Discussion Paper No. 17-036

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Economic Research

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Abstract

This paper investigates whether and how strongly the share of homeowners in a community affects residential property taxation by local governments. Different from renters, homeowners bear the full property tax burden irrespective of local market conditions, and the tax is more salient to them. "Homeowner communities" may hence oppose high property taxes in order to protect their housing wealth. Using granular spatial data from a complete housing inventory in the 2011 German Census and historical war damages as a source of exogenous variation in local homeownership, we provide empirical evidence that otherwise identical jurisdictions charge significantly lower property taxes when the share of homeowners in their population is higher. This result is invariant to local market conditions, which suggests tax salience as the key mechanism behind this effect. We find positive spatial dependence in tax multipliers, indicative of property tax mimicking by local governments.

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Abstract

This paper investigates whether and how strongly the share of homeowners in a community affects residential property taxation by local governments. Different from renters, homeowners bear the full property tax burden irrespective of local market conditions, and the tax is more salient to them. "Homeowner communities" may hence oppose high property taxes in order to protect their housing wealth. Using granular spatial data from a complete housing inventory in the 2011 German Census and historical war damages as a source of exogenous variation in local homeownership, we provide empirical evidence that otherwise identical jurisdictions charge significantly lower property taxes when the share of homeowners in their population is higher. This result is invariant to local market conditions, which suggests tax salience as the key mechanism behind this effect. We find positive spatial dependence in tax multipliers, indicative of property tax mimicking by local governments.

JEL classification: D72, H20, H31, H71, R31.
Keywords: Homeownership, public financing, residential property tax, spatial tax mimicking, yardstick competition.

1 Introduction

In many countries, taxing housing wealth forms an important source of fiscal revenue for local governments.[1] Due to the immobility of the tax base, residential property taxes are also generally considered to score high from a tax efficiency perspective (Wilson, 2006). Their actual efficiency, however, hinges critically upon the political economy of property taxation, which is concerned with the decisions of whom, how and how much to tax.

Property taxes are levied on both owner-occupiers and renters, but the perception and true economic burden differ substantially between these two groups.[2] According to the "home voter hypothesis" first coined by Fischel (2001), especially households who own their homes are expected to oppose high local property taxes. Homeowners have strong incentives to promote high market values for the typically biggest item in their wealth portfolios. Recent research suggests that the unpopularity of property taxes among homeowners also results from higher salience: in many countries, the property tax tends to be much more visible for homeowners than for renters.[3] Renters sometimes even underlie the illusion of not paying property taxes at all (Oates, 2005).

If homeowners oppose property taxes more strongly than renters, "homeowner communities" — i.e., jurisdictions with large shares of households owning their homes — are expected to tax property less heavily than governments of otherwise comparable communities. This paper makes use of a previously untapped and highly detailed data set to empirically investigate this hypothesis. The backbone of this data set is a complete inventory of residential real estate compiled in the 2011 German Census. For each indi-

[1] Total revenue of the Type B German Property Tax (levied on non-agricultural property, including improvements to land) amounted to 13.26 billion euros in 2016, according to Federal Statistical Office. This corresponds to 323 euros per dwelling and about one-sixth of total municipal tax revenue. The relative importance of property taxes is even larger in Anglo-Saxon and also many other OECD countries, see Norregaard (2013) for in-depth discussion.

[2] Landlords are often statutorily allowed to shift the property tax to their tenants on a pro rata basis. Local market conditions may however preclude that property taxes are fully shifted forward onto renters in many locations in economic terms.

[3] German homeowners annually receive a discrete property tax bill from their municipality. For renters, the tax usually appears among many other cost positions in the annual utilities statement, which comes from their landlords. Other positions include insurance, waste collection, housekeeping etc.

vidual housing unit, the inventory collected information about the type of owner and the current state of use. We aggregate this data to the level of municipalities, which typically rank between U.S. Census Tracts and Census Block Groups in terms of population size. We merge this data with local property tax multipliers and rich information from local property tax statistics, fiscal accounts, income tax statistics, labor statistics and federal elections. Our final data set covers a cross-section of 8,036 Western German municipalities[4] and contains information on local fiscal conditions, socioeconomic characteristics, economic prosperity and political tastes.

One key contribution of our paper is a clear identification of causality running from local homeownership rates to property tax multipliers. To this end, our empirical analysis exploits two unique institutional circumstances of the German housing market. We first make use of the missing link between the size of the local property tax base and actual housing market values in the special design of the German property tax. This special design guarantees that choosing the local multiplier is the only way by which local governments can influence their property tax revenue. Second, we exploit historical information on housing damages during the Second World War. Such damages led to large-scale provision of rental housing in areas affected by warfare, having long-lasting effects on homeownership independent from local public financing. This natural experiment provides exogenous variation that we use for causal inference about the homeowner effect.[5] Based on spatial autoregressive models, we simultaneously account for the possibility of strategic interdependence among municipalities' property tax choices.

In comparison to the rich literature on strategic spatial interaction in local property taxation, the role of property rights in driving property taxes has been subject to a very limited number of studies. Existing attempts (see, e.g., Roche, 1986; Oates, 2005; Brunner, Ross, and Simonsen, 2015) have been plagued by issues of identification and

[4]We do not include Eastern German municipalities due to data constraints on several important variables.
[5]In contrast to many other industrialized economies, regional homeownership rates in Germany often lie below 50 percent, see Lerbs and Oberst (2014) for further discussion.

statistical control. We contribute to this strand of literature by asking whether and how strongly the local rate of homeownership causally affects property taxation across a very large sample of local jurisdictions. By providing further evidence supportive of spatial dependence in local property tax multipliers, our study also contributes to the spatial interaction literature in property tax setting (see, e.g., Brueckner and Saavedra, 2001; Allers and Elhorst, 2005; Lyytikäinen, 2012).

We approach the question of a homeowner effect in the presence of spatial interaction in property tax rates among 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 econometric framework that links local property tax multipliers to local proportions of owner-occupied housing and neighboring localities' multipliers. We use an extensive set of possibly confounding variables in order to control for local fiscal conditions, socioeconomic structure and political colouring. Our identification strategy explicitly tackles the endogeneity problem among local property tax and homeowner share in a spatial instrumental variable setting.

Our results suggest that local governments indeed tax homeowner communities differently compared to otherwise comparable communities. Depending on the exact specification, a hypothetical rise in a local jurisdiction's homeownership rate by ten percentage points decreases the local property tax multiplier by an average direct effect of 2-3 points. This key result remains unchanged when spatial dependence in tax multipliers and endogeneity among homeownership and property taxes is accounted for. Calculating the average total effect of a hypothetical change in homeownership, we estimate that local tax multipliers would be on average 6-7 points lower in the case of a global rise in homeownership of ten percentage points across all jurisdictions in the sample. Such a reduction in local multipliers would correspond to an annual tax loss of 120-140 million euros, or one percent of total property tax revenue.

An interesting implication of our finding is that actual levels of residential property taxation may not be efficient from a social welfare perspective. If homeowners successfully manage to oppose high property taxes relative to other sources of fiscal revenue, property taxation will tend to be too low in high-homeownership communities, while other local taxes and fees will tend to be too high. The latter effect could unfold adverse repercussions on the access to local public and quasi-public goods. Our results finally have practical implications for local policy makers in providing a possibility to judge their actual tax multiplier choices against an empirical benchmark.

The remainder of the paper is organized as follows. Section 2 reviews the current state of research concerning the political economy of property taxation and spatial property tax dependence, including a discussion of the key concepts of home-voting, tax illusion and tax mimicking. Section 3 links this review to a yardstick competition model of local property taxation, which serves to derive the key hypotheses we test. Section 4 introduces the data set and discusses our identification strategy. Section 5 presents the empirical results, while Section 6 concludes.

2 Home-Voting, Renting and Spatial Property Tax Interaction

The concept of utility-maximizing residents ultimately determining residential property tax rates goes back to as early as Tiebout (1956). Tiebout's seminal "voting with your feet model" relied on fully mobile consumers and dispensed with any political behavior. Fischel (2001) was the first to articulate the idea that homeowners who are voters ("home-voters") are special with respect to their interests towards desired local levels of public spending and property taxes, and that they articulate these interests in local political processes. According to this "home-voter hypothesis", the level of property taxation and other public financing decisions are ultimately driven by the desire of resident homeowners to maximize the values of their houses. Fischel's hypothesis has been tested in the context of numerous local public referenda, usually with corroborating results (see, e.g., Dehring, Depken II, and Ward, 2008; Ahlfeldt and Maennig, 2015).

Rather than focusing solely on homeowners, subsequent work has put stronger focus on the tastes and behavior of homeowners *and* renters. Particularly for the U.S., research suggests that the larger the share of households renting their homes in a jurisdiction, the higher the tendency of the local government to spend extensively on public services, the so-called "renter effect". Oates (2005) focuses on the potential mechanisms that lead renters to drive up local public expenditures in a jurisdiction. Consistent with early research by Roche (1986), he finds that the positive association between rental share and public spending is due to renters' perception of public services being "not so costly", rather their higher demand for such services compared to homeowners. Fiscal illusion is thus a likely source of the renter effect. In the presence of a renter effect, any empirical model explaining property tax rate choice through spatial variation in homeownership must carefully control for the local level of public expenditure.

More recently, Brunner, Ross, and Simonsen (2015) discuss fiscal illusion as a possible explanation for the higher willingness of renters to support an increase in local property taxes to expand funding for public services. Using micro-level data of registered voters in California, they find that compared to renters, homeowners are 10-15% less likely to be in favor of a property tax rather than a sales tax increase. Their estimation strategy controls for individual preferences towards public spending. Contradictory to the fiscal illusion hypothesis, their result is not driven by the voting behavior of renters: while renters are indifferent to whether a property tax or sales tax increase is used to finance additional spending, it is the *homeowners* who strongly oppose a property tax increase relative to a sales tax increase. Importantly, the strong aversion against property tax increases is not associated with the relative tax burden faced by this group of residents. As a potential explanation for this finding, Brunner, Ross, and Simonsen (2015) refer to the more salient nature of property taxes for homeowners.

Cabral and Hoxby (2016) exploit variation in property tax escrow across locations in the U.S. in order to investigate in more detail to what extent the salience of the property tax for homeowners affects its level and acceptance. To study the effect of salience, they make use of the fact that about half of U.S. 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 payment that is collected through automatic methods. Variation in the use of tax escrow generates variation in property tax salience over different jurisdictions and time that can be considered as random. 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.

Existing studies on the policital economy of property taxation in the presence of home-voting and differences in tax salience between owners and renters fail to account for spatial dependence emanating from local governments' interactions in tax rate choice. There is ample evidence that local property tax rates are at least partially driven by the observable choices of neighboring governments. The corresponding literature will be briefly reviewed in the following.

