

Do local governments tax homeowner communities differently?

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Abstract

This article 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. By merging granular spatial data from a complete housing inventory in the 2011 German Census with historical homeownership rates and housing damages during the Second World War as sources 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 is the key mechanism behind this effect. Moreover, we find positive spatial dependence on tax multipliers, indicative of property tax mimicking by local governments.

KEYWORDS

homeownership, public financing, residential property tax, spatial tax mimicking, yardstick competition

1 | INTRODUCTION

Property taxes are levied on both homeowners and renters. However, the perception and the true economic burden of property taxation might substantially differ for both groups. According to the “homevoter hypothesis,” first coined by Fischel (2001), households who own their homes are expected to oppose high local property taxes as they have the incentive to promote a high market value for the typically biggest asset in their portfolios.¹

This homeowner effect is well documented by the literature. Contrastingly, strategic spatial interaction in local property taxation and the role of property rights in driving property taxes has been subject to a very limited number of studies. In this article, we investigate four hypotheses, which are based on our theoretical model of the homeowner effect, local property taxation, and tax mimicking. We, thereby, answer the following questions: First, we ask how the local rate of homeownership causally affects property taxation in a local community and across a very large sample of local jurisdictions. Second, we study whether local governments mimic each other in setting property tax multipliers. Third, we analyze whether the intensity of tax mimicking is stronger among local governments of high-homeownership municipalities. Lastly, we investigate if higher tax salience² or tax incidence³ is the decisive mechanism behind the homeowner effect.

To test our hypotheses empirically, our article makes use of a previously untapped and highly detailed data set on German municipalities, which typically rank between U.S. Census Tracts and Census Block Groups in terms of population size. The backbone of this data is a complete inventory of residential real estate compiled in the 2011 German Census. For each individual housing unit, the inventory collects information about the owner type and the current state of use. We merge this data with local property tax multipliers and rich information from demographic statistics, income tax statistics, labor statistics, as well as voting behavior in the last federal elections. Our final data set covers a cross-section of 8036 Western German municipalities⁴ and is used to estimate a tax rate choice model in a nonspatial setting as well as in the presence of spatial interaction in property tax rates. More specifically, we employ ordinary least squares (OLS) and spatial lag models with multiple types of spatial weighting matrices that link local property tax multipliers to local proportions of owner-occupied housing and neighboring localities' multipliers.⁵ To account for unobserved local heterogeneity, we also run a spatial Durbin model.

¹ In many countries, taxing housing wealth forms an important source of fiscal revenue for local governments. 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.

² 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. For example, Oates (2005) states that renters sometimes even underlie the illusion of not paying property taxes at all.

³ 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 causing varying degrees of tax incidence.

⁴ We do not include Eastern German municipalities as well as the cities Hamburg and Bremen due to data constraints on several important variables. Unfortunately, it is not possible to set up a panel data set as historical data on control variables are unavailable at the municipal level (the municipal homeownership rate was surveyed in the 1987 Western German Census for the last time before 2011).

⁵ In the institutional setting of German property taxation, we 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 design

Most importantly, to address a potential endogeneity problem among local property tax and homeowner share in a spatial instrumental variable setting, we run a three-stage least squares estimation (3SLS). In this instrumental variable approach, we sequentially exploit historical homeownership rates as well as information on housing damages during the Second World War as sources of exogenous variation. These damages to the housing stock led to large-scale provision of rental housing in areas affected by warfare, changing historical homeownership independent from local public financing. Hence, both instruments influence contemporaneous local property tax multipliers only through the channel of having long-lasting effects on our causal variable of contemporaneous homeownership. In the final step, we validate our tax rate choice models by a reestimation in several robustness checks. These include two-stage least squares estimation (2SLS), the aggregation of our data to 3445 associated municipalities, and the replacement of the local property tax multiplier with the local business tax multiplier, the actual property tax payment per capita, as well as local spending per capita. We also stress the tax rate choice model by including potential bad-control variables, which allow controlling for local fiscal conditions more thoroughly. Additionally, we account for different spatial variations among the dependent variable and the error term.

One key contribution of our article is a clear identification of causality running from local homeownership rates to property tax multipliers. More precisely, our results suggest that local governments indeed tax homeowner communities differently compared to otherwise comparable communities. This key finding remains unchanged when endogeneity among homeownership and property taxes as well as spatial dependence on tax multipliers is accounted for. On the one hand, the homeowner effect does not rely on spatial dependences. On the other hand, spatial lags support a valid and robust estimation of the effect. Depending on the exact specification, a hypothetical rise in a local jurisdiction's homeownership rate by 10 percentage points decreases the local property tax multiplier by an average direct effect of 2–4 points. Calculating the average total effect of a hypothetical global rise in homeownership of 10 percentage points across all jurisdictions in the sample, we estimate that local tax multipliers would be, on average, 4–6 points lower. This reduction in local multipliers would correspond to an annual tax loss of 80–120 million euros or almost 1% of total property tax revenue.⁶ We also show that spatial tax mimicking among municipalities is stronger among high-homeownership municipalities, which suggests that governments not only set lower local property tax rates but also care more intensively about the tax choices of their neighbors when homeowners force them to do so. Based on sample splits of low- and high-vacancy municipalities, we also find evidence that higher property tax salience of the homeowners is likely to be the decisive mechanism behind the homeowner effect.⁷

As an interesting implication, our finding provides local governments with evidence enabling them to benchmark their actual tax rate choices against other structurally comparable local jurisdictions. Second, as our finding of a homevoter effect in property taxation is driven by varying

guarantees that choosing the local multiplier is the only way by which local governments can influence their property tax revenue.

⁶ Total revenue of the type B German property tax (levied on nonagricultural property, including improvements to land) amounted to 13.26 billion euros in 2016, according to the 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 an in-depth discussion).

⁷ 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 utility statement, which comes from their landlords. Other positions include insurance, waste collection, housekeeping, etc.

tax salience between renters and homeowners, this mechanism indicates that the property tax should be levered in a more transparent way so that renters are more aware of paying property taxes. Hence, our results provide insights into a distortion-free design of property taxation at the municipal level.

