfeldt and Maennig 2015).

Rather than focusing solely on the incentives of homeowners, the subsequent literature has put stronger focus upon the partition of local voting groups into homeowners and renters. It has been particularly observed in the U.S. that the larger the share of households renting their homes in local jurisdictions, the higher the tendency of local governments to spend extensively on public services. Oates (2005) focuses on the mechanisms that let renters drive up local public expenditures in a jurisdiction (the so-called “renter effect”). Consistent with early research on the renter effect by Roche (1986), he finds that the positive association between spending and the rental share is rooted in renters’ perception of public services being ‘not so costly’, rather than simply due to a higher demand for such services compared to homeowners. This advocates for the case of fiscal illusion as a potential source of the renter effect. At the same time, any empirical model that explains local tax choices by homeownership must carefully control for the local level of public expenditure.

Brunner et al. (2015) discuss renter illusion as a possible explanation for the higher willingness of renters to support an increase in property taxes to expand funding for local public services. Using micro-level survey data of registered voters in California, the authors find that renters compared to homeowners are 10-15% more likely to be inclined in favour of a property tax rather than a sales tax increase. Their difference-in-differences estimation strategy controls for individual specific preferences towards public spending. Contradictory to renter illusion, however, their result is *not* driven by the voting behavior of renters: while renters are indifferent between a property tax and sales tax increase to finance additional spending, homeowners strongly oppose a property tax increase relative to a sales tax increase. The strong opposition among homeowners against the property tax is not associated with the relative tax burden faced by this group of residents. As a potential explanation for this finding, the authors refer to the salient nature of property taxes for homeowners.

In order to investigate more deeply how the salience of property taxes for homeowners affects tax rate choice, Cabral and Hoxby (2016) recently exploit cross-local variation in property tax escrow. According to their argument, the exact method by which property tax is collected in U.S. local jurisdictions directly relates to its salience. Variation in tax collection leads to variation in salience over different jurisdictional areas and time that can be considered as random. To study the effect of salience, they make use of the fact that about half of homeowners with mortgages pay their property taxes through tax escrow, a payment method that converts the usually highly visible property tax into an indirect, difficult-to-compute tax that is typically collected through automatic methods. Their findings indicate that areas where property taxes are less salient witness higher tax rates and lower likelihoods of tax revolts, which they use as an indication of tax popularity.

A shortcoming of existing studies on property tax rate choice in the presence of home-voting and differences in tax salience between groups is that they do not take into account the underlying spatial aspects that govern the interactions between renters, homeowners and local governments falling under a particular jurisdiction. Local public spending and tax decisions have been shown to be driven by spatial interaction among local governments. We show in our data section that local tax multipliers, shares of people owning their homes and potentially confounding factors are all strongly spatially auto-correlated. It therefore becomes central to disentangle spatial interactions from spatial patterns of housing tenure. Our attempt to do so draws upon existing empirical research on the form and causes of spatial interaction in property tax rates. So far, this strand of the literature appears surprisingly disconnected from the home-voting/tax salience literature and will be briefly reviewed.

Among the first to use spatial econometric methods to investigate property tax interaction among local governments were Brueckner and Saavedra (2001). These authors estimated a spatial lag model to trace out the property tax reaction function of the representative community within a relatively small sample of 70 cities in the Boston metropolitan area. They find significant spatial lag parameters that vary strongly in size.[6] The model is motivated by a tax competition approach with footloose, heterogeneous consumers and sorting. However, the authors note that their results are observationally equivalent with a local-government version of the seminal yardstick competition framework by Besley and Case (1995). Within this alternative framework, residents are immobile and have homogeneous preferences, but look at tax rates in other jurisdictions to find out whether their own local government is inefficient and deserves to be voted out of office. Self–interested governments choose tax rates knowing that residents make such comparisons, such that strategic interaction among jurisdictions arises just as in a tax competition model.

Following the work of Brueckner and Saavedra (2001), an increasingly long list of studies has looked at spatial property tax dependence in different countries with larger samples. A key goal has been to discriminate among the alternative explanatory approaches of property tax dependence. Bordignon et al. (2003) use a data set including detailed

[6] Their spatial lag parameter estimates range from 0.16 to 0.70, depending on the form of the spatial weighting matrix. Obviously, a concise estimation is strongly limited by the small sample size.

information about electoral behavior and tax setting in a sample of Italian cities. Their results show that local property tax rates are positively spatially auto-correlated among adjacent jurisdictions when the mayors run for re-election, while this correlation is absent where either the mayors face a term limit or where they are backed by an overwhelming majority in the local council. Allers and Elhorst (2005) estimate both spatial lag and error versions of spatial dependence models to analyse property tax choice interaction by neighbouring municipalities in Netherlands.[7] They estimate a spatial lag parameter of 0.35, equivalent with ten percent higher property tax rates in neighbouring municipalities leading to a 3.5 percent higher tax rate in equilibrium. As in Bordignon et al. (2003), interaction in property tax rates is less pronounced among municipalities governed by coalitions backed by large majorities. Fiva and Rattsø (2007) apply a spatial probit model to test whether the decision to have residential property tax in local communities in Norway depends on the observable past decisions of adjacent localities. Their results are also in line with yardstick competition explaining the distinct geographic pattern in local property taxation observed.

Two more recent studies deserve to be mentioned. Dubois and Paty (2010) use a panel of 104 local communities from 1989-2001 in order to test housing tax setting in France. They extend the analysis of yardstick competition by controlling for the impact of tax choices in locations that are not geographically close but comparable with respect to socio-economic characteristics. Their results suggest that voters sanction their incumbents when their own local housing tax is high relative to geographic neighbors, and reward them when similar cities in terms of demographic characteristics have high local taxes. Delgado et al. (2011) use a considerably large sample of 2,713 Spanish municipalities and find evidence of tax mimicking behaviour with a spatial lag parameter of over 0.4 for the property tax. In sum, the

[7] Robust LM-tests, as proposed by Anselin et al. (1996), reject the spatial error versions of their model.

accumulated evidence strongly points towards existence of systematic spatial dependence in property tax choices and yardstick competition as the main driver of this dependence.[8]