Among the first to use spatial econometric methods to investigate strategic property tax interaction are Brueckner and Saavedra (2001). Spatial interaction is motivated in their paper by public tax competition in the presence of footloose, heterogeneous consumers and sorting. In order to trace out the property tax reaction function of the representative community, Brueckner and Saavedra (2001) estimate a spatial autoregressive model with data covering a sample of cities in the Boston metropolitan area. They find significant spatial lag parameters from 0.16 to 0.70, depending on the form of the spatial weighting matrix.[6] While these results are generally in line with tax competition, Brueckner and Saavedra (2001) note correctly that their findings are observationally

[6]Obviously, a precise estimation is strongly limited by the small sample size that is used in that paper.

equivalent with the yardstick competition framework of Besley and Case (1995). In this framework, resident voters are immobile and have homogeneous preferences but use information about tax rates in neighboring jurisdictions to judge whether their own local government is inefficient and deserves to be voted out of office.[7]

Following the work of Brueckner and Saavedra (2001), an increasing number of papers has examined spatial dependence in local property tax rates for different countries. These papers usually estimate spatial dependence parameters of 0.4-0.6, equivalent with ten percentage point higher average property tax rates in neighboring jurisdictions leading to a 4-6 points higher tax rate in the jurisdiction considered (without accounting for any feedback effects). A key objective has been to better discriminate among tax and yardstick competition as possible sources of such dependence.

Bordignon, Cerniglia, and Revelli (2003) show that local property tax rates are positively spatially autocorrelated among adjacent jurisdictions in Italy when the mayors run for reelection, while this correlation is absent either when mayors face a term limit or when backed by an overwhelming majority in the local council. This result clearly supports yardstick competition and tax mimicking as the relevant mechanism. Analyzing property tax choice interaction by Dutch municipalities, Allers and Elhorst (2005) corroborate this view, finding that 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 the residential property tax in local communities in Norway depends on the observable past decisions of adjacent localities. Their results also point towards yardstick competition as best predictor of existing geographic patterns in local property tax rates.

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 the impact of tax choices

[7] Self-interested governments choose tax rates knowing that residents make such comparisons and strategic interaction among jurisdictions arises just as in a tax competition model.

in locations which are not only geographically close but comparable in socioeconomic structure. Their results suggest that voters sanction incumbents when their own local housing tax is high relative to geographic neighbors, and reward them when cities similar in socioeconomic structure have high local taxes. Delgado, Lago-Penas, and Mayor (2011) use a large sample of 2,713 municipalities in Spain and find evidence of property tax mimicking with a spatial lag parameter of slightly over 0.4. Overall, the accumulated evidence strongly points towards the existence of systematic spatial dependence in property tax choices and yardstick competition as the main driver of this dependence.[8]

3 A Simple Yardstick Competition Model

Yardstick competition in tax rates (Besley and Case, 1995) is based on informational externalities between jurisdictions. Voters make comparisons between jurisdictions to overcome the political agency problem of asymmetric information about the true cost of providing local public services and the quality of local policymakers. This forces incumbent governments into yardstick competition, in which they have to account for other (neighboring) local governments' tax choices. We incorporate the political economy of homeowning versus renting into this framework by allowing for heterogeneity in voters' information sets and motivation to vote against high property taxes.

In order to finance public services, local governments within an economy of M autonomous but interdependent jurisdictions can tax property at a rate τ_m per unit of local property tax base. The cost of providing public services per unit of tax base, ϕ_m, is random

[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 neighboring 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 neighboring 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.

and specific to each municipality. This cost is known to local governments but unobserved by residents. The socially optimal level of spending per unit of tax base corresponding to local cost is g_m^*. Different from property tax rates, the local cost of providing public services cannot be controlled by policy makers. It is reasonable to assume that the local cost varies with exogenous jurisdictional characteristics, such as population size and socio-demographic composition (e.g., the proportion of residents seeking unemployment benefits or subsidies), as well as with revenues from other taxes and transfers from superordinate layers of federal government (Revelli, 2005). Governments have to tax property more heavily if they face higher unit costs, such that in equilibrium it holds $\tau_m = \tau(\phi_m)$ with $\frac{d\tau_m}{d\phi_m} > 0$. This leads to our first testable hypothesis:

Hypothesis 1 – Local Public Financing through Property Taxes: *Higher spending needs and more constrained fiscal conditions in a jurisdiction go along with higher local property tax multipliers.*

Residents obtain utility from public services consumption and earn disutility from being taxed. There can be two types of government: "good" governments provide public services at true cost, whereas "bad" governments engage in rent-seeking by increasing property taxes over costs and impropriating the surplus, $s_m = \tau_m - \phi_m$. Resident voters can appraise incumbents' and discriminate "good" from "bad" governments only by comparing the property tax rate and public services in their own jurisdiction with observable neighboring jurisdictions' average tax rates and services, $\overline{\tau}_{-m}$ and $\overline{g}_{-m}$. Voters care about minimizing expected future taxes using present taxes and services to update their beliefs that the incumbent is good using Bayes' rule. With given observables, they vote "bad" incumbents out of office with probability $p_m = p(\tau_m, \overline{\tau}_{-m}, g_m, \overline{g}_{-m})$.[9] Information about public policies in neighboring municipalities thus help imperfectly informed voters to learn about the own local governments' public financing efficiency. Since incumbent

[9] Both voters and the property tax base are considered to be immobile between jurisdictions, e.g., because of prohibitive transaction costs of moving house. This shuts down the voting-with-your-feet channel that is central to the class of tax competition models in the spirit of Tiebout (1956).

governments aim at being reelected, they are forced to take neighboring jurisdictions' policies into account in their own tax rate choices. Besley and Case (1995) demonstrate that in equilibrium, a situation emerges where adjacent local jurisdictions strategically mimic each others' property tax rate choices, known as yardstick competition: $\tau_m = \tau\left(\phi_m, \overline{\tau}_{-m}\right)$ with $\frac{d\tau_m}{d\phi_m}, \frac{d\tau_m}{d\overline{\tau}_{-m}} > 0$. This leads to our second testable hypothesis:[10]

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

Information asymmetry between local councils and voters about the true costs of local public services provision lies at the heart of the yardstick competition framework. In the homeowner-renter context, it is plausible to keep this core assumption and assume that such costs are fully known to the local councils but generally not observable by both homeowners and renters. The research reviewed in the previous chapter yet clearly suggests that it is reasonable to allow for heterogeneity with regard to the degree of information and behavior of these two different groups of residents, as homeowners have stronger incentives to closely monitor local governments' property tax choices than renters and the tax is generally more salient to them. This is expected to cause a greater willingness among homeowners to sanction bad governments in the presence of inefficiently high taxes. In this case, jurisdictional homeownership rates enter the probability-of-reelection function for bad governments[11] as additional arguments. To see this, note that the utility of bad governments in the yardstick competition game, V_m, depends on the surplus they can appropriate from raising taxes over costs in the current period and, in case they get

[10] Revelli (2005) points out that when the main interest is on identifying spatial interaction, it is necessary to look for further restrictions that help to discriminate yardstick competition from spatially autocorrelated shocks to local public finances. Since our main focus is on the effect of homeownership on tax multipliers, we do not look for such further restrictions, but instead carefully interpret any significant spatial dependence in multipliers as the absence of evidence against yardstick competition.

[11] See Besley and Case (1995) for in-depth discussions of the probability-of-reelection function.

reelected, subsequent periods:

$$V_m = \max_{s_m}\{v_m\left(s_m\right) + p_m V_m^{t+1}\} \tag{1}$$

with marginal utility $\frac{dv_m}{ds_m} > 0$ and marginal probability of reelection $\frac{dp_m}{ds_m} < 0$. Equation (1) highlights the fundamental trade-off between higher utility from higher surpluses in the present period against the lower probability of being reelected for the subsequent period if being unmasked of being "bad".

Now assume that homeowners, present in local populations with varying and exogenous shares of π_m, always only reelect incumbents if they can expect them to be good, given the observable property tax setting decisions in their own jurisdiction relative to neighboring municipalities. Renters, present in local populations with shares of $1-\pi_m$, can be of two different types: an exogenous fraction of γ (homogeneous among municipalities) is "careless" about the relative level of property taxes and reelects incumbents with an exogenous probability of p_γ^{ex}, whereas a fraction of $1-\gamma$ is "informed" and follows the same probabilistic voting behavior as homeowners do. We lend to the notation of Revelli (2005) in writing the probability-of-reelection function among homeowners in this case as

$$p_m^{\text{owners}} = p\left(\tau_m, \overline{\tau}_{-m}, g_m, \overline{g}_{-m}\right) \tag{2}$$

and among renters as

$$p_m^{\text{renters}} = \gamma p_\gamma^{\text{ex}} + (1-\gamma)\, p\left(\tau_m, \overline{\tau}_{-m}, g_m, \overline{g}_{-m}\right). \tag{3}$$

The total probability-of-reelection function for municipality m becomes

$$p_m = \left(1-\gamma+\pi_m\gamma\right) p\left(\tau_m, \overline{\tau}_{-m}, g_m, \overline{g}_{-m}\right) + \left(\gamma-\pi_m\gamma\right) p_\gamma^{\text{ex}}, \tag{4}$$

which is a weighted average of the reelection probabilities among homeowners and renters.

For $p^{\mathrm{ex}}_{\gamma} > p(\cdot)$, it holds that $\frac{dp_m}{d\pi_m} < 0$, i.e. the reelection probability always decreases with higher local shares of homeowners irrespective of the level of γ.[12] If local governments maximize (1) with respect to s_m and incumbents' probability of being reelected follows (4), the emerging tax reaction function includes both the local share of homeowners and the share of homeowners in neighboring jurisdictions as arguments:

$$\tau_m = \tau\left(\phi_m, \pi_m, \overline{\tau}_{-m}, g_m, \overline{g}_{-m}, \overline{\pi}_{-m}\right). \tag{5}$$

Through decreasing the reelection probability in the case of being unmasked of "bad" behavior, a higher local homeownership rate unanimously decreases the property tax rate in the own municipality. This leads us to our third and key testable hypothesis:

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

Heterogeneity with regard to voting behavior between owners and renters in the context of local property taxation leads to another interesting implication: as property tax rates are complements in the yardstick competition game, the higher local governments set their own tax multipliers relative to neighbors, the higher the probability that homeowners (and informed renters) vote them out of office. Yardstick competition and tax mimicking among jurisdictions should therefore be particularly intense when homeownership rates in the region are generally higher than elsewhere, i.e. when there are many "watchdogs" in the populations of competing jurisdictions. This leads to a fourth and final testable hypothesis which supplements our key hypothesis on the homeowner effect:

Hypothesis 3^* **– Regional Homeownership and Tax Competition:** *The intensity of spatial tax mimicking among local governments is stronger within regions of high-homeownership municipalities.*

[12] This condition implies that "careless" renters always reelect "bad" local governments with a higher probability than homeowners and "informed" renters, independent of the local level of rent seeking. If $p^{\mathrm{ex}}_{\gamma} = p(\cdot)$, the partition of local voters into homeowners and renters would have no effect on the overall local probability of reelection of rent-seeking governments.

4 Data and Estimation Methodology

4.1 Data

Property Tax Multipliers. Like in many other countries, the German property tax is levied at the municipal level. The taxonomy of property taxation 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:

$$TAX_{j,k,m} = VAL_j^{ass} \cdot RATE_k \cdot MULT_m, \tag{6}$$

where TAX denotes the tax payment, VAL^{ass} the property-specific assessed value, $RATE$ a property-type-specific tax rate and $MULT$ the local tax multiplier.