The remainder of the article is organized as follows. Our literature review summarizes 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. We link this review to a theoretical model of the homeowner effect as well as local property taxation, which serves to derive our key hypotheses in the next section. In the following section, we introduce the data set and discuss our identification strategy. Our section on results shows and describes our main findings, while the final section concludes.

2 | LITERATURE REVIEW

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) is the first to articulate the idea that homeowners who are voters ("homevoters") 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 "homevoter 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., Ahlfeldt & Maennig, 2015; Dehring et al., 2008; McGregor & Spicer, 2016).

Rather than focusing solely on homeowners, subsequent work has put a stronger focus on the tastes and behavior of homeowners *and* renters. Particularly for the United States, 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.⁸ Fiscal illusion or tax salience is thus a likely source of the renter effect (Brunner et al., 2015; Cabral & Hoxby, 2016). 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.

Existing studies on the political economy of property taxation in the presence of homevoting 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.

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 article by public

⁸ These findings are in line with Epplé and Romer (1991) who state that homeowners prefer less redistribution in terms of public spending than renters.

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. While these results are generally in line with tax competition, Brueckner and Saavedra (2001) note correctly that their findings are observationally equivalent to 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.⁹

Following the work of Brueckner and Saavedra (2001), an increasing number of articles have examined spatial dependence on local property tax rates for different countries. These articles usually estimate spatial dependence parameters of 0.4–0.6, equivalent to 10 percentage points 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 et al. (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 the best predictor of existing geographic patterns in local property tax rates.

Several more recent studies deserve to be mentioned as well. Dubois and Paty (2010) use a panel of 104 local communities from 1989 to 2001 in order to test the housing tax setting in France. The authors extend the analysis of yardstick competition by the impact of tax choices in locations that 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 et al. (2015) use a large sample of 2713 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 on property tax choices and yardstick competition as the main drivers of this dependence.¹⁰ Hence,

⁹ Self-interested governments choose tax rates knowing that residents make such comparisons so that strategic interaction among jurisdictions arises just as in a tax competition model.

¹⁰ Recent articles 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 to a tendency to overestimate the true amount of interaction. Lytikäinen (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

the study of Delgado et al. (2015) confirms and advances a previous analysis by Bosch and Sole-Olle (2007).

To the best of our knowledge, hardly any studies examine spatial dependencies in local property tax rates in Germany. However, evidence for yardstick competition and partial coordination in setting business tax rates in Germany is found by Buettner and von Schwerin (2016). As German municipalities enjoy autonomy in setting business tax multipliers, the authors document that neighboring municipalities set identical or similar multipliers.

3 | HOME-VOTING AND SPATIAL PROPERTY TAX INTERACTION

Poterba (1984, 1992) emphasizes the duality of housing as a consumption and investment good. In equilibrium, the per-period user costs of owning P and the price of rental services R are equal for a unique home i :

$$P_i(\delta_i + \kappa_i + \tau_i(1 - \theta) + r - g_i) = R_i(H), \quad (1)$$

with depreciation rate δ , maintenance costs κ , property tax rate τ , marginal tax rate θ , mortgage rate r , appreciation rate g in the dwelling's value, and a vector of housing characteristics H . Solving for the price yields the traditional capitalization formula:

$$P_i = \frac{R_i(H)}{\delta_i + \kappa_i + \tau_i(1 - \theta) + r - g_i} = \frac{R_i(H) - P_i(\delta_i + \kappa_i + \tau_i(1 - \theta) - g_i)}{r}. \quad (2)$$

Hence, the property's value equals the present discounted value of the net annual rental flows which are endogenous only in housing characteristics. Assuming that both owners and renters bear the full property tax payment due to tax shifting requires transforming annual rental flows to an implicit function of tax payments:

$$P_i = \frac{\overbrace{R_i(H) + P_i\tau_i(1 - \theta)}^{R_i} - P_i(\delta_i + \kappa_i + \tau_i(1 - \theta) - g_i)}{r} = \frac{R_i(H) - P_i(\delta_i + \kappa_i - g_i)}{r}. \quad (3)$$

In the above equation, the annual rental payment is a function of both housing characteristics and the landlord's tax burden $P_i\tau_i(1 - \theta)$. As the term for property taxation cancels out in this model, rental property values are unaffected by property taxes. Therefore, owners of rental properties will be indifferent to any increases in taxes since they are able to pass the full burden onto tenants. It follows that renters and owner-occupiers will be equally averse to property tax increases under perfect asset market assumptions.

However, under real-world assumptions, two potential effects may distort the equal tax aversion between owner-occupiers and renters, namely differences in tax incidence or tax salience (see Hypothesis 4). It follows that renters bear (or perceive to pay) only incomplete parts of property tax burdens (Carroll & Yinger, 1994; Dusansky et al., 1981). Consequently, homeowners oppose property taxes more strongly than renters do as the per-period user costs of owning

exceed the price of rental services (Fischel, 2001). This leads us to our first and key testable hypothesis:

Hypothesis 1 (Homeowner effect). *Local property tax multipliers decrease with an increasing share of owner-occupied dwellings in a municipality.*

Voting against high property taxes is, hence, a protection of homeowners' housing wealth. However, in general, voters cannot vote for property tax rates directly. Residents can only influence property taxation by electing local governments. In this process, 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 (Besley & Case, 1995). This forces incumbent governments into yardstick competition, in which they have to account for other (neighboring) local governments' tax choices. In the next step, we incorporate the political economy of homeownership 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 and specific to each municipality. These costs are 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 policymakers. It is reasonable to assume that these local costs vary with exogenous jurisdictional characteristics, such as population size and sociodemographic composition (e.g., the proportion of residents seeking unemployment benefits) as well as with revenues from other taxes and transfers from superordinate layers of the federal government (Revelli, 2005). Governments have to tax property more heavily if they face higher unit costs. In equilibrium, it holds $\tau_m = \tau(\phi_m)$ with $\frac{d\tau_m}{d\phi_m} > 0$.