3 A Yardstick Competition Model of Local Property Taxation

Tiebout (1956) introduces the “voting-with-their-feet” mechanism where local governments compete for fully mobile consumers. The competing local governments provide a local public good at a random cost ϕ_i and tax a local property at a rate $\tau_i : P_{H,i}$. Thereby, the local governments seek to minimize the average cost of public good provision. In contrast, fully mobile consumers obtain utility from public good consumption and earn disutility from being taxed. Hence, households choose among the location which provides the highest overall utility. The model assumes no externalities and no spatial independence, so that in equilibrium it must hold that $\tau_i = f(\phi_i)$ with $\frac{d\tau_i}{d\phi_i}$. This leads to our first hypothesis:

Hypothesis 1 – Local Public Financing through Property Taxes: *More constrained fiscal conditions in a location go along with higher effective property tax rates.*

In reality, local jurisdictions are not isolated entities, but informational spillovers occur among neighboring jurisdictions (Besley and Case, 1995). The incumbent local governments aim at being re-elected. They provide a local public good of random cost ϕ_i, which is known to them and tax local property at a rate $\tau_i : P_{H,i}$. While “good” governments provide a public good at average cost, “bad” governments engage in rent-seeking. Immobile consumer-

[8] Some recent papers have advocated a quasi-experimental research design to identify strategic interaction in property tax setting. This line of research has argued that reduced-form spatial interaction models rely on comparatively strong assumptions that lead towards a tendency to overestimate the true amount of interaction. Lyytikäinen (2012) uses a reform of the statutory lower limits to property tax rates in Finland as a source of exogenous variation to estimate the response of municipalities to tax rates in neighbouring communities. He finds no evidence of systematic interdependencies in property tax rates. Baskaran (2014) exploits a reform of the fiscal equalization scheme in the German state of North Rhine-Westphalia, which exogenously caused local municipalities to increase their property and business tax rates, to identify tax mimicking by local governments in the neighbouring state of Lower Saxony. While traditional spatial lag regressions suggest immediate strategic interactions, a difference-in-difference analysis also points towards insignificant interaction in tax rates.

voters try to distinguish “good” from “bad” local governments and appraise incumbent’s relative performance to neighboring places. As a consequence they vote “bad” incumbents out of office. In equilibrium the yardstick competition emerges: $\tau_i = f(\phi_i, \overline{\tau}_i)$ with $\frac{d\tau_i}{d\phi_i}, \frac{d\tau_i}{d\overline{\tau}_i} > 0$, from which the second hypothesis on spatial tax mimicking follows:

Hypothesis 2 – Spatial Tax Mimicking: *Local governments mimic each other in setting property tax rates: higher tax multipliers in neighboring local jurisdictions go along with higher tax multipliers in the own municipality, and vice versa.*

Poterba (1984, 1992) emphasizes the duality of housing as consumption and investment good, which allows us to study strategic setting of property tax in the context of the heterogeneous agents model. Under perfect asset market assumptions, the price of housing capital equals the PDV of its future service stream. In equilibrium, the per-period price of rental services equals the user costs of owning:

$$R(H_i) = P_{H,i}(\delta_i + \kappa_i + \tau_i(1-\theta)r - \pi_{H\,i}), \tag{1}$$

with rent $R(H_i)$ and property price $P_{H,i}$, appreciation rate δ_i, maintenance costs κ_i, marginal tax rate θ, mortgage rate r, and appreciation rate of house price, π_{H_i}. Since property tax payment ($P\tau$) is capitalized, both owners and tenants fully bear the tax in this model. Under real world assumptions of limited tax shifting as well as “home voting” and “tax illusion” among tenants, tenants bear only incomplete parts of property tax burdens (Dusansky et al. 1981, Caroll and Yinger 1994) and homeowner-voters oppose property taxes more strongly than tenants do (Fischel, 2001). According to Oates (2005), tenants also demand higher levels of public services. This leads us to our third hypothesis on the homeowner effect:

Hypothesis 3 – Homeowner Effect: *Effective property tax decreases with an increasing share of owner-occupied dwellings in a municipality.*

Homeowners possess the economic incentive to oppose high property taxes in order to protect their housing wealth (Fischel 2001). Property taxes are also more salient to homeowners than renters (Oates 2005, Cabral and Hoxby 2016), and homeowners bear the full burden of the property tax irrespective of local market conditions. Our main research hypotheses hence is that higher local shares of owner-occupying households prompt local governments to tax residential property more lightly, *ceteris paribus*. Differences in the strength of this hypothetical effect may arise across local jurisdictions from differences in the local incidence of the property tax between landlords and tenants. Statutorily, landlords can fully shift running costs of property tax to tenants. They might yet fail to do so when the price elasticity of local demand for rental housing services is large. In our empirical analysis, we exploit variation in local shares of vacant non-single family housing. In so doing, we pick up variation in housing demand elasticity in order to investigate whether the size of a possible home voter effect differs between areas of high and low housing demand and therefore discriminate between the tax incidence and the tax salience channels.

4 Data and Estimation Methodology

4.1 Data

Homeownership rates. Data on small spatial scale owner-occupation rates is obtained from the 2011 German Census. The Census encompassed a complete inventory of residential buildings and their housing units, containing detailed information on the type of owner (private individual, owners' association, housing company or cooperative, and other types), property characteristics, and current use (owner-occupied, rented out, or vacant). We clean this data from seasonal and recreational dwellings as well as dwellings used by diplomats and foreign armed forces. In order to avoid data issues related to the special position of Eastern municipalities in connection with horizontal fiscal equalization and solidarity tax, we restrict our sample to Western German municipalities.[9] After accounting for missing values, data on local shares of housing owner-occupied is available for 8,462 municipalities. Figure 1 illustrates the geographical distribution of local owner-occupation rates.

Figure 1: Homeownership Rate Variation across German Municipalities

Source: Own illustration based on data from the 2011 Census.

The figure shows the geographical distribution of the proportion of owner-occupied housing units (in %) in 8,462 German municipalities in 2011.

[9] Data on important possibly confounding fiscal variables, such as debt or public spending, is also not available for Eastern German municipalities in time periods close to the Census year.

The proportion of municipal homeownership has a mean rate of 67 percent with an enormous range, spanning from 20 to 100 percent. High-homeownership jurisdictions appear to particularly cluster in the northwest and northern Bavaria, as well as in the center part of western Germany. Low-ownership locations concentrate in the western Rhein-Ruhr-Area, as well as in major metropolitan areas such as Hamburg, Munich, or Frankfurt and the Rhein-Neckar region.