Municipal autonomy in choosing the effective property tax rate is limited to setting the local tax multiplier $MULT_m$. The responsibility for setting this multiplier is with the municipal councils. The property-specific assessed values (*"Einheitswerte"*) are fixed by the local tax offices based on a methodology using 1964 house prices for West Germany and 1935 prices for East Germany.[13] The property-type-specific tax rates are ruled by federal law and uniform across the country.[14] The local tax multiplier is hence the only component of the effective tax rate that can be directly influenced by local governments, while all other components are exogenous.[15]

Local councils are generally allowed to alter the multiplier once in a calendar year. Any change to the multiplier has to be disclosed to the public in the municipal register (*"Gemeindeblatt"*). Public referenda about changes to the local property tax multiplier

[13]Due to the outdated price references, the assessed values are completely disconnected from current market conditions. See Box 1 in the Appendix for further institutional details on assessed values.

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

[15]It could be argued that local governments can influence the size of the tax base in the long run by allowing more housing construction. However, new construction is typically very small compared to the existing stock due to the extreme durability of housing. The property tax base is thus practically fixed for periods far longer than a major's typical period of power.

are not possible. Households can only avoid paying higher property taxes by voting for another party in response to tax rises or by discussing with the elected members of the local council, which is voted every five or six years depending on state law.

Data on local property tax multipliers for the year of 2011 is obtained from Local Property Tax Statistics. We restrict our sample to 8,036 Western German municipalities without the two city states of Hamburg and Bremen.[16] As illustrated by Figure 1, local tax multipliers vary widely across municipalities. Some local governments set the tax multiplier to zero, which is equivalent to exempting housing from taxation. The maximum multiplier is 800 percent, 2.4 times the sample mean of 333 percent. Residing in even fairly adjacent locations can lead to substantial differences in annual tax burdens: moving ten kilometers from Dierfeld, a small municipality in Rhineland-Palatinate with the highest multiplier in the sample, to the adjacent municipality of Diefenbach could save a household owning a typical single-family home with an assessed value of 80,000 euros[17] a property tax payment of 1,500 euros annually. This annual saving would translate into several ten thousands of euros over the typical duration of a household in a home.

[INSERT FIGURE 1 HERE]

Homeownership Rates. Data on municipality-level homeownership 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, cooperative or other), current use (owner-occupied, rented out or vacant) and characteristics of each housing unit. We remove seasonal and recreational dwellings as well as dwellings used by diplomats and foreign armed forces. We subsequently compute the percentage shares of owner-occupied, rental and vacant housing units at the municipal level.

[16] Due to data limitations for important fiscal variables, such as debt or public spending, it was not possible to include Eastern German municipalities in the sample.

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

Figure 2 illustrates the geographical distribution of municipal homeownership rates. The unweighted mean share of homeowners at the municipality level is 67 percent, with an enormous range spanning from 20 to 100 percent. Due to a very large number of small jurisdictions with high homeownership rates, the sample mean is considerably higher than the population-weighted Western German homeownership rate of 48 percent. High-homeownership jurisdictions are particularly clustered in rural regions in the northwest, in Bavaria and southwestern Germany. Low-homeownership municipalities are primarily concentrated in major metropolitan areas and post-industrial regions.

[INSERT FIGURE 2 HERE]

Figure 3 shows Kernel estimates of the probability mass functions of local property tax multipliers among "low" (below-median) and "high" (above-median) homeownership rate municipalities. The estimated density functions are identifiably 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.

[INSERT FIGURE 3 HERE]

Fiscal Conditions. Local property tax rates critically depend on local fiscal conditions. If homeowners have different tastes with respect to levels of public spending or debt, these conditions in turn systematically differ with respect to the local share of homeownership (Oates, 2005). In order to account for the possibly confounding role of fiscal circumstances, we include 2010 levels of local public spending and municipal debt (at the superordinate district level) per capita, as well as per capita revenues from local business tax and vertical transfers of federal income and sales tax for the same year.[18]

[18] In 2010, the entity of municipalities received 15% of the county-wide income tax and 2.2% of the country-wide sales tax revenue within the German vertical fiscal equalization scheme. The revenues were distributed to individual municipalities according to allocation formulae which account for, among other factors, local income tax and business tax revenue.

We obtain this data from the Federal Statistical Office. We additionally control for the size of the local property tax base per capita, which can be considered exogenous to local governments because assessed values are completely uncoupled from market values and local housing stocks are extremely durable (Glaeser and Gyourko, 2005).

Further Controls. As socioeconomic controls, we include population size, squared population size, population density and multiple indicators of socioeconomic structure (2009 taxable income per capita, share of unemployed persons, share of population aged 10 years or younger and population aged 70 years or older). In order to account for heterogeneous political preferences as another potentially confounding variable, we also include local shares of valid votes for the three main German left-oriented parties[19] in the 2009 Federal elections.[20] We obtain all data from the Federal Statistical Office. We additionally include a set of dummy variables flagging municipalities with state or country borders and cities with 100,000 inhabitants or more. We finally include a set of dummy variables reflecting the state in which a certain municipality is located.

Table 1 shows key descriptive statistics for all variables used in the analysis. In addition to characteristic values of each variable's univariate distribution, we report Moran's I as a common measure of global spatial autocorrelation.[21] According to Moran's I, both local property tax multipliers and homeownership rates display considerable spatial dependence, as do almost all covariates.

[INSERT TABLE 1 HERE]

[19] As left-oriented parties we include the Social Democratic Party (*"Sozialdemokratische Partei Deutschlands", SPD*), the Green Party (*"Bündnis 90/Die Grünen"*) and the Socialist Party (*"Die Linke"*).

[20] In the 2009 German Bundestag Election, every voter had two votes: one to directly elect a local candidate (who 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.

[21] Moran's I values are computed using the row-standardized 10-nearest-neighbor spatial weight matrix.

4.2 Estimation Strategy

We test our hypotheses within a spatial framework of property tax rate choice. We link local property tax multipliers to local homeownership rates, neighboring municipalities' multipliers and controls in a spatial autoregressive model allowing for heteroskedastic disturbances:

$$\tau = \lambda W\tau + \beta HOR + X\Psi + \epsilon \quad \text{with } \epsilon \sim \left(\mathbf{0}, \sigma_m^2 \mathbf{I_N}\right). \tag{7}$$

The dependent variable τ is an $N \times 1$-vector of municipal property tax multipliers in 2011, measured in percent. The tax multiplier in each municipality is not influenced by the characteristics of this jurisdiction alone, but also by a weighted average of property tax multipliers in adjacent localities. The strength of this dependence is governed by the N-dimensional spatial weighting matrix W_N and the size of the spatial lag parameter λ. HOR is an $N \times 1$-vector of municipal homeownership rates; X is an $N \times k + 1$-matrix of fiscal and non-fiscal control variables, while β and Ψ pick up (vectors of) coefficients.

Spatial Weighting Matrix. The choice set to specify a spatial weighting matrix ranges from different forms of geographical contiguity to distance-based connectivity. In the contiguity case, the spatial weights are typically based on the common border criterion, which allocates equal weights to all geographical neighbors. In the distance case, the spatial weights can be based on geographic and/or socioeconomic distance (Fingleton and Le Gallo, 2008; Dubois and Paty, 2010) and decrease exponentially in size at an exogenously defined rate of distance decay. We base the choice of spatial weights on our theoretical model and refer to the concepts of contiguity and geographic distance rather than socioeconomic distance: first, geographic neighbors are most likely to experience similar shocks and therefore provide the most useful information on the size of innovation for neighboring jurisdictions' voters (Besley and Case, 1995). Second, resident voters can most probably compare their own jurisdiction with others belonging to the same local media market.[22] Our baseline matrix is a row-standardized, binary nearest-neighbor matrix that links all municipalities to their 10 closest neighbors. We check whether our results are sensitive to replacing this baseline matrix with a row-standardized inverse-physical-distance matrix with a 50 kilometer-cutoff band as well as with less sparse nearest-neighbor matrices with 20 and 30 neighbors, respectively.[23]

Unobserved Heterogeneity. A concern about estimating the spatial autoregressive model of Equation (7) with cross-sectional data is unobserved local heterogeneity. Accounting extensively for observables cannot rule out that fixed effects in local tax multipliers that are correlated with local homeownership remain uncontrolled. Unfortunately, we lack historical data on all relevant variables at this fine-grained spatial level that would allow us to set up a panel data set. We instead resort to including spatial lags in the covariates along with the ordinary spatial lag in the property tax multiplier. The resulting spatial Durbin model (SDM)[24] is able to capture unobserved heterogeneity when the unobserved factors are spatially correlated (LeSage and Pace, 2010; Elhorst, 2010).[25]

Endogeneity. Our identification strategy faces a potential endogeneity issue for the homeownership rate: if unobserved shocks to local property tax multipliers provide homeowners with an incentive to migrate to lower-tax locations, this decreases an area's homeownership and increases its tax rate in the long run. Such reverse causality would generate correlation between homeownership rates and the disturbances. Drukker, Egger,

[22]The use of socioeconomic indicators for the definition of weights would furthermore require to ensure their strict exogeneity, unless their endogeneity is explicitly considered in the model specification.

[23]Revelli (2005) argues that if unobserved shocks hit adjacent jurisdictions similarly, there may still remain spatial autocorrelation in the disturbance process of a spatial lag model of tax rate choice. To rule out this possibility, we test the regressions residuals of all spatial models for remaining spatial dependence using Moran's I. We additionally estimate a so-called mixed-regressive spatial model, which contains both a spatial lag in the dependent variable and a spatially autocorrelated error term. The mixed-regressive spatial model can be written as: $\tau = \lambda W\tau + \beta HOR + X\Psi + \epsilon$ with $\epsilon = \rho W\xi$, $\xi \sim \left(\mathbf{0}, \sigma_i^2\mathbf{I_N}\right)$. The results for this model, as well as further alternative specifications of the spatial lag model, are reported in Table IntA.1 in the Internet Appendix.

[24]The spatial Durbin model can be written as: $\tau = \lambda W\tau + \beta HOR + \gamma WHOR + X\Psi + WX\Omega + \epsilon$ with $\epsilon \sim \left(\mathbf{0}, \sigma_m^2\mathbf{I_N}\right)$.

[25]Only in the very special case that the dependent variable does not exhibit spatial dependence *and* there are no spatially dependent omitted variables correlated with the included covariates, OLS and SDMs will yield very similar parameter estimates.

and Prucha (2013) recently propose a generalized method-of-moments and instrumental variable estimation strategy for spatial autoregressive models with additional endogenous regressors, extending earlier work by Kelejian and Prucha (1998, 1999).[26] We use their estimation strategy and consider variables as instruments that are strongly correlated with 2011 local homeownership rates but expectedly independent of unobserved shocks to local tax multipliers. Based on extensive data search and processing, we resort to two previously untapped historical measures: the share of local housing destroyed or severely damaged by allied warfare during the Second World War and historical local proportions of owner-occupied dwellings directly after the war.[27] We obtain data on both variables at the level of historical districts from a complete housing inventory compiled in the 1950 West German Housing Census.[28] We construct municipality-level data for both variables matching the contemporaneous boundaries of all Western German municipalities to the boundaries of historical districts using historical maps and GIS.