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 their true costs, whereas "bad" governments engage in rent-seeking by increasing property taxes over costs and appropriating 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, $\bar{\tau}_{-m}$, and $\bar{g}_{-m}$. Voters care about minimizing expected future taxes by 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 the office with probability $p_m = p(\tau_m, \bar{\tau}_{-m}, g_m, \bar{g}_{-m})$.¹¹ Thus, information about public policies in neighboring municipalities helps imperfectly informed voters learn about the local government's public financing efficiency. Since incumbent 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

¹¹ Both voters and the property tax base are considered to be immobile between jurisdictions, for example, 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).



each other's property tax rate choices, known as yardstick competition: $\tau_m = \tau(\phi_m, \bar{\tau}_{-m})$ with $\frac{d\tau_m}{d\phi_m}, \frac{d\tau_m}{d\bar{\tau}_{-m}} > 0$. This leads to our second testable hypothesis:¹²

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 their own municipality and vice versa.*

Information asymmetry between local councils and voters about the true costs of local public service 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. Nevertheless, the research reviewed in the previous section 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.¹³ In this case, jurisdictional homeownership rates enter the probability-of-reelection function for bad governments¹⁴ 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 reelected, subsequent periods:

$$V_m = \max_{s_m} \{v_m(s_m) + p_m V_m^{t+1}\}, \quad (4)$$

with marginal utility $\frac{dv_m}{ds_m} > 0$ and marginal probability of reelection $\frac{dp_m}{ds_m} < 0$. Equation (4) 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 “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

¹² 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 on multipliers as the absence of evidence against yardstick competition.

¹³ Generally, homeowners are not centrally organized in unions. Therefore, homeowners have a strong incentive to monitor property taxation on an individual basis and vote according to the “home voter hypothesis.” In contrast, renter unions would be more powerful in influencing property taxation. However, due to lower tax salience for renters, renter unions typically aim at decreasing net rents as landlords only pass on the property tax burden if local market conditions allow it.

¹⁴ See Besley and Case (1995) for in-depth discussions of the probability-of-reelection function.

homeowners or renters as

$$p_m^{\text{owners}} = p(\tau_m, \bar{\tau}_{-m}, g_m, \bar{g}_{-m}), \quad (5)$$

$$p_m^{\text{renters}} = \gamma p_\gamma^{\text{ex}} + (1 - \gamma) p(\tau_m, \bar{\tau}_{-m}, g_m, \bar{g}_{-m}). \quad (6)$$

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

$$p_m = (1 - \gamma + \pi_m \gamma) p(\tau_m, \bar{\tau}_{-m}, g_m, \bar{g}_{-m}) + (\gamma - \pi_m \gamma) p_\gamma^{\text{ex}}. \quad (7)$$

If local governments maximize (4) with respect to s_m and incumbents' probability of being reelected follows (7), the emerging tax reaction function includes both the local share of homeowners and the share of homeowners in neighboring jurisdictions as arguments:

$$\tau_m = \tau(\phi_m, \pi_m, \bar{\tau}_{-m}, g_m, \bar{g}_{-m}, \bar{\pi}_{-m}). \quad (8)$$

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. Hence, our first hypothesis can also be derived causally in the spatial setting from property tax interaction.

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, that is, when there are many “watchdogs” in the populations of competing jurisdictions. This leads to a third 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.*

As mentioned earlier, the decisive mechanism behind the homeowner effect may be due to varying tax incidence and/or different tax salience among renters and homeowners. First, differences in tax incidence are caused if taxes are not necessarily capitalized into rents to a full extent.¹⁵ Therefore, Equation (3) is expanded by $\alpha = f(\alpha_{\max}, \eta) = [0, 1]$ which defines the degree at which

¹⁵ A study by Schwegman and Yinger (2020) documents that property taxes are not often fully shifted onto urban renters. Additionally, England (2016) quantitatively summarizes several studies on property tax incidence which document varying degrees of property tax shifting.

owners of rental properties can shift taxes onto tenants.¹⁶

$$P_i = \frac{\overbrace{R_i(H) + \alpha P_i \tau_i (1 - \theta) - P_i (\delta_i + \kappa_i + \tau_i (1 - \theta) - g_i)}^{R_i}}{r} = \frac{R_i(H) - (1 - \alpha) P_i (\delta_i + \kappa_i - g_i)}{r}. \quad (9)$$

More precisely, the degree of tax shifting is influenced by tenancy law α_{max} as well as local rental market conditions, reflected in the price elasticity of demand $\eta = \frac{dH}{dR_i}$, which influences a landlord's market power (Öktem & Huang, 2011). For example, even with the ability to shift property tax payments to a full extent, landlords might refrain from doing so in local markets where demand for rental housing is price elastic $\eta > 1$. In contrast, owners of rental homes will shift property tax to the maximum degree in local markets where the rental housing demand is price inelastic or unitary $\eta \leq 1$.

Second, the varying tax salience of property taxation can influence the degree of the homeowner effect. In earlier results, Oates (2005), Brunner et al. (2015), as well as Cabral and Hoxby (2016) state that property taxes are more salient to homeowners than to renters.¹⁷ This effect is likely to be driven by the fact that renters pay property taxes to their landlords in a similar way as a tax escrow.¹⁸ Property taxes are billed to renters on an annual basis, together with all other ancillary costs, and tenants prepay monthly installments towards this annual settlement. In contrast, most homeowners receive and settle the property tax bill directly. Therefore, our last testable hypothesis investigates the main reason behind the homeowner effect and explores why homeowners are more tax-averse than renters. Two potential mechanisms are tested in this respective:

Hypothesis 4 (Tax salience vs. tax incidence). *Higher salience of the property tax burden for homeowners is the decisive mechanism behind the homeowner effect rather than actual tax incidence.*

4 | INSTITUTIONAL SETTING, DATA, AND METHODOLOGY

4.1 | The German property tax scheme

Fiscal federalism in Germany is characterized by the strong coordination of taxation and revenue sharing among different layers of government — the federal, state, and municipality levels. The German constitution determines tax assignments to these specific levels of government, and only minor adjustments in these assignments may be made by the federal government. As outlined by Spahn (1997), the main federal taxes are income tax, value-added tax (VAT), corporate

¹⁶ The inability to shift taxes onto renters will be reflected in the degree to which property taxes are negatively capitalized into rental properties' values. For example, the United Kingdom added a new investor surcharge for the tax on buying rental properties in 2016 which caused prices for rental homes to dip while prices in the overall housing market continued to rise (Rielly & Schomberg, 2016). $\alpha = 1$ implies a full shift, and $\alpha = 0$ describes the inability to shift property taxes.