Property tax multipliers. Property tax in Germany is levied at the municipal level, but follows the same principles country-wide. The annual tax burden for a property j of type k in a municipality m can be calculated as follows:

$$\mathrm{TAX}_{j,k.m} = \mathrm{VAL}_{\mathrm{j}}^{\mathrm{ass}} \cdot RATE_k \cdot MULT_m \,, \tag{2}$$

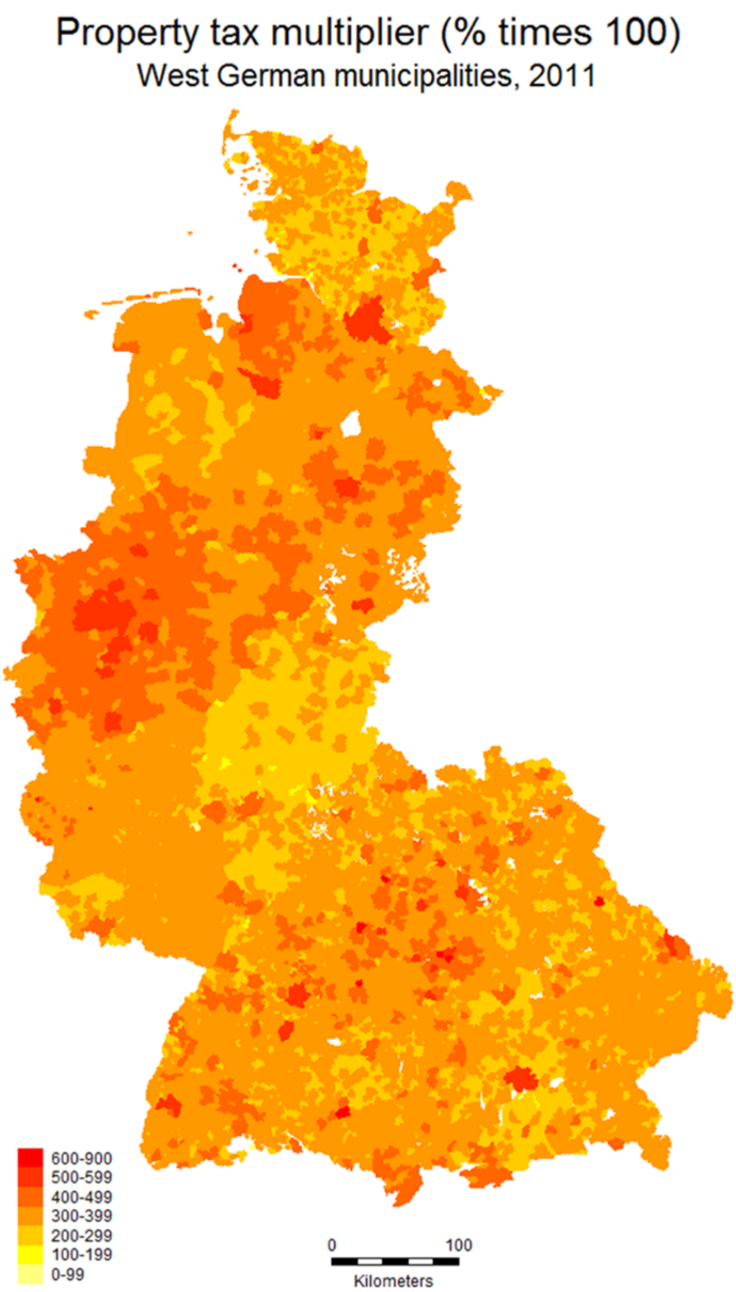
where TAX, VAL^{ass}, $RATE$ and $MULT$ denote the tax burden, the property-specific assessed value, the object-type specific tax rate and the local tax multiplier, respectively. Property-specific assessed values are fixed by the states and refer to 1964 in West Germany (1935 in East Germany), whereas object-type specific tax rates are ruled by federal law.[10] The local multiplier is hence the only component of the effective tax rate that can be directly influenced by local governments, whereas all other components are exogenous.

As illustrated by Figure 2, local tax multipliers vary widely among municipalities. Some local governments set the multiplier to zero, which means no taxation at all. The maximum multiplier is 900 per cent, more than twice the average of 335 per cent. As a result, residing in even fairly adjacent locations can lead to substantial differences in annual tax burdens: moving the ten kilometer distance from Dierfeld (a small municipality of eleven inhabitants in Rhineland-Palatinate with the highest tax multiplier in the sample) to the adjacent municipality of Diefenbach (71 inhabitants) would save a household owning a

[10] The object-type specific tax rate is 2.6 ‰ for single-family houses until the first 38.356,89 euros of the assessed value and 3.5 ‰ thereafter. The rate is 3.1 ‰ for two-family houses and 3.5 ‰ for all other non-agricultural properties.

single-family house worth 80.000 euros of assessed value[11] a tax payment of 1,500 euros annually, which translates into several ten-thousands of euros over the typical duration of a household in a home.