Both war-related housing damages and directly after-war homeownership rates are expected to be valid instruments, influencing contemporaneous local property tax multipliers only through the channel of having long-lasting effects on our causal variable of interest, contemporaneous homeownership. Allied warfare can be viewed as a natural experiment that changed German local homeownership rates markedly within the first two decades after the war (Wolf and Caruana-Galicia, 2015). As described in detail by Voigtländer (2009), war-induced damages to local housing stocks led to large-scale, publicly subsidized provision of rental housing in affected areas, especially from the year of 1950 onwards.[29] Importantly, this public funding came entirely from the superordinate

[26] Kelejian and Prucha (1998, 1999) propose using the linearly independent columns of X, WX and W^qX as instruments to solve the endogeneity problem between Y and WY.

[27] We experimented with local voter participation in the 2009 Bundestag elections as an additional instrument. Voter parcicipation is strongly (positively) correlated with homeownership, but probably not exogeneous to local property tax rates in equilibrium due to sorting effects.

[28] The boundaries of 1950 districts usually comprise dozens of contemporaneous municipalities.

[29] On Western German territory, about 2.25 million dwellings were destroyed, reducing the housing stock by nearly 20 percent in comparison to prewar levels. A further 2-2.5 million dwellings were damaged. Estimates suggest that in 1950, there was still a shortage of more than 4.5 million homes. This shortage was heavily reduced to an estimated shortfall of 660,000 dwellings in 1962, see Voigtländer (2009).

state level. Municipal governments did not have to increase property taxation in order to finance rental housing provision.

Panel A of Figure 4 shows the distribution of war-related housing damage rates in 1950 at the level of historical districts. War damages mainly followed a west-east pattern which mimicked the direction of entry of Allied forces into Germany. High damage rates focused on towns and cities but extended to both urban and rural regions. Panel B illustrates historical homeownership rates at the district level. The first-stage regression reveals that municipal homeownership rates today are still significantly lower in municipalities positioned in historical districts which suffered more war-related housing damages and had lower 1950 homeownership rates.[30]

[INSERT FIGURE 4 HERE]

5 Empirical Results

5.1 Estimation of Tax Multiplier Choice Model

Table 2 presents regression results from estimating different versions of Equation (7). To allow assessing the influence of accounting for spatial dependence and endogeneity on the results, the first column shows results for a non-spatial, non-instrumental variable version estimated by OLS. The subsequent columns show results for two alternative specifications of the spatial autoregressive model: the first specification is based on the baseline 10-nearest-neighbor contiguity matrix, while the second one is based on inverse physical distances between municipality centroids with a cutoff band of 50 kilometers.[31] The fourth and fifth columns show estimation results for two extended spatial versions of the model: first, a spatial Durbin model that includes spatially lagged covariates along with the spatially lagged tax multiplier, and second, a spatial autoregressive model which treats local

[30]Regression results for the first stage are reported in Table IntA.2 in the Internet Appendix.
[31]For results based on 20- and 30-nearest-neighbors, see Table IntA.1 in the Internet Appendix.

homeownership as endogenous, using war-related housing damages and homeownership rates at the historical district level as instruments. Both extended versions are estimated using the baseline 10-nearest-neighbor matrix.

[INSERT TABLE 2 HERE]

All models are generally successful in explaining the variation in municipal property tax multipliers. In line with our main hypothesis, the local homeownership rate carries the expected negative sign and is throughout significant at the five percent level or better.[32] The estimated coefficients for local homeownership turn out to be highly robust across the different specifications in terms of statistical and economic significance, as do the coefficients for fiscal and non-fiscal controls.

As indicated by the significant spatial parameters and large values of Moran's I for the OLS disturbances, OLS clearly fails to account for the spatial interaction processes governing property tax choice. Depending on the exact specification, the spatial lag parameter lies between 0.62 and 0.85 and is always strongly significant. These results do not hinge upon the concrete definition of the spatial weighting matrix: replacing nearest neighbors by inverse distance reduces the goodness of fit while only slightly changing the estimated coefficients for homeownership and the covariates.[33] Including spatially lagged covariates in the model remarkably improves fit but leaves most coefficients and also the spatial dependence parameter almost unchanged vis-à-vis the spatial lag model.

Almost all covariates capturing local fiscal conditions tend to be highly significant and carry plausible signs. Higher spending and debt levels per capita, reflecting higher financing needs, are associated with higher property tax multipliers. Higher local business tax revenues and vertical tax transfers per capita relax local governments' budget

[32] We experimentally ran the same regressions with the percentage multiplier change between 2001-2011 as dependent variable instead of the level of multipliers. The local homeownership rate pertains its significantly negative effect on multipliers in this setting.

[33] Increasing the number of neighbors from 10 to 20 or 30 also yields larger dependence parameters with otherwise very similar results.

constraints and go along with lower local property tax multipliers, ceteris paribus. The size of the property tax base is found to be insignificant in the majority of specifications.

Concerning the role of socioeconomic structure and political tastes in municipal property tax rate choice, the evidence is again in line with expectations, albeit some coefficients lack statistical significance. We find higher tax multipliers in larger and more densely populated municipalities (with decreasing margins in population), 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 do not find any separate effect for localities with populations of 100,000 or more.[34]

The coefficients estimated on our main variable of interest are always statistically significant and negative, ranging between -0.199 in the OLS specification to -0.284 for the first-round (or direct) effect in the spatial IV specification. While caution is warranted for comparisons of coefficients estimated in linear non-spatial versus simultaneous spatial models, the evidence clearly shows that higher shares of homeowners in local populations are indeed associated with systematically lower property tax levels. This key result remains unchanged when an instrumental variable estimation is carried out based on teasing out exogenous variation in the contemporaneous homeownership rate based on variation in war-related housing damages and long-lagged homeownership rates at the superordinate historical district level. This indicates that the correlation that we observe in the data indeed lends itself to a causal interpretation.

Concerning economic significance, we first refer to the direct effect of a change in the homeownership rate on the tax multiplier in a certain municipality. Shutting down any indirect effects of tax changes emanating from multi-channel feedback playing out through the system of spatially interdependent jurisdictions, a ten percentage point rise

[34] All specifications include the (unreported) full set of state dummies, which are highly significant in every specification, indicating considerable differences in average property tax levels across states that remain unexplained by the given covariates. This finding can be explained by the multi-tiered structure of German public finances, which renders fiscal conditions very heterogeneous on state-level and makes unconditional tax multiplier levels highly dependent on states.

in the local homeownership would on average reduce the local property tax multiplier by 2-3 percentage points. For a typical single-family house worth 80,000 euros of assessed value, this direct effect would be equivalent to a roughly one percent decrease in the annual tax burden, evaluated at the sample mean multiplier of 340 points. While this is a small economic effect at the level of the individual house, it is important to remember that municipalities typically consist of several hundreds or even thousands of homes.

Due to the strong spatial dependence in municipal property tax multipliers, the estimated direct effect of a change in homeownership in some municipality does not capture the total effect of this change on property tax multipliers. As adjacent jurisdictions react to the resulting change in their neighboring municipality's multiplier with altering their own multiplier, so will do their neighbors, and so on. The steady-state equilibrium size of these indirect effects depends on the size of the spatial dependence parameter and the shape of the spatial weighting matrix.[35] Following the "total effect to an observation" viewpoint pioneered by LeSage and Page (2009), we calculate the average total impact on the tax multiplier of a locality m from a global ten percentage point rise in local homeownership shares across the entire sample.[36] In the spatial autoregressive model with 10 nearest neighbors, the average total effect is -5.6, more than twice as much as the average direct effect of -2.1. Using the estimates from the 10-nearest-neighbors spatial Durbin model, the total effect even amounts to -7.1.[37] The resulting reduction in local multipliers of 6-7 points would correspond to an annual loss of 120-140 million euros, or one percent of total property tax revenue across all municipalities in the sample.

[35] See LeSage and Page (2009) for a formal exposition of average direct, indirect and total effects.

[36] The actual homeownership rate exceeded 90 percent in 111 communities in 2011 (1.4 percent of the sample). The resulting error can be considered negligible.

[37] Compared to the direct effect, this is a disproportional increase vis-à-vis the spatial autoregressive model that can be explained by the larger estimate for the spatial lag parameter.

5.2 Discriminating among Tax Incidence and Tax Salience as Possible Channels

A natural question is whether the key result of a homeowner effect in local property taxes is driven by differences in tax incidence or tax salience between homeowners and renters. The design of the German property tax certainly renders salience higher for homeowners than for renters. Regarding incidence, homeowners bear the full property tax burden irrespective of local market conditions. For rental housing, incidence depends on the relative local price elasticities of housing demand and supply. In “loose” markets where demand for rental housing is considerably price elastic, the main portion of property tax burdens in economic terms will remain with landlords. Renters are expected to bear the main portion in “tight”, strong housing demand markets. Since every household is expected to fully bear the tax, the partition of local housing into owner-occupied and rental should play less a role for property taxes in the latter case. If local price elasticities do not play a role, differences in salience are likely to be the main driver of our key result.

Discriminating among municipalities of high and low housing demand elasticities is a challenging task. As a proxy of the relative local bargaining power between landlords and tenants, we resort to the fraction of rental housing standing vacant in each municipality.[38] It is plausible to assume that tenants' bargaining power and price elasticity of demand increase with higher local rental vacancy. This conjecture is strongly supported by a regression of the cumulative local growth in apartment rents from 2004-2011 on the 2011 local rate of vacancy and state fixed effects: on average, each additional percentage point of vacancy in local rental housing was associated with 8 percentage points less cumulative rent growth at the level of districts.[39]

[38] For computation of the rental vacancy rate, we refer to the 2011 Census, taking into account only vacancies in non-single family residential buildings excluding hostels and nursing homes, as well as dwellings of diplomats and foreign armed forces. A housing unit is considered vacant if it was neither owner-occupied nor rented out, excluding units that were temporarily not inhabited due to modernization or renovation.

[39] Since data on rents is only available at the district level, we use data at this spatial scale instead of municipalities. See Figure A.1 in the Appendix for a scatterplot of local rent growth and vacancy rates.

In order to test the proposition of a deviating homeowner effect, we interact local homeownership rates with two mutually exclusive dummy variables, flagging municipalities in the highest quartile of the rental vacancy distribution ("loose areas", high vacancy=1 and 0 otherwise) and the lower three quartiles of the same distribution ("tight areas", low vacancy=1 and 0 otherwise). Since the distribution of rental vacancies is strongly right-skewed, we conservatively split the sample at the 75^{th} percentile rather than the median. This ensures we only have true excess-housing jurisdictions in the high-vacancy group.[40]

If differences in tax incidence drive our main result, we would expect homeownership rates to depress property tax multipliers less strongly in jurisdictions with low rental vacancies (low price elasticity of housing demand). However, Table 3 shows that the homeownership coefficients for the two subsamples of high- vs. low-vacancy municipalities are always very close to one another, regardless of the specification considered.[41] In fact, the null hypothesis that the two coefficients be equal can never be rejected at common significance levels. Our key result thus holds regardlessly of the actual incidence of property taxes, which supports the view that a higher salience of the property tax for homeowners is likely to be the decisive mechanism that is driving our key result.