¹⁷ This concept of tax salience cannot be included in the equation of the price of rental housing versus the cost of owner-occupied housing. More specifically, a lower property tax salience for renters does not affect the price of rental housing.

¹⁸ Cabral and Hoxby (2016) describe the effects of tax escrows on the reduction of tax salience. Similar results are found by Hayashi (2023) who finds that paying taxes via a tax escrow lowers tax salience.

income tax, mineral oil, tobacco, and alcohol tax (except beer). The most important state taxes are the net wealth tax, inheritance tax, betting, and lottery taxes, as well as the beer tax, among others (Bury & Feld, 2023). Local municipalities levy business taxes, communal charges on public services (utilities) as well as property taxes (developed and undeveloped land).

Although taxes are levied at different levels, the most important tax revenue sources are shared by different layers of the government through complex fiscal equalization schemes (horizontally and vertically). For example, income taxes, the corporation tax, and the VAT are all jointly appropriated by all states to avoid financial disparities. In addition, the local business tax income is shared by all levels of government. Contrastingly, property tax income fully stays within municipalities.¹⁹

The taxonomy of property taxation follows the same principles countrywide. More precisely, the annual tax burden (TAX) for a property j of type k in a municipality m is based on the property-specific assessed value (VAL^{ass}), a property-type-specific tax rate ($RATE$), and the municipal tax multiplier (τ):

$$TAX_{j,k,m} = VAL_{j,m}^{ass} \cdot RATE_k \cdot \tau_m. \quad (10)$$

The local tax multiplier²⁰ is the only component of the effective tax rate that municipal governments can directly influence, while all other components are exogenous.²¹ First, the property-type-specific tax rates are governed by federal law and are uniform across the country.²² Second, instead of current market values, the German property tax is based on historical assessed values. These property-specific assessed values are fixed by the local tax offices based on a methodology using 1964 house prices for West Germany and 1935 prices for East Germany. Due to these outdated price references, the assessed values do not reflect current market conditions.²³ Third, there are no tax interdependencies between the property tax and other municipal property fees, which are charged at a cost-covering principle in Germany (i.e., sewerage or waste collection fees).

Local councils are generally allowed to alter the multiplier once a calendar year. Any change to the multiplier has to be disclosed to the public in the municipal register. Public referenda about

¹⁹ In general, fiscal equalization schemes in Germany prevent municipalities from exporting nonbusiness taxes to nonresidents. Hence, findings of McLure (1967), stating that local governments will use taxes which are most easily exported, do not hold for German municipalities.

²⁰ Consequently, the term tax multiplier is used differently in the context of German property taxation. In the United States, a tax multiplier refers to the total change in real GDP caused by a change in taxes.

²¹ 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. Thus, the property tax base is practically fixed for periods far longer than a major's typical period of power.

²² 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 nonagricultural properties or commercial buildings.

²³ The legislator's original intention was to reassess all taxable properties every 6 years. This intention was coded in §21 (1) of the German Valuation Law, 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 properties constructed after 1964 (West Germany) or 1935 (East Germany), respectively, assessed values are computed based on comparison values reflecting historical prices of properties of the same type and similar size. Over the last few years, the German Federal Constitutional Court has received multiple lawsuits concerning the legitimacy of the current form of property taxation. Therefore, property tax reform aiming at a new assessment of all taxable property in 2022, is currently in preparation for property tax reform in 2025.



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.

changes to the local property tax multiplier 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 5 or 6 years depending on state law.

4.2 | Data

Property tax multipliers. Data on local property tax multipliers for the year 2011 is obtained from Local Property Tax Statistics. Due to data limitations for important covariates, we restrict our sample to 8036 Western German municipalities without the two city-states of Hamburg and Bremen. 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 property from taxation. The maximum multiplier is 800%, 2.4 times the sample mean of 333%. Residing in

even fairly adjacent locations can lead to substantial differences in annual tax burdens: moving 10 km 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 euros²⁴ a property tax payment of 1500 euros annually. This annual saving would translate into several tens of thousands of euros over the typical duration of a household's life in a home. *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 dwellings that are not used as main residences in Germany, and, hence, do not go hand in hand with municipal voting rights. These dropped properties include seasonal and recreational dwellings as well as houses 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.

Figure 2 illustrates the geographical distribution of municipal homeownership rates. The unweighted mean share of homeowners at the municipality level is 67%, with an enormous range spanning from 20% to 100%. 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%. 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. 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 considerably less concentration of probability mass towards the right end of the multiplier scale. *Municipal characteristics:* As socioeconomic controls, we include population size, population density, and multiple other indicators of socioeconomic structure at the municipal level (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 include local shares of valid votes for the three main German left-oriented parties²⁵ in the 2009 Federal elections.²⁶ In order to account for the possibly confounding role of fiscal

²⁴ 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.

²⁵ 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").

²⁶ 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 party-related second votes.



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.