Figure 2: Property Tax Multiplier Variation across Municipalities



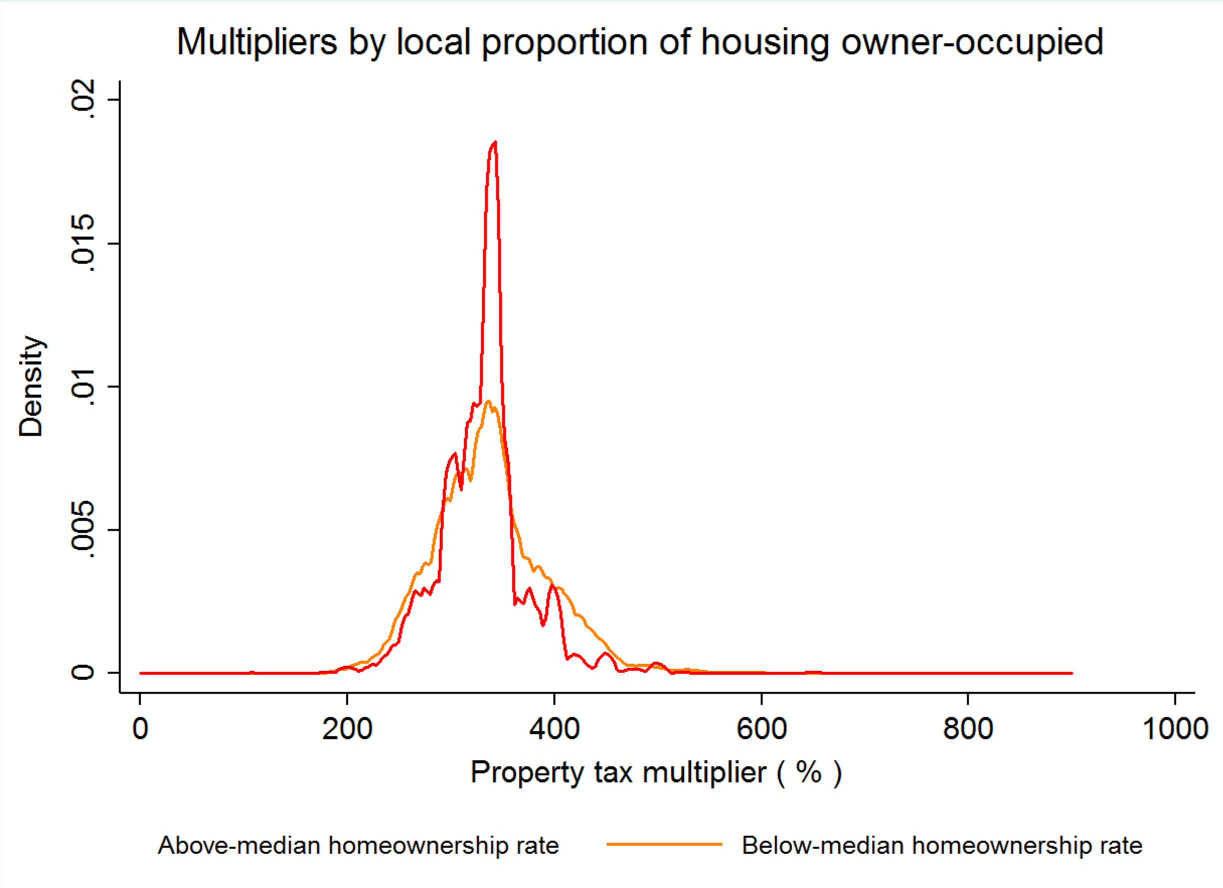
Source: Own illustration based on data from the Federal Statistical Office.

The figure shows the geographical distribution of property tax multipliers (% times 100) for 8,464 Western German municipalities in 2011.

[11] Due to their considerable age, the assessed values used to compute the individual tax burden are typically much lower than contemporaneous property market values, which reduces the effective property tax rate.

Figure 3 shows Kernel estimates of the probability mass functions of local tax multipliers among “low” (below median) and “high” (above median) homeownership municipalities. The estimated density functions are apparently different, indicating a concentration of probability mass at average multipliers among high homeownership locations in comparison to low homeownership ones, with considerable less concentration of probability mass towards the right end of the multiplier scale.

Figure 3: Density Distributions of Tax Multipliers by Homeownership Rate Group



Source: Own illustration based on data from the Federal Statistical Office.

The figure shows Kernel density estimates of property tax multipliers by local proportion of owner-occupied housing. Property tax multiplier distributions above-median multiplier and below-median multiplier municipalities in 2011 are indicated in red and orange, respectively.

Fiscal Conditions. Local levels of property taxation are likely to depend on local fiscal conditions, which can in turn systematically differ with respect to the local share of homeownership. For example, homeowners may have different tastes with respect to the level of local public spending (Oates 2005) or with respect to local public debt levels. In order to account for such variation in local fiscal circumstances, we include the 2010 levels of public spending per capita and municipal debt per capita, as well as the respective levels of per capita revenues from local business tax and vertical transfers of income and value-added tax for the same year. We additionally control for the per-capita size of the local property tax base, which is practically exogenous to local governments in the presence of non-market based valuation due to the extreme durability of housing (Glaeser and Gyourko 2005).

Further Controls. We use population size, squared population size, population density, economic prosperity (proxied by income tax revenues per capita) and socio-demographic structure (share of unemployed persons, share of population aged 10 years or less, and share of population aged 70 years or more) as non-fiscal controls. In order to account for heterogeneous political preferences among locations as another potential confounding factor, we include local shares of valid votes for the three main German left-oriented parties[12] in the 2009 Federal (Bundestag) elections.[13] We include a set of dummy variables flagging municipalities with state or country borders and "metro" municipalities with 100,000 inhabitants or more. We finally reference all municipalities to their respective states.

Table 1 reports key descriptive statistics on the included variables. In addition to the characteristic values of each variable's univariate distribution, it shows the respective Moran's I statistics as indices of global spatial autocorrelation.[14] Both local property tax multipliers and homeownership rates display considerable spatial dependence, as do almost all the control variables. This holds true particularly for debt and shares of left-wing votes.

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[12] The parties belonging to this spectrum include the Social Democratic Party (SPD), Bündnis 90/Grüne and Die Linke.

[13] In the 2009 German Bundestag Election, every voter had two votes: a first vote to elect a local (which can but must not necessarily be associated with a party), and a second vote to elect a party for seats in the German Bundestag. We use only the party-related second votes.

[14] Each Moran's I value is calculated using a 10-nearest-neighbor row-standardized spatial weighting matrix.

Table 1: Descriptive statistics for the included variables

	Mean	**S.D.**	**Min**	**Max**	**Moran's I**
Tax multiplier (pct.)	340.67	51.72	0	900	0.495
Pct. owner-occupied (pct.)	67.92	11.27	20.34	100	0.416
Municipal spending p.c. (euros)	1,245.50	5611.91	-85.94	494,633.2	0.042
Municipal debt p.c. (euros)	1,396.06	867.95	27.00	8,068.00	0.838
Revenue business tax p.c. (euros)	271.37	4182.43	-690.66	380,645.8	0.103
Transfers income tax/VAT p.c. (euros)	352.84	126.30	0	5,416.67	0.553
Property tax base p.c. (euros 1000s)	28.97	24.68	0	2,028.57	0.334
Resident population	8,464	7,599	11	1,348,335	0.160
Population density (inh./km²)	20.59	29.04	0.27	432.63	0.523
Taxable income p.c. (euros 1000s)	15.04	3.84	0.62	100.64	0.467
Unemployed (Pct.)	3.12	1.89	0	80.48	0.300
Persons aged 10 years or less (pct.)	8.79	1.85	1.24	33.33	0.204
Persons aged 70 years or more (pct.)	14.88	3.22	5.23	42.86	0.310
Votes left-wing parties 2009 (pct.)	38.66	10.47	0	81.58	0.686
State or country border (dummy)	0.15	-	0	1	-
Metro city (dummy)	0.01	-	0	1	-
State: Schleswig-Holstein (dummy)	0.13	-	0	1	-
State: Hamburg (dummy)	0.00	-	0	1	-
State: Bremen (dummy)	0.00	-	0	1	-
State: Lower Saxony (dummy)	0.12	-	0	1	-
State: Northrhine-Westfalia (dummy)	0.05	-	0	1	-
State: Hesse (dummy)	0.05	-	0	1	-
State: Rhineland-Palatinate (dummy)	0.27	-	0	1	-
State: Baden-Wurttemberg (dummy)	0.13	-	0	1	-
State: Bavaria (dummy)	0.24	-	0	1	-
State: Saarland (dummy)	0.01	-	0	1	-