[INSERT TABLE 3 HERE]

5.3 Differences in Intensity of Property Tax Mimicking between High- and Low-Homeownership Regions

If home-voters act as "watchdogs" over the efficiency of property taxation by local incumbents, not only are property tax rates influenced by the level of homeownership in each

[40]See Figure A.2 in the Appendix for the empirical frequency distribution of local rental vacancy rates. The 75^{th} percentile is 8 percent of vacancy, which already signals a considerably slack housing market. The median is 5.6 percent of vacancy, a still fairly moderate rate. Mean homeownership rates in the two groups of high and low rental vacancies are similar (66 vs. 72 percent).

[41]Full regression results for the local housing vacancy rate split are reported in Table IntA.3 in the Internet Appendix.

municipality, but the intensity of spatial interaction in local governments' tax rate choices is expected to be larger within regions featuring high homeownership rates in general.

In order to test this proposition empirically, we split our sample into two subsamples reflecting different levels of regional homeownership rates. We first cluster the whole sample of municipalities into the 72 official Western German planning regions, which are delineated based on commuting patterns and can be interpreted as regional labor markets (Lerbs and Oberst, 2014). We then compute the unweighted average homeownership rates of municipalities belonging to each region and finally group municipality-regions according to the average rate. Since the planning regions differ in size and comprise different numbers of municipalities, this procedure is not equivalent to just splitting the sample at the median homeownership rate. In contrast, our procedure ensures that jurisdictions within functional regions are grouped together instead of jurisdictions spread all over the country.

The sample of municipalities in high-homeownership regions consists of 4,171 jurisdictions, while in low-homeownership regions, we arrive at a number of 3,865. The mean local homeownership rate is 72.8 percent in the "high" sample versus 62.8 percent in the "low" sample.[42] We construct different spatial weighting matrices individually for the two subsamples using the same definitions of geographical adjacency as before and estimate the familiar spatial models. The results are shown in Table 4. Our results are perfectly in line with the theoretical prediction: for each specification, the estimated spatial dependence in property tax multipliers is considerably larger within the group of high-homeownership regions.[43] The absolute difference is largest for the spatial lag model estimated using the inverse distance matrix, where the estimated spatial lag parameter is 0.97 for the high-homeownership subsample and 0.65 for the low-homeownership subsample. We hence conclude that in addition to a significant effect of more homeownership

[42]With 62.8 percent, the mean local homeownership rate in the "low" sample is still considerably high. In this sense, the split can be considered very conservative. The underlying reason is that aggregate homeownership rates at the level of planning regions are relatively homogeneous.

[43]Full regression results for the split regressions for high- versus low-homeownership regions are reported in Tables IntA.4 and IntA.5 in the Internet Appendix.

within a particular municipality, higher homeownership rates in the region tend to be associated with stronger property tax mimicking by local governments in that region.

[INSERT TABLE 4 HERE]

6 Conclusion

In efficient property markets, contract arrangements governing the partition of property rights in local housing do not make any difference to how strongly housing is taxed. A growing body of evidence suggests, however, that homeowners oppose property taxation much more than renters. Homeowners have strong economic incentives to shield their housing wealth against taxation, as they bear the full burden of the property tax independent of local market conditions. They typically also face a stronger tax salience than renters. This makes a case for the political economy of property taxation.

Based on data for over 8,000 German local jurisdictions, this paper has presented representative and large-scale empirical evidence in favor of an economically meaningful home-voter effect in local property taxation: property is taxed less heavily in jurisdictions with higher proportions of owner-occupied housing. Based on estimates derived from spatial econometric models that account for spatial dependence in municipal tax multipliers and endogeneity in homeownership, we are able to compute the average total effect from a hypothetical change in homeownership rates on property tax revenue. We estimate that local tax multipliers would on average be 6-7 points lower if the homeownership rate was ten percentage points higher across all 8,036 municipalities in our sample. Such a reduction in local multipliers would correspond to an annual 120-140 million euros or one percent loss of total tax revenue. This effect withstands the inclusion of a battery of potentially confounding factors, the consideration of spatial dependence and the correction for bias arising from endogeneity of homeownership levels.

Interacting municipal homeownership rates with an indicator of rental housing demand elasticity — the local non-single family housing rate of vacancy — suggests that our key result even holds in "tight" housing markets, i.e. *even when* tenants are expected to bear very similar property tax burdens in economic terms as their fellow owner-occupying neighbors. We interpret this as evidence that the home-voter effect originates from differences in salience of the property tax between owner-occupiers and renters rather than from differences in tax incidence. This interpretation is in line with recent findings by Cabral and Hoxby (2016) and Brunner, Ross, and Simonsen (2015) using U.S. data. We finally show that spatial tax mimicking among jurisdictions is stronger within regions comprising high-homeownership-rate municipalities, suggesting that governments not only set lower local tax rates but also care more intensively about the tax choices of their neighbors when homeowning residents force them to do so.

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 homeowners successfully manage to oppose high property tax rates, property taxation will tend to be systematically too low in home-owner communities, whereas other local fees and taxes will tend to be too high. Such second-round effects, while not investigated in this paper, potentially affect the equity of local access to public and quasi-public goods. Examining the question 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 is a fruitful avenue of future research.

Appendix

Box 1: Further Institutional Details on Assessed Values Used in German Property Taxation

Instead of current market values, the German property tax is based on historical so-called **assessed values** (*"Einheitswerte"*). Assessed values for all taxable property were determined for the last time in **1964** in former **West Germany** and 1935 in former East Germany. The legislator's original intention was to reassess all taxable property every six years. This intention was coded in §21(1) of the German Valuation Law (*"Bewertungsgesetz"*), but the law was already suspended in 1965. Ever since, there has been no legal foundation for updating the historical assessed values to current market values. For property constructed after 1964 (West Germany) or 1935 (East Germany), respectively, assessed values are computed based on comparison values that reflect the historical prices of properties of the same type and similar size. Due to the very long time span since taxable properties had been valuated, the assessed values are **completely disconnected** from current market conditions. Over the last years, the German Federal Constitutional Court has accepted multiple sues doubting the legitimacy of the current form of property taxation. A reform of the German property tax, aiming at a new assessment of all taxable property in 2022, is currently in preparation.

Figure A.1: Scatterplot of Non-Single Family Housing Vacancy and Rent Growth

This figure is based on data from the Federal Institute for Research on Building, Urban Affairs and Spatial Development and the 2011 Census and shows the empirical association between cumulative growth in net apartment rents over 2004-2011 and the 2011 non-single family housing rate of vacancy in 325 Western German districts.

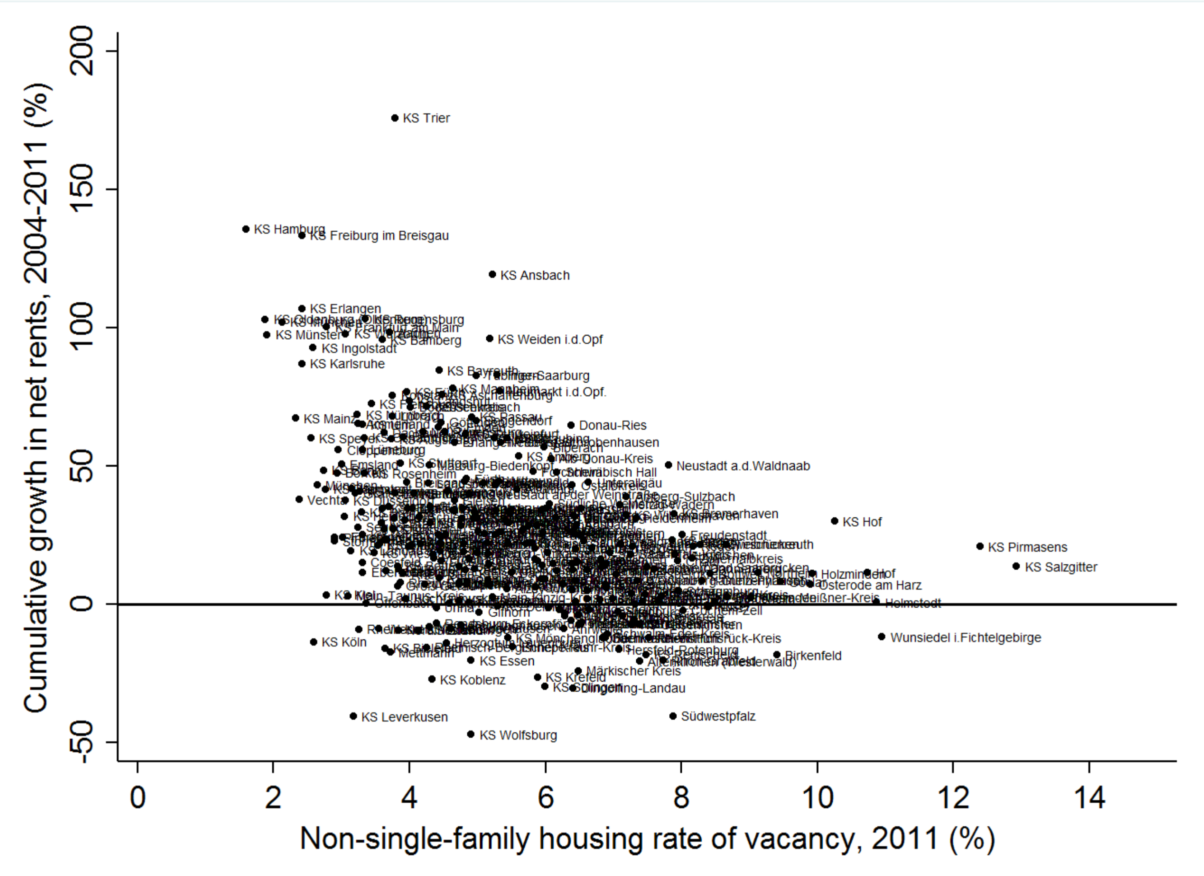
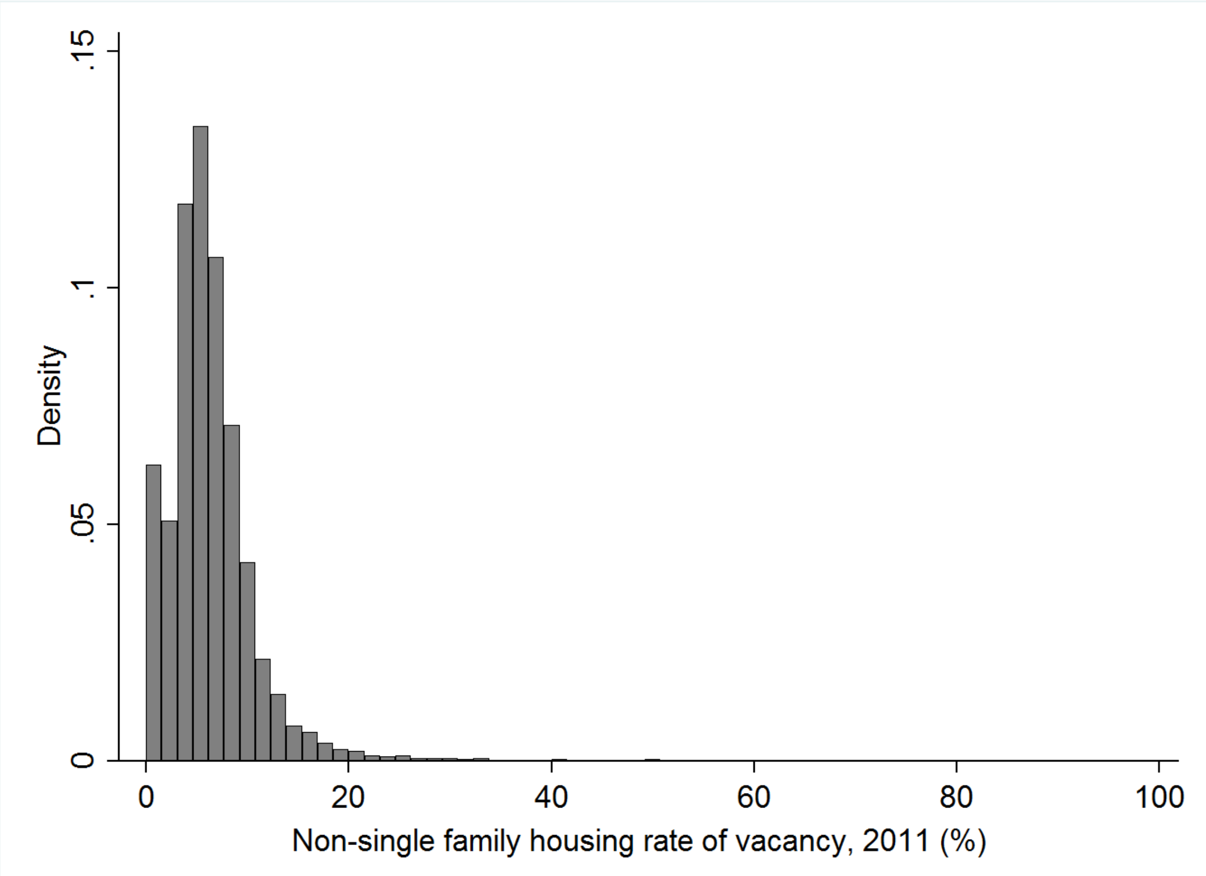