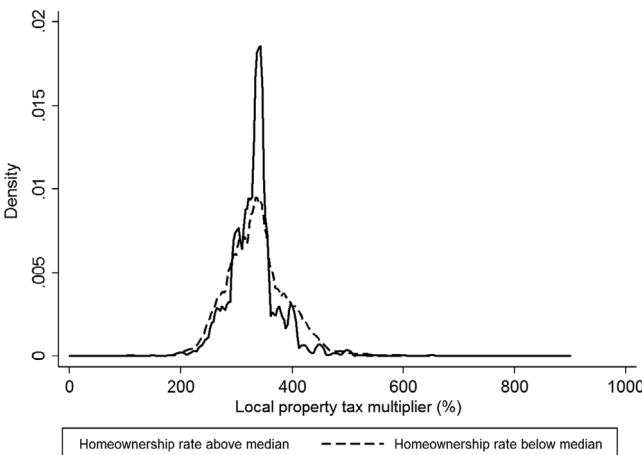


FIGURE 3 Density distributions of tax multipliers. The figure is based on data from the Federal Statistical Office and shows Kernel estimates of the empirical density distribution of tax multipliers grouped by local proportions of owner-occupied housing. Property tax multiplier distributions are grouped by municipalities with above-median and below-median homeownership rate, indicated by solid and dashed lines, respectively.

circumstances,²⁷ we use vertical transfers of federal income and sales tax for the same year.²⁸ Additionally, we 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. We obtain all data from the Federal Statistical Office. Furthermore, we construct a set of dummy variables. First, we include dummies flagging municipalities with state or country borders. Second, a set of dummy variables reflects the state in which a certain municipality is located. Third, to capture potential agglomeration effects, we enter a dummy variable for medium cities as well as for metropolises in our model.²⁹ Table 1 shows descriptive statistics for all key 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. According to Moran's I ,³⁰ both local property tax multipliers and homeownership rates display considerable spatial dependence, as do almost all covariates. Furthermore, Table 2 shows pairwise correlation coefficients for all main variables.

4.3 | Estimation strategy

We test our first and main hypothesis with a property tax rate choice model. We link local multipliers to local homeownership rates as well as municipal characteristics in a linear regression model allowing for heteroskedastic disturbances:

$$\tau = \beta_1 + \beta_2 HOR + X\Psi + \epsilon \text{ with } \epsilon \sim (\mathbf{0}, \sigma^2). \quad (11)$$

The dependent variable τ is an $N \times 1$ -vector of municipal property tax multipliers in 2011 (in percent). HOR is an $N \times 1$ -vector of municipal homeownership rates (in percent); X is an $N \times k + 1$ -matrix of fiscal and nonfiscal control variables at the municipality level, while β_1 , β_2 , and Ψ pick up (vectors of) coefficients. ϵ denotes a normally distributed error term. This linear regression model in Equation (11) serves as our baseline specification. As endogeneity problems have to be solved, various spatial interactions and spatial heterogeneity are possible, this baseline estimation is adapted accordingly.

²⁷ In order to finance local public services, municipalities receive revenues from a variety of sources (Borck et al., 2015). The first pool of municipal income sources involves autonomous revenues that can be ruled by municipal decision-makers independently of other layers of government. Within this pool, local taxes in the form of the property tax and the local business tax are charged. In most cases and in particular, in economically strong locations, annual income from property tax is lower than income from business tax. Municipal governments can also decide independently on different kinds of service charges, for example, for general administrative services or waste collection. The second general pool of municipal income sources encompass nonautonomous revenues that are allocated to individual jurisdictions via the respective fiscal equalization schemes of German federal states. Within these fiscal equalization schemes, municipalities receive compulsory shares of revenue from personal income taxes and VAT as well as grants that depend on their relative fiscal health. In sum, municipalities benefit from considerable and constitutionally guaranteed discretion in budgeting but have only limited access to autonomous financing sources.

²⁸ 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, the fiscal conditions of each municipality.

²⁹ Controlling for potential agglomeration effects is essential, as taxation and agglomerations are interconnected (see publications in the field of new economic geography such as Jofre-Monseny, 2013). More specifically, agglomeration and peripheral locations might levy taxes in different amounts due to varying levels of local amenities.

³⁰ Moran's I is computed by using a row-standardized 10-nearest-neighbor spatial weighting matrix.

TABLE 1 Descriptive statistics.

	Mean	S.D.	Min	Max	Moran's <i>I</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
Total population (1000s)	7.2	28.9	0.0	1348	0.160
Population density (population/km ²)	20.8	28.7	0.5	432.6	0.523
Taxable income p.c. (euros 1000s, 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
Income tax/VAT transfers p.c. (euros, 2010)	355	106	17	5155	0.553
Property tax base p.c. (euros 1000s)	28.8	11.4	0	362.8	0.334
State or country border (dummy)	0.15	-	0	1	-
Metropolis (population ≥ 100,000, dummy)	0.01	-	0	1	-
City (20,000 < population < 100,000, dummy)	0.06	-	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	-
<i>Variables used for IV and sample split:</i>					
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

Note: This table shows descriptive statistics for the main variables in the analysis. All values refer to the year 2011 except when indicated otherwise. The reference level is 8036 German municipalities. Moran's *I* is a measure of spatial autocorrelation.

Abbreviations: S.D., standard deviation; VAT, value-added tax; pct., percent; p.c., per capita; SFH, single-family home

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 a correlation between homeownership rates and the disturbances. To avoid this bias, we use a 3SLS to reestimate our tax rate choice model. Based on extensive data search and processing, we resort to two previously untapped historical measures from the 1950 German Census as instrumental variables in this equation-by-equation technique: the share of local housing destroyed or severely damaged by allied warfare during the Second World War and historical local proportions of owner-occupied

TABLE 2 Correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Property tax multiplier (pct.)	1												
(2) Pct. owner-occupied	−0.128	1											
(3) Population (1000s)	0.263	−0.364	1										
(4) Population density	0.175	−0.552	0.555	1									
(5) Income p.c. (1000s)	−0.119	−0.246	0.068	0.275	1								
(6) Pct. unemployed	0.103	−0.276	0.190	0.211	−0.165	1							
(7) Pct. < 10 years	−0.025	−0.011	−0.006	0.000	0.064	−0.114	1						
(8) Pct. > 70 years	0.071	−0.041	0.018	0.041	−0.128	0.176	−0.490	1					
(9) Pct. left-wing votes	0.024	−0.112	0.110	0.195	−0.084	0.373	−0.203	0.190	1				
(10) Tax base p.c. (1000s)	−0.055	−0.448	0.137	0.268	0.355	0.137	−0.060	0.101	0.071	1			
(11) Income/VAT p.c.	−0.111	−0.318	0.123	0.359	0.623	−0.160	0.051	0.155	−0.096	0.301	1		
(12) Pct. housing damaged 1950	0.241	−0.035	0.085	0.119	−0.109	0.038	−0.057	0.098	0.089	−0.076	−0.153	1	
(13) Pct. owner-occupied 1950	0.019	0.244	−0.091	−0.147	−0.113	−0.143	0.029	0.032	−0.251	−0.195	−0.104	0.172	1

Note: This table reports the pairwise correlation coefficients (Bravais–Pearson) of all main variables in the analysis. Binary variables are not included. All reported correlation coefficients are significant at a 1% level.
Abbreviations: VAT, value-added tax; pct., percent; p.c., per capita.