4.2 Estimation Strategy

We test our key hypotheses within an integrated spatial model of tax rate choice. We link local property tax multipliers to local homeownership rates, neighbours' tax multipliers and controls within a spatial autoregressive (SAR) framework:

$$\tau = \lambda W \tau + X\Psi + \beta HOR + Z\Theta + \varepsilon \, . \tag{3}$$

Our dependent variable is the municipal property tax multiplier in 2011 in percent times 100. Equation (3) states that the property tax multiplier in a local jurisdiction is not influenced by the traits of this jurisdiction alone, but also by a weighted average of tax rates in adjacent jurisdictions. The strength of this dependence is governed by the specification of the spatial weighting matrix W and the size of the spatial lag coefficient λ. HOR stands for the homeownership rate in municipality *i*, whereas X and Z reflect the fiscal and non-fiscal control variables.

Spatial Weighting Matrix. There are different ways to specify a weighting matrix. The choice set ranges from different forms of binary contiguity matrices (neighbourhood-based matrices) to distance-based matrices, where weights are typically calculated as reflecting the inverse of physical distance. Alternatively, spatial weights can be based on (socio-)economic distances (Dubois and Paty 2010)[15], or on a combination of both (such as the modified Zhao measure). We base the choice of spatial weights on our theoretical model: we argue that voters plausibly compare their own localities with spatially adjacent ones. We thus refer to the neighbourhood rather than the distance concept, using three different *k*-nearest-neighbour matrices (10, 20, and 30 neighbours). Revelli (2005) argues that when unobserved random shocks hit spatially adjacent municipalities in similar way, this may give rise to spatial autocorrelation in the disturbance process of a tax choice regression. We therefore test all

[15] Dubois and Paty (2010) argue that in yardstick competition, voters consider immediate neighbors and not directly adjacent municipalities of similar socio-demographic characteristics.

disturbances of the spatial regressions for remaining spatial dependence in the error terms using the Moran's I statistic.[16]

Unobserved Heterogeneity. A natural concern related to estimating Equation (3) with cross-sectional data is unobserved local heterogeneity. Even controlling extensively for fiscal and non-fiscal local circumstances will not guarantee that unobserved local factors correlated with homeownership and tax levels remain uncontrolled. Since we lack to historical data that would allow us establishing a panel dimension, we resort to including spatial lags in our covariates as a substitute to estimating a spatial unobserved effects model. Pace and LeSage (2010) establish that models including both a spatial lag in the dependent variable as well as spatial lags in the independent variables are well suited to capture unobserved local heterogeneity when the unobserved factors are spatially correlated.[17]

Endogeneity. In our identification strategy, we face a potential endogeneity issue for the homeownership rate: random unobserved shocks to the local tax rate could provide homeowners seeking to keep home values high with an incentive to migrate to low-tax locations, increasing the homeownership rate. A spatial lag model with endogenous homeownership rate can be estimated by using a generalized spatial two stage least squares method (2SLS), as proposed by Drukker, Prucha, and Raciborski (2013).[18] We consider as instruments variables that are highly correlated with the contemporaneous 2011 local homeownership rate, but simultaneously independent of unobserved shocks to the local property tax rate. We test the following instruments: as proxies of local social capital (which has been shown to be strongly correlated with homeownership, DiPasquale and Glaeser

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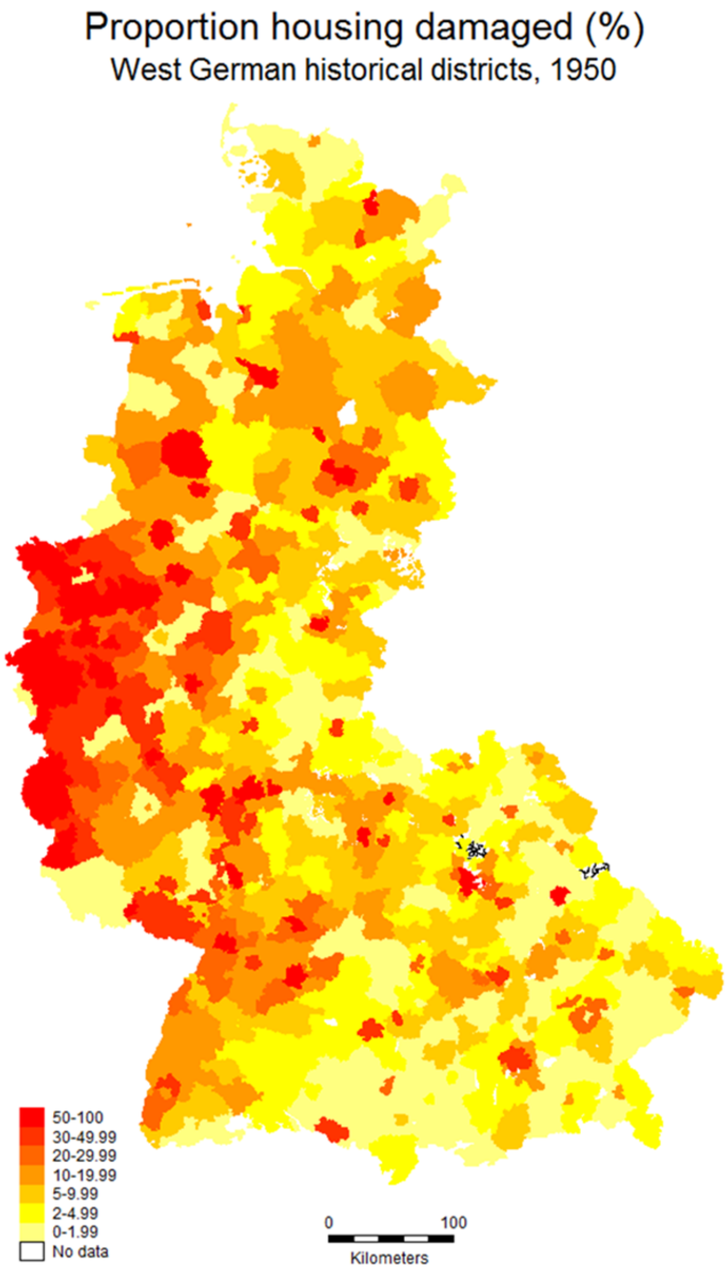
[16] We additionally estimate a mixed-regressive spatial model that contains both a spatial lag in the dependent variable and a spatially auto-correlated error term. The results of this model as well as further alternative specifications of spatial model can be inferred from Table A1 in the appendix.