Figure A.2: Empirical Frequency Distribution of Non-Single Family Housing Vacancy

This figure is based on data from the 2011 Census and shows the empirical frequency distribution of the non-single family housing rate of vacancy in 8,036 Western German municipalities in 2011.



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Tables

Table 1: Descriptive Statistics

This table shows descriptive statistics for the variables included in the analysis. All values refer to the year 2011 except when indicated otherwise. The reference level is 8,036 German municipalities.

	Mean	S.D.	Min	Max	Moran's I
Property tax multiplier (pct.)	333.6	51.7	0	800	0.495
Homeownership rate (pct.)	67.8	11.0	20.3	100.0	0.416
Municipal spending p.c. (euros, 2010)	1,175	1,468	-86	120,839	0.042
Municipal debt p.c. (euros, 2010)	1,372	860	104	8,068	0.838
Revenue business tax p.c. (euros, 2010)	224	387	-691	13,549	0.103
Income tax/VAT transfers p.c. (euros, 2010)	355	106	17	5,155	0.553
Property tax base p.c. (euros 1,000s)	28.8	11.4	0	362.8	0.334
Total population (1,000s)	7.2	28.9	0.0	1,348	0.160
Population density (inh./km^2)	20.8	28.7	0.5	432.6	0.523
Taxable income p.c. (euros 1,000s, 2009)	15.1	3.8	4.1	100.6	0.467
Unemployed rate (pct.)	3.1	1.9	0	80.5	0.300
Persons aged 10 years or younger (pct.)	8.8	1.7	1.2	20.7	0.204
Persons aged 70 years or older (pct.)	14.8	3.2	5.2	36.8	0.310
Left-wing votes (pct., 2009)	38.6	10.3	10.0	75.9	0.686
State or country border (dummy)	0.15	-	0	1	-
Metro area (dummy)	0.01	-	0	1	-
State: Schleswig-Holstein (dummy)	0.13	-	0	1	-
State: Lower Saxony (dummy)	0.10	-	0	1	-
State: North Rhine-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)	0.14	-	0	1	-
State: Bavaria (dummy)	0.25	-	0	1	-
State: Saarland (dummy)	0.01	-	0	1	-
Variables used for IV/sample split					
Share of war-damaged housing 1950 (pct.)	12.1	15.8	0.1	87.9	0.858
Homeownership rate 1950 (pct.)	56.3	15.9	8.3	83.5	0.717
Non-SFH vacancy rate (pct.)	6.3	4.8	0.0	100.0	0.112

Table 2: OLS and Spatial Regression Results

This table shows regression results for five different specifications of the tax rate choice model. The dependent variable is the 2011 municipal property tax multiplier in percent. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses. SL indicates the spatial lag model, SD the spatial Durbin model, SL IV the spatial lag instrumental variable model. N.N. denotes the number of nearest neighbors used in the definition of spatial weighting matrices. Inv. D. denotes the inverse distance spatial weighting matrix.

	OLS	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL IV (10 N.N.)
Constant	317.296***	130.555***	59.813***	116.938***	82.114***
	(8.863)	(9.492)	12.030	(15.648)	(18.822)
Pct. owner-occupied	-0.199***	-0.214***	-0.203***	-0.253***	-0.284**
	(0.068)	(0.061)	(0.063)	(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)	(0.000)	(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***	-0.055***	-0.049***	-0.057***
	(0.010)	(0.010)	(0.010)	(0.002)	(0.010)
Tax base p.c. (1,000s)	-0.129*	-0.025	-0.046	0.021	-0.071
	(0.068)	(0.056)	(0.056)	(0.059)	(0.064)
Population (1,000s)	0.545***	0.468***	0.464***	0.470***	0.454***
	(0.089)	(0.092)	(0.095)	(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 density	0.089***	0.076***	0.075***	0.198***	0.067**
	(0.027)	(0.026)	(0.026)	(0.030)	(0.029)
Income p.c. (1,000s)	-0.332	-0.261	-0.214	-0.227	-0.224
	(0.238)	(0.236)	(0.235)	(0.251)	(0.235)
Pct. unemployed	0.255	0.513**	0.461**	0.559**	0.378
	(0.238)	(0.238)	(0.231)	(0.264)	(0.253)
Pct. $<$ 10 years	-0.013	0.216	0.197	0.153	0.172
	(0.299)	(0.256)	(0.272)	(0.254)	(0.274)
Pct. $>$ 70 years	0.552***	0.421***	0.417***	0.363**	0.421***
	(0.177)	(0.151)	(0.161)	(0.159)	(0.162)
Pct. left-wing votes	0.231***	0.165***	0.148***	0.281***	0.149***
	(0.055)	(0.047)	(0.050)	(0.065)	(0.050)
D nation/state border	1.693	2.593**	2.637**	5.747***	2.513**
	(1.285)	(1.165)	(1.230)	(1.565)	(1.233)
D pop $>$ 100,000	4.216	4.444	4.179	3.804	5.667
	(13.467)	(14.138)	(14.369)	(13.861)	(14.409)
State dummies	Yes	Yes	Yes	Yes	Yes
λ	-	0.615***	0.850***	0.668***	0.800***
	-	(0.017)	(0.027)	(0.017)	(0.034)
Spatially 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	0.301	0.398	
Moran's I residuals	0.317	0.014	0.045	-0.017	0.104

Table 3: OLS and Spatial Regression Results for HOR-Vacancy Interaction Term

This table shows estimated interaction term coefficients for five different specifications of the tax rate choice model including interaction terms between the local homeownership rate and a dummy variable signaling high and low rental housing vacancy areas. The dependent variable is the municipal property tax multiplier in percent. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses. SL indicates the spatial lag model, SD the spatial Durbin model, SL IV the spatial lag instrumental variable model. N.N. denotes the number of nearest neighbors used in the definition of spatial weighting matrices. Inv. D. denotes the inverse distance spatial weighting matrix.

	OLS	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL IV (10 N.N.)
Pct. owner-occupied * D(high vacancy)	-0.195**	-0.210***	-0.197***	-0.248***	-0.284**
	(0.068)	(0.061)	(0.063)	(0.067)	(0.144)
Pct. owner-occupied * D(low vacancy)	-0.208**	-0.224***	-0.215***	-0.259***	-0.286*
	(0.070)	(0.063)	(0.065)	(0.069)	(0.153)
p-value of test on equal coefficients	0.368	0.281	0.184	0.389	0.969

Table 4: Spatial Dependence Parameters for Local Tax Multipliers within High- vs. Low-Homeownership Regions

This table shows estimated spatial dependence parameters (λ) for four different specifications of the spatial tax rate choice model using a sample split clustering together municipalities within regions of high vs. low average homeownership rates. The dependent variable is the municipal property tax multiplier in percent. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses. SL indicates the spatial lag model, SD the spatial Durbin model, SL IV the spatial lag instrumental variable model. N.N. denotes the number of nearest neighbors used in the definition of spatial weighting matrices. Inv. D. denotes the inverse distance spatial weighting matrix.

	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL IV (10 N.N.)
Municipalities in high-homeownership regions (N=4,171)	0.718***	0.966***	0.737***	0.902***
	(0.022)	(0.015)	(0.021)	(0.033)
Municipalities in low-homeownership regions (N=3,865)	0.485***	0.648***	0.572***	0.611***
	(0.023)	(0.036)	(0.024)	(0.041)

Figures

Figure 1: Property Tax Multipliers across German Municipalities

This figure is based on data from the German Federal Statistical Office and shows the geographical distribution of property tax multipliers in percent across Western German municipalities in 2011.