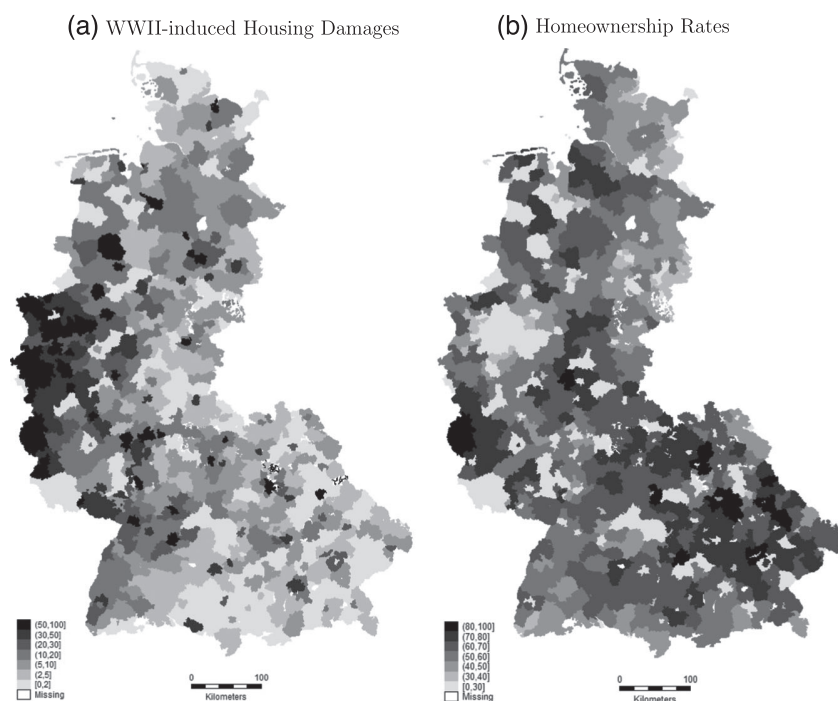


FIGURE 4 Housing damages and homeownership rates across German historical districts. This figure is based on data from the 1950 German Census. Panel A shows the geographical distribution of housing damage rates in percent for historical Western German districts in 1950. Panel B shows the geographical distribution of homeownership rates in percent for historical Western German districts in 1950.

dwelling directly after the war.³¹ 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. 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. Descriptive statistics on both variables can be found in Table 1. Moreover, Panel A of Figure 4 shows the distribution of war-related housing damage rates in 1950 at the level of historical districts.³² Panel B illustrates historical homeownership rates. The choice of the 3SLS simultaneous equation model is able to describe the chronological causal relationship between our instruments and the endogenous regressor. War-induced housing damages (exogenous shock) led to large-scale, publicly subsidized provision of rental housing in affected areas, especially from the year 1950 onwards (Voigtländer, 2009).³³ This public funding came entirely from the

³¹ We experimented with local voter participation in the 2009 Bundestag elections as an additional instrument. Voter participation is strongly (positively) correlated with homeownership, but probably not exogenous to local property tax rates in equilibrium due to sorting effects.

³² Data on war damages and 1950 homeownership rates are based on historical municipalities (Figure 4). These historical districts are larger in size (area) than contemporaneous municipalities (Figure 1) and, hence, our historical data do not have as much variation as recent municipality information. More granular data on war damages and historical homeownership are not available.

³³ On Western German territory, about 2.25 million dwellings were destroyed, reducing the housing stock by nearly 20% in comparison to pre-war levels. In addition, 2–2.5 million dwellings were damaged. Estimates suggest that in 1950, there

superordinate state level. Municipal governments did not have to increase property taxation in order to finance these rental housing provisions. As a consequence, the share of local housing destroyed or severely damaged by allied warfare during the Second World War describes an exogenous shock, which negatively influenced the historical homeownership rates in 1950 in the first stage. In the second stage, the German federal state started a program to support homeownership and facilitate moving from previously subsidized rental housing into owner-occupied properties in the late 1960s. These homeownership campaigns aimed to create reallocation chains in low homeownership communities, which suffered high damages during the Second World War and still had a shortfall of housing at this later point in time (shift share mechanism).

Consequently, both instrumental variables, war-related housing damage rates and historical homeownership rates, sequentially influence contemporaneous local property tax multipliers only through the channel of having long-lasting effects on our causal variable of interest, contemporaneous homeownership. Based on statistical as well as qualitative validation of instrumental variable assumptions below, war-related housing damages and direct after-war homeownership rates are expected to be valid and strong instruments in our 3SLS estimation.

After controlling for all exogenous regressors, the first-stage regression results in Table 3 reveal that historical homeownership rates were significantly lower in municipalities that suffered more war-related housing damages. Table 3 further lists second-stage regression estimates, which document a small but highly significant influence of historical homeownership rates on homeownership in 2011. Most importantly, high *F*-statistics and high Wald statistics confirm the sequential causal effect at all common significance levels. Hence, the *relevance assumption* of the two instrumental variables is met. Furthermore, the *exclusion restriction* holds as there is no direct effect of both instruments on the dependent variable. The German property tax burden is of a comparably small magnitude and, therefore, may not be used by damaged municipalities to increase their attractiveness, their economic power, or their residents' well-being. In addition, reverse effects between the dependent variable and both instruments can be ruled out due to the large temporal difference in the respective observation dates (independent of unobserved shocks to local tax multipliers). The *monotonicity assumption* is likely to hold as well. The small negative correlation coefficient between homeownership rates today and historical war damages describes a monotonic linear relationship and supports the absence of defier communities. A low positive correlation coefficient between homeownership rates in 1950 and 2011 further underlines the assumption that there are no defiers. The *independence assumption* is met as effects running through omitted variables can be ruled out due to the exogeneity in war-induced damages, the state-level funding of rental housing, and the shift-share tendency in the development of homeownership rates. Additionally, we document in Table 2 that our two instruments are weakly correlated with observable municipal attributes. Hence, we assume that both instruments have low or zero correlation coefficients with unobserved local characteristics.