[17] The Spatial Durbin model can be written as: $\tau = \lambda W\tau + X\Psi + \beta HOR + Z\Theta + \varepsilon$ with $\varepsilon = \rho W\varepsilon + \nu$.

[18] Kelejian and Prucha (1998, 1999) propose using the linearly independent columns of $\mathbf{X}$, $\mathbf{WX}$, and $\mathbf{W}^q\mathbf{X}$ as instruments to solve the endogeneity problem between Y and WY). In general, we can distinguish between spatial lag with exogenous *HOR* versus spatial lag with endogenous *HOR*. For the latter, we specify a generalized spatial two stage least squares model according to Kelejian and Prucha (1999, 1998, 2004, 2009) and Arraiz, Drukker, Kelejian, and Prucha (2009).

1999), we use local membership in sports clubs and voter participation in Federal elections. We also use historical district-level shares of owner-occupied dwellings and buildings destroyed or severely damaged by warfare during World War II. As an example, Figure 4 illustrates local housing damage rates as recorded in the 1950 Census.

Figure 4: War-induced Housing Damage Variation across Municipalities



Source: Own illustration based on data from the 1950 German Census.

The figure shows the geographical distribution of housing damage rates (in %) for historical Western German districts in 1950.

As can be interred from the Figure 4, war-induced housing damages mainly followed a west-east pattern that mimicked the direction of entry of Allied forces into Germany and extended to urban and rural locations. As described in Wolf and Galicia (2015), the destruction of local housing led to large-scale provision of rental housing. Indeed, the first-stage regression reveals that homeownership is today significantly lower in locations that suffered more war-related housing destruction (see Table A2 in the appendix).

5 Empirical Results

Table 2 presents regression results from different specifications of Equation (3). We first estimate a non-spatial, non-instrumental variable version of the equation by OLS in order to allow an assessment of the influence of spatial dependence and endogeneity on our key results. We subsequently report estimation results for two spatial autoregressive (SAR) models that only differ by the contiguity matrix chosen: the first model is estimated based on a 10-nearest-neighbor spatial contiguity matrix, whereas the second model is based on a matrix that extends the connectivity to the first 20 neighbours of each municipality. The fourth and fifth columns of the table contain estimation results for two extended spatial models: a spatial Durbin model that includes spatially lagged versions of all covariates based on the 10-nearest neighbour matrix along with the spatially lagged tax multiplier, and a SAR model treating local homeownership as endogenous using 1950 district-level warfare-related housing destruction and ownership rates as instruments.

Regardless of the exact specification, our model performs generally well in explaining local property tax rate choice. The coefficients estimated on local homeownership as well as the fiscal and non-fiscal control variables turn out to be fairly robust across the different specifications in terms of statistical and economic significance. As indicated by highly significant spatial parameters and a large Moran's I of the OLS disturbances, OLS fails to properly account for the spatial interaction processes governing municipal tax rate choice.

Table 2: OLS and Spatial Regression Results

	OLS	**SL model (10 NN)**	**SL model (20 NN)**	**SD model (10 NN)**	**SL IV (10NN)**
Constant	317.288***	130.555***	105.997***	116.938***	82.114***
	(8.863)	(9.492)	(9.937)	(15.648)	(18.822)
Pct. owner-occupied	-0.199***	-0.214***	-0.201***	-0.253***	-0.284**
	(0.068)	(0.061)	(0.062)	(0.067)	(0.144)
Spending p.c.	0.002***	0.001***	0.001**	0.001**	0.001***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
Debt p.c.	0.003***	0.001	0.001	0.003**	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Business tax p.c.	-0.012***	-0.013***	-0.013***	-0.014***	-0.013***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Income/VAT p.c.	-0.082***	-0.054***	-0.052***	-0.049***	-0.057***
	(0.010)	(0.010)	(0.010)	(0.002)	(0.10)
Tax base p.c.	-0.128*	-0.025	-0.027	0.021	-0.071
	(0.068)	(0.056)	(0.055)	(0.059)	(0.064)
Population (1000s)	0.545***	0.468***	0.475***	0.470***	0.454***
	(0.089)	(0.092)	(0.096)	(0.088)	(0.096)
Population^2	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population dens.	0.089***	0.076***	0.072***	0.198***	0.067**
	(0.027)	(0.026)	(0.026)	(0.030)	(0.029)
Income p.c. (1000s)	-0.332	-0.261	-0.215	-0.227	-0.224
	(0.238)	(0.236)	(0.234)	(0.251)	(0.235)
Pct. unemployed	0.254	0.513**	0.535**	0.559**	0.378
	(0.238)	(0.238)	(0.247)	(0.264)	(0.253)
Pct. <10 years	-0.015	0.216	0.230	0.153	0.172
	(0.299)	(0.256)	(0.247)	(0.254)	(0.274)
Pct. >70 years	0.552***	0.421***	0.419***	0.363**	0.421***
	(0.177)	(0.151)	(0.062)	(0.159)	(0.162)
Pct. left-wing votes	0.232***	0.165***	0.166***	0.281***	0.149***
	(0.055)	(0.047)	(0.048)	(0.065)	(0.050)
D border (nat./state)	1.692	2.593**	2.353**	5.747***	2.513**
	(1.285)	(1.165)	(1.184)	(1.565)	(1.233)
D pop>100,000	4.211	4.444	4.753	3.804	5.667
	(13.467)	(14.138)	(14.330)	(13.861)	(14.409)
State dummies	Yes	Yes	Yes	Yes	Yes
λ	-	0.615***	0.691***	0.668***	0.800**
		(0.017)	(0.019)	(0.017)	(0.034)
Spatial lagged cov.	-	-	-	Yes	-
Wald test:lag cov=0	-	-	-	418.53***	-
# obs.	8,036	8,036	8,036	8,036	8,036
R^2	0.385				
Squared corr. coeff.		0.359	0.349	0.398	
Moran's I error term	0.317	0.014	0.061	-0.017	0.104

***, **, and * denote significant coefficients at the 1, 5, and 10% level.

HAC-robust standard errors are reported in parentheses.