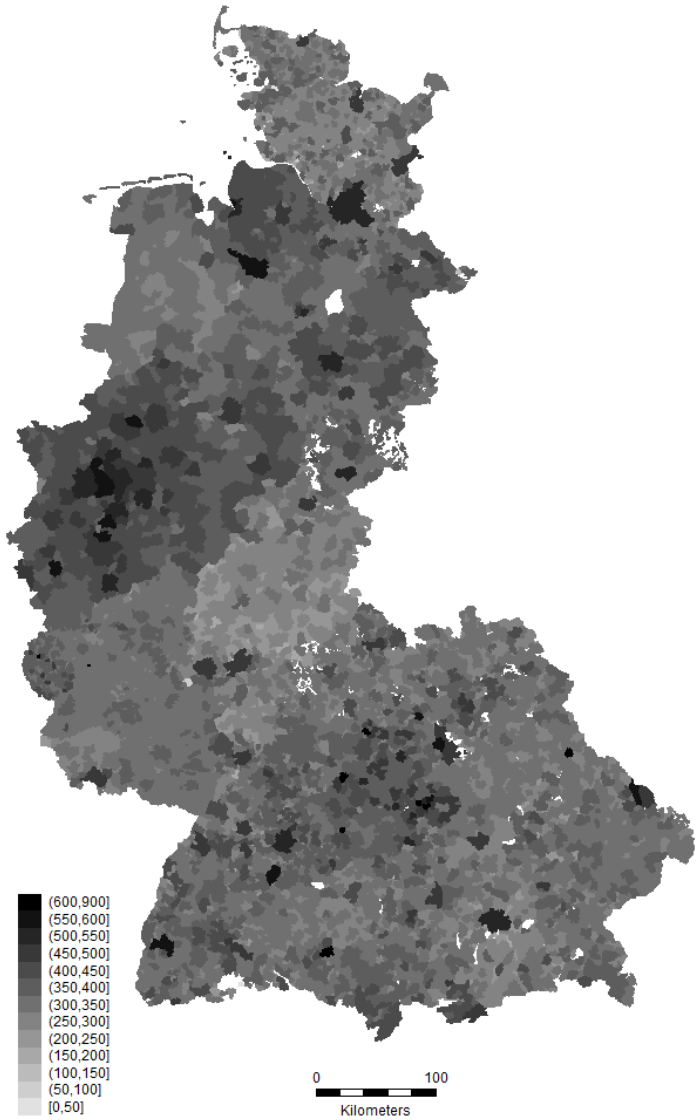


Figure 2: Homeownership Rates across German Municipalities

This figure is based on data from the 2011 Census and shows the geographical distribution of the proportion of owner-occupied housing units in percent across Western German municipalities in 2011.

Figure 3: Density Distributions of Tax Multipliers

The figure is based on data from the Federal Statistical Office and shows Kernel estimates of the empirical density distribution of tax multipliers grouped by local proportions of owner-occupied housing. Property tax multiplier distributions are grouped by municipalities with above-median and below-median homeownership rate, indicated by solid and dashed lines, respectively.

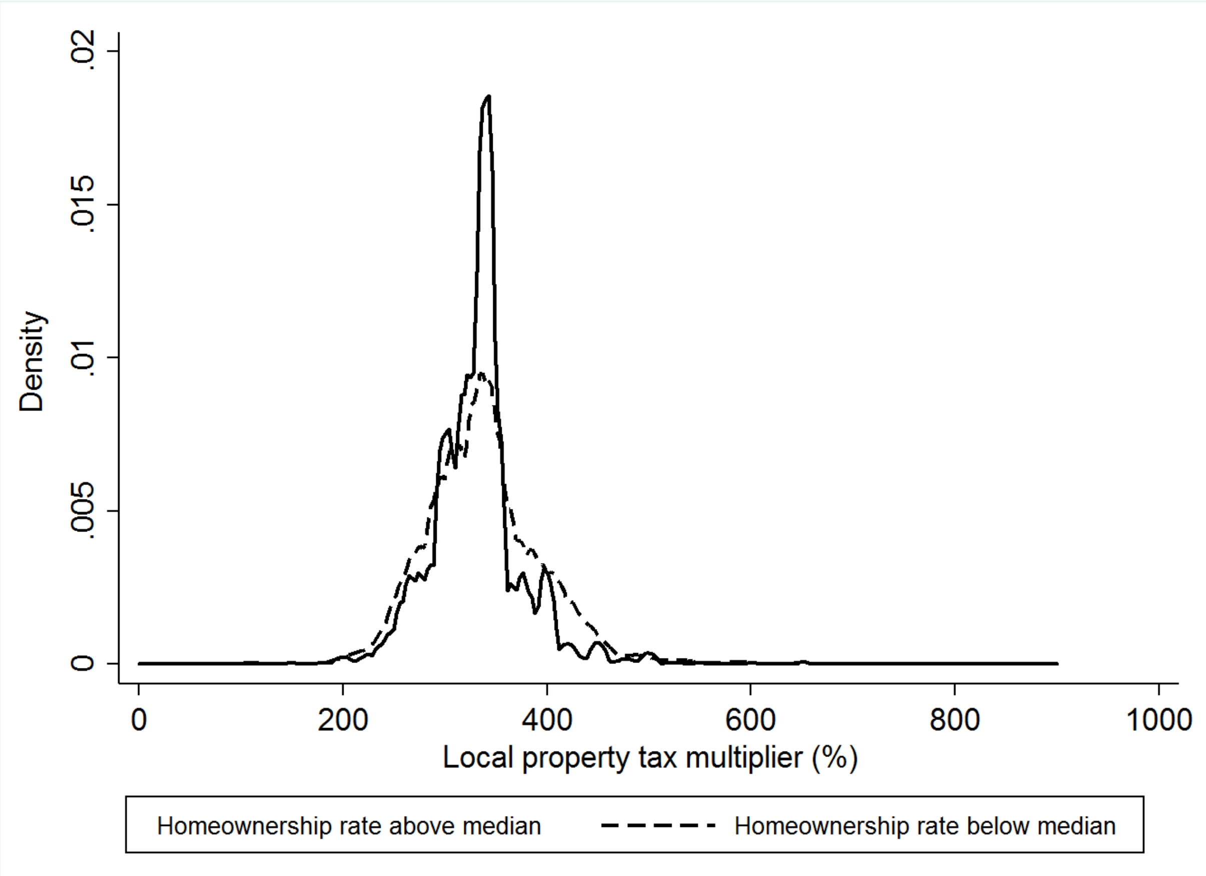
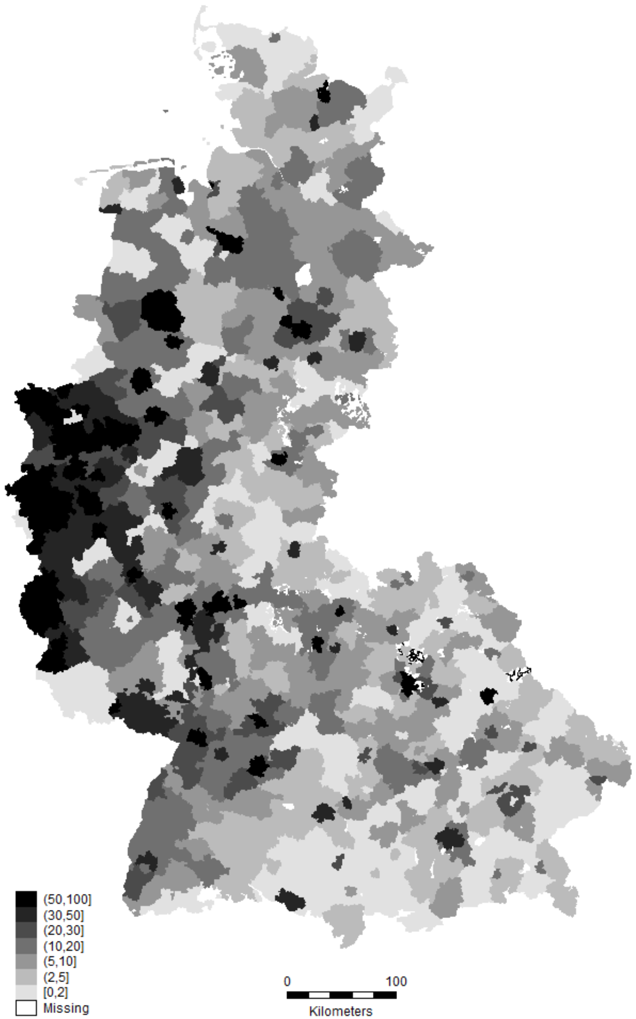


Figure 4: Housing Damages and Homeownership Rates across German Historical Districts

This figure is based on data from the 1950 German Census. Panel A shows the geographical distribution of housing damage rates in percent for historical Western German districts in 1950. Panel B shows the geographical distribution of homeownership rates in percent for historical Western German districts in 1950.

Panel A: WWII-induced Housing Damages



Panel B: Homeownership Rates

Internet Appendix for

Do Local Governments Tax Homeowner Communities Differently?

Roland Füss* Oliver Lerbs†

This version: September 2017

Abstract

This paper investigates whether and how strongly the share of homeowners in a community affects residential property taxation by local governments. Different from renters, homeowners bear the full property tax burden irrespective of local market conditions, and the tax is more salient to them. "Homeowner communities" may hence oppose high property taxes in order to protect their housing wealth. Using granular spatial data from a complete housing inventory in the 2011 German Census and historical war damages as a source of exogenous variation in local homeownership, we provide empirical evidence that otherwise identical jurisdictions charge significantly lower property taxes when the share of homeowners in their population is higher. This result is invariant to local market conditions, which suggests tax salience as the key mechanism behind this effect. We find positive spatial dependence in tax multipliers, indicative of property tax mimicking by local governments.

JEL classification: D72, H20, H31, H71, R31.
Keywords: Homeownership, public financing, residential property tax, spatial tax mimicking, yardstick competition.

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Table IntA.1: Results of Further Alternative Spatial Specifications

This table shows regression results for additional spatial specifications of Equation (7). The dependent variable is the 2011 municipal property tax multiplier in percent. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses. SE indicates the spatial error model, SL the spatial lag model, SAC the mixed-regressive spatial model. N.N. denotes the number of nearest neighbors used in the definition of spatial weighting matrices. Inv. D. denotes the inverse distance spatial weighting matrix.

	SL Model (20 N.N.)	SL Model (30 N.N.)	SAC Model (10 N.N.)
Constant	105.997***	130.555***	436.859***
	(9.937)	(7.772)	(15.854)
Pct. owner-occupied	-0.201***	-0.214***	-0.230***
	(0.062)	(0.050)	(0.053)
Spending p.c.	0.001**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Debt p.c.	0.001	0.001	0.004***
	(0.001)	(0.001)	(0.001)
Business tax p.c.	-0.013***	-0.013***	-0.014***
	(0.002)	(0.001)	(0.001)
Income/VAT p.c.	-0.052***	-0.054***	-0.053***
	(0.010)	(0.008)	(0.009)
Tax base p.c. (1,000s)	-0.027	-0.025	0.029
	(0.055)	(0.044)	(0.044)
Population (1,000s)	0.475***	0.468***	0.445***
	(0.096)	(0.046)	(0.043)
Population^2	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Population density	0.072***	0.076***	0.179***
	(0.026)	(0.020)	(0.023)
Income p.c. (1,000s)	-0.215	-0.261*	-0.277*
	(0.234)	(0.154)	(0 .149)
Pct. unemployed	0.535***	0.513**	0.643***
	(0.247)	(0.250)	(0.242)
Pct. $<$ 10 years	0.230	0.261	0.190
	(0.247)	(0.266)	(0.251)
Pct. $>$ 70 years	0.419***	0.421***	0.388***
	(0.062)	(0.151)	(0.151)
Pct. left-wing votes	0.166***	0.165***	0.269***
	(0.048)	(0.050)	(0.064)
D nation/state border	2.353**	2.593***	4.990***
	(1.148)	(1.126)	(1.430)
D pop $>$ 100,000	4.753	4.444	3.101
	(14.330)	(8.402)	(7.787)
State dummies	Yes	Yes	Yes
λ	0.691***	0.615***	0.839***
	(0.019)	(0.013)	(0.013)
ρ	-	-	-0.458***
	-	-	(0.044)
Spatially lagged cov.	-	-	-
Wald test: lag. cov.=0	-	-	-
# obs.	8,036	8,036	8,036
Squared corr. coeff.	0.349	0.359	0.371
Moran's I residuals	0.061	0.028	0.535

Table IntA.2: First-stage Regression Results for Spatial Lag IV Model

This table shows results for the first stage of the spatial lag instrumental variable regression. The dependent variable is the 2011 municipal share of homeownership in percent. Excluded instruments from the second-stage equation are the historical district percentage of housing damaged by warfare and historical district-level percentage of housing owner-occupied in 1950. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses.