As mentioned before, and most importantly, allied warfare can be viewed as a random and exogenous experiment that caused extreme damage to the housing stock. Overall, these war damages to residential housing (not overall war damages including industry, public buildings, etc.) occurred unsystematically in attacks of Allied air as well as infantry forces depending on the stage of the Second World War. In the first stage of the war, the air raids took place during the night and aimed at industrial targets or transportation systems (Brakman et al., 2004; Gentile, 2001). However, under battle conditions against a strong German air force, these attacks suffered from a lack

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).

TABLE 3 First- and second-stage regression results for the 3SLS models.

	3SLS (First)	3SLS (Second)	SL 3SLS (First) (10 N.N.)	SL 3SLS (Second) (10 N.N.)
Pct. housing damaged 1950	−0.286*** (0.015)	-	−0.283*** (0.015)	-
Pct. owner-occupied 1950	-	0.065*** (0.007)	-	0.065*** (0.007)
Population (1000s)	−0.015 (0.01)	−0.008 (0.012)	−0.016 (0.01)	−0.008 (0.012)
Population density	−0.07*** (0.008)	−0.118*** (0.007)	−0.069*** (0.008)	−0.118*** (0.007)
Income p.c. (1000s)	−0.206*** (0.07)	−0.019 (0.059)	−0.207*** (0.07)	−0.019 (0.059)
Pct. unemployed	−0.161* (0.092)	−0.918*** (0.304)	−0.171* (0.092)	−0.918*** (0.304)
Pct. < 10 years	0.066 (0.102)	−0.17** (0.082)	0.073 (0.102)	−0.17** (0.082)
Pct. > 70 years	0.005 (0.059)	−0.055 (0.05)	0.007 (0.059)	−0.055 (0.05)
Pct. left-wing votes	−0.116*** (0.021)	−0.053*** (0.016)	−0.116*** (0.021)	−0.053*** (0.016)
Tax base p.c. (1000s)	−0.034 (0.022)	−0.26*** (0.038)	−0.032 (0.022)	−0.26*** (0.038)
Income/VAT p.c.	−0.008** (0.004)	−0.006*** (0.002)	−0.009** (0.004)	−0.006*** (0.002)
D nation/state border	−0.547 (0.428)	−0.914*** (0.271)	−0.534 (0.427)	−0.914*** (0.271)
Constant	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes
City/metropolis dummies	Yes	Yes	Yes	Yes
λ	-	-	0.103*** (0.022)	0.458*** (0.021)
Spatial lag covariates	-	-	-	Yes
F-test	353.51***	336.27***	-	Yes
Wald χ^2	-	-	677.84***	621.421***
Number of observations	8036	8036	8036	8036
R ²	0.377	0.496	-	-
Squared correlation coefficient	-	-	0.270	0.496
Moran's <i>I</i> residuals	0.315	0.332	0.002	0.051

Note: This table shows the first- and second-stage regression results of the three-stage least squares regressions. In the first stage, the dependent variable is the 1950 municipal share of homeownership in percent, which is regressed on the historical district percentage of housing damaged by warfare. In the second stage, the dependent variable is the 2011 municipal share of homeownership in percent regressed on predicted levels of the 1950 municipal share of homeownership. λ is the spatial dependence parameter. HAC-robust standard errors are reported in parentheses. A Wald test is performed to test the spatial IV model's significance.

Abbreviations: 3SLS, three-stage least squares model; SL 3SLS, spatial lag three-stage least squares model; N.N., number of nearest neighbors used in the definition of spatial weighting matrices; VAT, value-added tax; pct., percent; p.c., per capita.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

of accuracy, often missed their targets, and had no measurable effect on essential German war production (USA, 1945). However, housing was destroyed as collateral damage.³⁴ In the second stage of the war, the strategy changed to area bombings where centers of cities and towns were the main target for nocturnal raids (Brakman et al., 2004). This strategy had an enormous and destructive effect on the morale of the German people as it resulted in the destruction of a large part of the housing stock. Furthermore, the strategy and the use of incendiary bombs implied that targets were not necessarily large, industrialized cities. Brakman et al. (2004) highlight that targets were selected more or less at random, depending, for example, on weather conditions. Consequently, high damage rates to the local housing stock occurred in urban areas but also extended massively to rural regions. In the final stage of the war, after Allied troops landed in Normandy, the destruction of the housing stock followed a west-east pattern which mimicked the direction of the entry of Allied infantry forces into Germany. In these final months, devastating street battles (including aerial support) dominated the events of war and mainly took place in geographically important cities, towns, or villages. According to MacDonald (2013), a bigger loss of housing stock was incurred during the final battles at locations where the German armed forces and the local population fought until the very end (in contrast to municipalities or regions that surrendered without much resistance).³⁵

Spatial property tax interaction: To validate our second, third, and fourth hypotheses, our tax rate choice model has to account for spatial dependencies. Therefore, we use spatial autoregressive models as well as a spatial instrumental variable estimation³⁶ that allows 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 communities. The strength of this dependence is governed by the N -dimensional spatial weighting matrix and the size of the spatial lag parameter.

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 (Dubois & Paty, 2010; Fingleton & Le Gallo, 2008) 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

³⁴ Conventionally, allied air forces designated the “target area” as a circle having a radius of 1000 ft around the aiming point of attack (USA, 1945). Only about 20% of the bombs aimed at precision targets fell within this target area. The bombing report further mentions target obscuration by enemy fighter opposition, anti-aircraft artillery defense, time limitations in combat crew training, night darkness, clouds, fog, smoke screens, industrial haze, as well as other bad weather conditions as the major limiting factors of bombing accuracy. In addition, aircrafts often could not find their targets due to deficits in aerial reconnaissance (Bode, 1995).