The local homeownership share carries the expected negative sign and is statistically significant at the five per cent level or better in every specification. The variables capturing local fiscal conditions are mainly highly significant and carry plausible signs: Higher per capita spending and debt levels are associated with higher property tax multipliers, reflecting higher financing needs. The fact that our regression appears to capture local governments' budget constraint quite well is supported by the negative and strongly significant coefficients on per capita revenues out of local business tax and vertical transfers of income and value added taxes, both of which relax the municipal budget constraint ceteris paribus. The size of the property tax base is found to be insignificant in the majority of specifications.

Concerning the role of socio-demographics and political tastes in local jurisdictions in property tax rate choice, the evidence is again in line with expectations, albeit some coefficients lack statistical significance. We find higher tax multipliers in municipalities with higher population size (with decreasing margins) and density, more unemployment, higher shares of elderly persons, and more left-oriented political preferences. Municipalities at state or federal borders tend to charge higher multipliers, whereas we find no separate level effect for localities with populations of 100,000 or more (while already controlling for size continuously). All specifications include the full set of (unreported) state dummies that are highly significant in every specification, indicating considerable differences in average property tax levels across states that remain unexplained by the remaining covariates. This finding is explained by the multi-tier structure of public finances in Germany, which renders public financial conditions very heterogeneous on state-level and makes average multiplier levels highly dependent on state.

The coefficients estimated on our main variable of interest, the local share of owner-occupied dwellings, are always fairly close to one another, ranging between -0.199 in the OLS specification to -0.284 in the spatial IV specification that allows for spatial dependence in tax multipliers. While caution is warranted for direct comparisons of coefficients estimated in linear non-spatial versus simultaneous spatial models, we conclude that higher shares of homeowners in local populations are indeed associated with systematically lower property tax levels, corroborating the home voter hypothesis. This key result survives an instrumental variable estimation based on exogenous variation in the contemporaneous ownership share derived from long-lagged housing damage and ownership shares at the superordinate district level, indicating that the correlation that we observe in the data lends itself to a causal interpretation. Concerning the economic significance of the effect, we refer to the direct effect interpretation of a change in the ownership rate on the tax rate in the municipality itself, which is comparable to the marginal effect of OLS estimation (LeSage and Pace 2009): shutting down any indirect effects of tax changes emanating from multi-channel feedback that plays out through the system of spatially dependent jurisdictions, a ten percentage point rise in the local homeownership would reduce the local multiplier by 2-3 percentage points on average. For a typical single-family house worth 80,000 euros of assessed value, this direct effect would be equivalent to roughly a one per cent decrease in the annual tax burden, evaluated at the mean local multiplier of 340 points. While this is an economically small effect for the individual household, it is important to remember that municipalities typically consist of several thousands of homes. This implies that marginal homeownership-related house-level tax discounts accumulate to several ten thousands of euros less of property tax revenue in municipal budgets annually.

Since our spatial regressions suggest strong evidence in favor of spatial dependence in municipal property tax multipliers[19], the estimated direct effect of a change in homeownership in some municipality on the local multiplier does not capture the full or total effect of this change. Since the adjacent jurisdictions react to the resulting change in their

[19] The Moran's I statistic for the residuals of the OLS model is 0.317 in comparison to values of around zero for all spatial models' residuals.

neighboring municipality's tax rate with altering their own multiplier, so will do their neighbors, and so on. The steady-state equilibrium size of these indirect effects depend on the size of the spatial dependence parameter and the shape of the spatial weighting matrix (LeSage and Pace 2009). The spatial dependence parameters in our models are estimated between 0.62 and 0.80 depending on specification and are highly significant throughout. Importantly, this result does not hinge upon the choice of the spatial weighting matrix: increasing the number of neighbors from 10 to 20 changes the spatial dependence parameter only slightly[20], while the model's goodness of fit somewhat decreases. Including spatially lagged covariates in the spatial Durbin model improves the goodness of fit remarkably, but does not alter the spatial dependence parameter considerably vis-à-vis the 10-nearest neighbor SAR specification. With a size of 0.8, the largest parameter is estimated for the spatial IV regression.

Following the total effect to an observation viewpoint mathematically exposed by LeSage and Pace (2009), we are able to calculate the average total impact on the tax multiplier of a locality *m* from a global one percentage point rise in local homeownership shares across the entire sample. In the spatial lag model with 10 nearest neighbors, the average total effect is -0.56, more than twice as high the average direct effect of -0.21. This total effect translates into a 5.6 point average decrease in the multiplier in the presence of a global ten percentage point rise in homeownership across the country.[21] Using the estimates from the 10-nearest-neighbors spatial Durbin model, the total effect becomes -0.71. Compared to the direct effect, this is a disproportional increase vis-á-vis the spatial lag model that can be explained by the larger estimate for the spatial lag parameter.

5.3 Discriminating among Tax Incidence and Tax Salience as Possible Channels

[20] Increasing the number of nearest neighbors to 30 yields a dependence parameter of with otherwise very similar results.
[21] The actual homeownership rate exceeded 90 percent in 111 communities in 2011 (1.4 per cent of the sample). The resulting error can be considered negligible.

Differences in property tax incidence between landlords and tenants across locations are a natural candidate that could potentially challenge our claim that differences in tax salience between homeowners and renters drive our key result. While homeowners bear the full property tax burdens irrespective of local market conditions, the incidence of property taxes for the case of rented housing depends on the relative sizes of the local price elasticities of rental housing demand and supply. In regions, where demand for rental housing is considerably elastic, the main portion of property tax burdens will remain with the landlords, while renters are expected to bear the main portion in strong housing demand, "landlord-friendly" markets. In the latter circumstances, the division of local housing use between owner-occupied and rental should be less influential on property taxes because any resident bears the tax.