Constant	48.76***
	(2.273)
District pct. housing damaged in 1950	-0.031***
	(0.008)
District pct. housing owner-occupied 1950	0.028***
	(0.006)
Spending p.c.	-0.000
	(0.000)
Debt p.c.	0.000
	(0.000)
Business tax p.c.	-0.001***
	(0.000)
Income/VAT p.c.	-0.001
	(0.003)
Tax base p.c. (1,000s)	-0.207***
	(0.032)
Population (1,000s)	-0.173***
	(0.025)
Population^2	0.000***
	(0.000)
Population density	-0.077***
	(0.007)
Income p.c. (1,000s)	0.075
	(0.060)
Pct. unemployed	-0.946***
	(0.312)
Pct. $<$ 10 years	-0.117
	(0.076)
Pct. $>$ 70 years	-0.076*
	(0.046)
Pct. left-wing votes	-0.023
	(0.015)
D nation/state border	-0.608**
	(0.242)
D pop $>$ 100,000	18.426***
	(2.273)
State dummies	Yes
λ	0.468***
	(0.016)
# obs.	8,036
Squared corr. coeff.	0.378

Table IntA.3: Full Regression Results for Local Housing Vacancy Rate Split

This table shows regression results for five alternative specifications of Equation (7), where the homeownership share is replaced by interaction terms between homeownership share and a dummy variable indicating rental housing vacancy above and below the highest quartile of the sample vacancy rate distribution. The dependent variable is the 2011 municipal property tax multiplier in percent times 100. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses. N.N. denotes the number of nearest neighbors used in the definition of spatial weighting matrices. Inv. D. denotes the inverse distance spatial weighting matrix.

	OLS	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL IV (10 N.N.)
Constant	317.886***	131.150***	60.533***	116.466***	82.284***
	(8.960)	(9.547)	(12.076)	(15.744)	(18.927)
Pct. owner-occupied * D(high vacancy)	-0.195***	-0.210***	-0.197***	-0.248***	-0.284**
	(0.068)	(0.061)	(0.063)	(0.067)	(0.144)
Pct. owner-occupied * D(low vacancy)	-0.208***	-0.224***	-0.215***	-0.259***	-0.286*
	(0.070)	(0.063)	(0.065)	(0.069)	(0.153)
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***	0.000	0.001**	0.003**	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Business tax p.c.	-0.012***	-0.019***	-0.013***	-0.014***	-0.013***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Income/VAT p.c.	-0.082***	-0.053***	-0.055***	-0.048***	-0.057***
	(0.010)	(0.010)	(0.010)	(0.012)	(0.010)
Tax base p.c. (1,000s)	-0.129*	-0.060	-0.047	0.0210	-0.071
	(0.068)	(0.056)	(0.056)	(0.060)	(0.064)
Population (1,000s)	0.546***	0.469***	0.464***	0.470***	0.454***
	(0.089)	(0.093)	(0.095)	(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 density	0.090***	0.077***	0.076***	0.198***	0.067**
	(0.027)	(0.026)	(0.026)	(0.030)	(0.029)
Income p.c. (1,000s)	-0.333	-0.259	-0.211	-0.227	-0.223
	(0.238)	(0.236)	(0.235)	(0.251)	(0.236)
Pct. unemployed	0.239	0.497**	0.441*	0.554**	0.374
	(0.238)	(0.235)	(0.227)	(0.265)	(0.262)
Pct. < 10 years	-0.005	0.224	0.208	0.155	0.173
	(0.298)	(0.255)	(0.272)	(0.258)	(0.277)
Pct. > 70 years	0.534***	0.407***	0.399**	0.362**	0.419**
	(0.177)	(0.151)	(0.161)	(0.159)	(0.175)
Pct. left-wing votes	0.231***	0.164***	0.147***	0.280***	0.149***
	(0.055)	(0.047)	(0.050)	(0.065)	(0.051)
D nation/state border	1.692	2.592	2.636**	5.729***	2.512**
	(1.285)	(1.165)	(1.230)	(1.564)	(1.234)
D pop > 100,000	3.989	4.204	3.865	3.751	5.648
	(13.471)	(14.144)	(14.375)	(13.867)	(14.435)
State dummies	Yes	Yes	Yes	Yes	Yes
λ	-	0.615***	0.850***	0.668***	0.800***
	-	(0.017)	(0.268)	(0.017)	(0.034)
Spatially lagged cov.	-	-	-	Yes	-
Wald test: lag. cov.=0	-	-	-	420.51***	-
# obs.	8,036	8,036	8,036	8,036	8,036
R^2	0.385	-	-	-	-
Squared corr. coeff.	-	0.359	0.302	0.398	-

Table IntA.4: Full Regression Results for Municipalities within High-Homeownership Regions

This table shows regression results for four alternative specifications of Equation (7), where only municipalities are considered that are located within regions of high average homeownership rates. The dependent variable is the 2011 municipal property tax multiplier in percent times 100. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses. N.N. denotes the number of nearest neighbors used in the definition of spatial weighting matrices. Inv. D. denotes the inverse distance spatial weighting matrix.

	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL IV (10 N.N.)
Constant	101.891***	30.564**	127.445***	-0.032
	(12.917)	(12.151)	(20.873)	(31.500)
Pct. owner-occupied	-0.169**	-0.144*	-0.148*	0.081
	(0.079)	(0.082)	(0.084)	(0.236)
Spending p.c.	0.000	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Debt p.c.	-0.001	0.000	-0.001	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)
Business tax p.c.	-0.016***	-0.016***	-0.017***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
Income/VAT p.c.	-0.026	-0.030	-0.024	-0.021
	(0.019)	(0.019)	(0.021)	(0.020)
Tax base p.c. (1,000s)	-0.021	-0.067	0.034	0.055
	(0.071)	(0.073)	(0.072)	(0.074)
Population (1,000s)	0.664***	0.618***	0.790***	0.843***
	(0.178)	(0.183)	(0.182)	(0.225)
Population^2	-0.001	-0.001	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Population density	0.046	0.069	0.118*	0.098
	(0.051)	(0.046)	(0.061)	(0.063)
Income p.c. (1,000s)	-0.538	-0.614	-0.662	-0.566
	(0.565)	(0.550)	(0.586)	(0.563)
Pct. unemployed	0.177	0.296	0.152	0.544
	(0.211)	(0.239)	(0.196)	(0.353)
Pct. $<$ 10 years	0.085	-0.030	0.002	-0.036
	(0.290)	(0.309)	(0.298)	(0.296)
Pct. $>$ 70 years	0.188	0.170	0.026	0.118
	(0.163)	(0.177)	(0.173)	(0.170)
Pct. left-wing votes	0.066	0.026	0.086	0.014
	(0.050)	(0.054)	(0.068)	(0.051)
D nation/state border	0.343	1.057	0.687	0.242
	(1.520)	(1.619)	(2.118)	(1.581)
D pop $>$ 100,000	13.885	13.114	14.771	12.314
	(32.675)	(32.308)	(33.321)	(33.293)
State dummies	Yes	Yes	Yes	Yes
λ	0.718***	0.966***	0.737***	0.902***
	(0.022)	(0.015)	(0.021)	(0.033)
Spatially lagged cov.	-	-	Yes	-
Wald test: lag. cov.=0	-	-	238.87***	-
# obs.	4,171	4,171	4,171	4,171
Squared corr. coeff.	0.146	0.022	0.188	-

Table IntA.5: Full Regression Results for Municipalities within Low-Homeownership Regions

This table shows regression results for four alternative specifications of Equation (7), where only municipalities are considered that are located within regions of low average homeownership rates. The dependent variable is the 2011 municipal property tax multiplier in percent times 100. ***, ** and * denote statistical significance at the 1, 5, and 10% levels. HAC-robust standard errors are reported in parentheses. N.N. denotes the number of nearest neighbors used in the definition of spatial weighting matrices. Inv. D. denotes the inverse distance spatial weighting matrix.

	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL IV (10 N.N.)
Constant	153.331***	103.493***	140.696***	98.312***
	(14.575)	(17.346)	(28.461)	(23.013)
Pct. owner-occupied	-0.291***	-0.283***	-0.385***	-0.092
	(0.101)	(0.102)	(0.110)	(0.187)
Spending p.c.	0.003***	0.003**	0.002**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Debt p.c.	0.005***	0.006***	0.005**	0.006***
	(0.001)	(0.001)	(0.003)	(0.001)
Business tax p.c.	-0.012***	-0.012***	-0.013***	-0.012***
	(0.002)	(0.002)	(0.003)	(0.002)
Income/VAT p.c.	-0.066***	-0.064***	-0.065***	-0.064***
	(0.012)	(0.012)	(0.018)	(0.013)
Tax base p.c. (1,000s)	-0.015	-0.029	0.004	0.017
	(0.099)	(0.098)	(0.112)	(0.102)
Population (1,000s)	0.431***	0.449***	0.413***	0.479***
	(0.101)	(0.103)	(0.096)	(0.107)
Population^2	-0.000**	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Population density	0.065**	0.068**	0.174***	0.084**
	(0.030)	(0.030)	(0.034)	(0.003)
Income p.c. (1,000s)	-0.216	-0.221	-0.103	-0.231
	(0.190)	(0.193)	(0.191)	(0.195)
Pct. unemployed	1.301***	1.057**	1.174**	1.310**
	(0.483)	(0.455)	(0.502)	(0.533)
Pct. $<$ 10 years	0.725	0.782	0.525	0.812
	(0.484)	(0.505)	(0.493)	(0.505)
Pct. $>$ 70 years	0.813***	0.881***	0.873***	0.892***
	(0.305)	(0.315)	(0.332)	(0.316)
Pct. left-wing votes	0.301***	0.273***	0.535***	0.285***
	(0.103)	(0.105)	(0.141)	(0.105)
D nation/state border	2.207	1.524	7.979***	1.575
	(1.664)	(1.718)	(2.157)	(1.724)
D pop $>$ 100,000	3.119	0.961	5.374	-1.546
	(16.451)	(16.572)	(16.278)	(16.847)
State dummies	Yes	Yes	Yes	Yes
λ	0.485***	0.648***	0.572***	0.611***
	(0.023)	(0.036)	(0.024)	(0.041)
Spatially lagged cov.	-	-	Yes	-
Wald test: lag. cov.=0	-	-	249.33***	-
# obs.	3,865	3,865	3,865	3,865
Squared corr. coeff.	0.509	0.626	0.531	-