We test this proposition based on replacing the local homeownership share with two separate and mutually exclusive interaction terms: we interact local homeownership rates with two mutually exclusive dummy variables which flag municipalities in the highest quartile of the non-single family housing vacancy rate distribution ("high vacancy areas") and the lower three quartiles of the same distribution ("low vacancy areas"), respectively. We split the sample at the 75th percentile of the non-single family housing vacancy rate because this distribution is heavily right-skewed: the 75th percentile is 8 per cent vacancy, while median vacancy is 5.6 per cent, a still fairly usual vacancy rate (see Figure A1 in the appendix). Importantly, mean homeownership rates in high- and low-vacancy areas are quite similar (66 vs. 72 per cent).

The homeownership coefficients for the subsamples of high- vs. low-vacancy communities hardly differ from one another. A χ^2-test of the null that the two coefficients be equal cannot be rejected at common significance levels. This lets us conclude that a home-voter effect is present in local property tax multipliers regardless of vacancy in the local rental market. Since vacancies can serve as an adequate proxy for the local price elasticity of rental housing demand, our key result holds regardless of the actual incidence of property taxes between tenants and landlords. That is, a home-voter effect exists *even when* tenants are likely to bear the same property tax burdens as their fellow owner-occupying citizens do. This corroborates that the higher visibility of the property tax for homeowners is likely to be the main mechanism driving our result.

5.4 Robustness tests

1. Neighbor- and distance-based matrix: test for similar economic development or purchasing power

2. See comment OL1: commuting or travel time as distance measure

Table 3: Results of further alternative spatial specifications

	SE model (10 NN)	**SL model (30 NN)**	**SAC model (10 NN)**
Constant	305.047***	130.555***	436.859***
	(7.980)	(7.772)	(15.854)
Pct. owner-occupied	-0.241***	-0.214***	-0.230***
	(0.055)	(0.050)	(0.053)
Spending p.c.	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Debt p.c.	0.003***	0.001	0.004***
	(0.001)	(0.001)	(0.001)
Business tax p.c.	-0.014***	-0.013***	-0.014***
	(0.001)	(0.001)	(0.001)
Income/VAT p.c.	-0.060***	-0.054***	-0.053***
	(0.009)	(0.008)	(0.009)
Tax base p.c.	0.022	-0.025	0.029
	(0.046)	(0.044)	(0.044)
Population (1000s)	0.463***	0.468***	0.445***
	(0.045)	(0.046)	(0.043)
Population^2	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Population dens.	0.163***	0.076***	0.179***
	(0.024)	(0.020)	(0.023)
Income p.c. (1000s)	-0.329**	-0.261*	-0.277*
	(0.155)	(0.154)	(0 .149)
Pct. unemployed	0.690***	0.513**	0.643***
	(0.252)	(0.250)	(0.242)
Pct. <10 years	0. 158	0.261	0.190
	(0.262)	(0.266)	(0.251)
Pct. >70 years	0.412***	0.421***	0.388***

	(0.157)	(0.151)	(0.151)
Pct. left-wing votes	0.273***	0.165***	0.269***
	(0.064)	(0.050)	(0.064)
D border (nat./state)	4.658***	2.593***	4.990***
	(1.425)	(1.126)	(1.430)
D pop>100,000	3.262	4.444	3.101
	(8.140)	(8.402)	(7.787)
State dummies	Yes	Yes	Yes
λ	-	0.615***	0.839***
		(0.013)	(0.013)
ρ	0.684***		-0.458***
	(0.012)		(0.044)
Spatial lagged cov.	-	-	-
Wald test:lag cov=0	-	-	-
# obs.	8,036	8,036	8,036
Squared corr. coeff.	0.378	0.359	0.371
Moran's I error term	0.778	0.028	0.535

3. Test of the IVS "sport club membership" and "election participation" as well as all three IVs together. We should include discussion of "social capital" and the problem of selection bias for municipalities with low taxes.

6 Conclusions

In efficient and frictionless property markets, contract arrangements governing the property rights in local housing should not make any difference for how strongly housing is taxed, at least if landlords are statutorily allowed to pass on property taxes to their tenants. Real-world evidence increasingly suggests that owner-occupiers, who bear the full burdens of property taxes independent on local market conditions, experience strong property tax salience and possess strong incentives to protect their housing wealth, oppose high property tax levels much more than renters do. This leads towards a case for a political economy of property taxation.

In this paper, we have presented first-time representative and large-scale empirical evidence in favor of a home-voter effect in local property taxation. Based on data for over 8,000 German local jurisdictions, we have shown local property tax multipliers to be on average 20-30 points lower ceteris paribus if local homeownership increases by 10 percentage points. This effect withstands the inclusion of a battery of potential confounding factors, the consideration of spatial dependence in property tax rate choice and the correction for the bias arising from potential endogeneity of the homeownership share. Interacting homeownership rates with local shares of vacant rental housing suggest that the home-voter effect exists *even when* tenants are likely to bear the same property tax burdens as their fellow owner-occupying neighbors. We interpret this as evidence that the home-voter effect originates from differences in tax salience rather than from differences in tax incidence between owners and renters, which is in line with the recent findings of Cabral and Hoxby (2016) and Brunner et al. (2015).

Our results have at least two important practical implications. First, they provide local governments with evidence enabling them to benchmark their actual tax rate choices against other structurally comparable local jurisdictions. Second, our finding of a home-voter effect in property taxation indicates that actual property tax levels may not be efficient in terms of overall social welfare. If owner-occupiers successfully manage to oppose high property tax rates, property taxation will tend to be systematically too low in homeowner communities, whereas other local fees and taxes will tend to be too high.

The latter second-round effect, while not investigated in this paper, may potentially affect the equity of local access to public and quasi-public goods. We think that examining the questions of whether local governments attempt to compensate lower property tax revenues resulting from higher local political power of homeowners by charging higher fees and non-property taxes could be a fruitful avenue of further research.

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Appendix

Figure A1: Empirical frequency distribution of non-single family housing vacancy in 2011, 8036 German municipalities.