³⁵ For example, severe fights in the Ruhr area were ongoing until mid-April 1945 and caused severe destruction as local supporters and armed forces refused to surrender. In contrast, fights in the neighboring Rhein area (same longitude) ended at the beginning of March 1945 as the local population forced regime representatives to flee or surrender, which prevented extensive last-minute destruction of the housing stock.

³⁶ Drukker et al. (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). In this estimation method, Kelejian and Prucha (1998, 1999) propose using linearly independent columns of X , WX , and W^qX as instruments to solve the endogeneity problem between Y and WY . This adaptation avoids imposing multiple further exclusion restrictions due to spatial lags of explanatory and instrumental variables.

shocks and, therefore, provide the most useful information on the size of innovation for neighboring jurisdictions' voters (Besley & Case, 1995). Second, resident voters can most probably compare their own jurisdiction with others belonging to the same local media market.³⁷ 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. Furthermore, we use less sparse nearest-neighbor matrices with 20 and 30 neighbors and a population-based weighting scheme as robustness checks.³⁸

A concern about estimating the spatial autoregressive version of our property tax rate choice model 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. As the municipal homeownership rate was surveyed in the 1987 Western German Census for the last time before 2011, we lack historical data on all relevant variables at this fine-grained spatial level that would allow setting up a panel data set. Instead, we include spatial lags in the covariates along with the ordinary spatial lag in the property tax multiplier. The resulting spatial Durbin model is able to capture unobserved heterogeneity when the unobserved factors are spatially correlated (Elhorst, 2010; LeSage & Pace, 2010).³⁹

5 | EMPIRICAL RESULTS

5.1 | Estimation of the tax multiplier choice model

Table 4 presents regression results from estimating different versions of Equation (11). To allow for assessing the influence of accounting for spatial dependence and endogeneity on the results, the first column shows results for a nonspatial, noninstrumental variable version estimated by OLS. The second column accounts for the endogeneity problem and lists estimates of a nonspatial 3SLS model. 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 km. The fifth and sixth columns show estimates 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 3SLS model that treats local homeownership as endogenous, using war-related housing damages and homeownership rates at the historical district level as sequential instruments. Both extended versions are estimated using the baseline 10-nearest-neighbor matrix.

All models are generally successful in explaining the variation in municipal property tax multipliers. In line with our first and main hypothesis, the local homeownership rate carries the

³⁷ 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.

³⁸ 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*.

³⁹ 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 spatial Durbin model will yield very similar parameter estimates.

TABLE 4 OLS, 3SLS, and spatial regression results.

	OLS	3SLS	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL 3SLS (10 N.N.)
Pct. owner-occupied	−0.207*** (0.068)	−0.211*** (0.068)	−0.209*** (0.059)	−0.203*** (0.062)	−0.225*** (0.065)	−0.210*** (0.068)
Population (1000s)	0.096*** (0.032)	0.098*** (0.032)	0.102*** (0.036)	0.101*** (0.034)	0.088*** (0.034)	0.098*** (0.032)
Population density	0.059** (0.027)	0.083*** (0.026)	0.055** (0.025)	0.054** (0.025)	0.176*** (0.030)	0.083*** (0.025)
Income p.c. (1000s)	−0.870*** (0.257)	−0.866*** (0.257)	−0.573** (0.230)	−0.553** (0.228)	−0.560** (0.270)	−0.866*** (0.256)
Pct. unemployed	0.463* (0.256)	0.653*** (0.250)	0.505** (0.232)	0.516** (0.235)	0.609** (0.266)	0.656*** (0.249)
Pct. < 10 years	−0.156 (0.301)	−0.121 (0.299)	0.078 (0.257)	0.049 (0.273)	0.066 (0.259)	−0.119 (0.299)
Pct. > 70 years	0.735*** (0.179)	0.747*** (0.179)	0.479*** (0.150)	0.504*** (0.161)	0.452*** (0.161)	0.746*** (0.179)
Pct. left-wing votes	0.293*** (0.054)	0.304*** (0.054)	0.205*** (0.046)	0.202*** (0.049)	0.322*** (0.066)	0.305*** (0.054)
Tax base p.c. (1,000s)	−0.237*** (0.080)	−0.183*** (0.154)	−0.133** (0.060)	−0.159*** (0.060)	−0.109* (0.063)	−0.183** (0.074)
Income/VAT p.c.	−0.057*** (0.010)	−0.056*** (0.011)	−0.045*** (0.006)	−0.045*** (0.006)	−0.046*** (0.006)	−0.056*** (0.001)
D nation/state border	1.935 (1.322)	2.124 (1.325)	2.546** (1.204)	2.608** (1.269)	5.190*** (1.601)	2.124 (1.324)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
City/metropolis dummies	Yes	Yes	Yes	Yes	Yes	Yes
λ	-	-	0.616*** (0.017)	0.851*** (0.027)	0.670*** (0.016)	0.411*** (0.038)
Spatial lag covariates	-	-	-	-	Yes	-
Wald χ^2	-	-	-	-	391.551***	-
Number of observations	8036	8036	8036	8036	8036	8036
R^2	0.377	0.377	-	-	-	-
Squared correlation coefficient	-	-	0.355	0.295	0.387	0.518
Moran's I residuals	0.315	0.324	0.060	0.080	−0.041	0.077

Note: This table shows the regression results of six different specifications of the tax rate choice model. The dependent variable is the 2011 municipal property tax multiplier in percent. λ is the spatial dependence parameter. Moran's I is a measure of spatial autocorrelation. HAC-robust standard errors are reported in parentheses.

Abbreviations: OLS, ordinary least squares estimation; 3SLS, three-stage least squares model; SL, spatial lag model; SD, spatial Durbin model; SL 3SLS, spatial lag three-stage least squares model; N.N., number of nearest neighbors used in the definition of spatial weighting matrices; Inv. D., inverse distance spatial weighting matrix; VAT, value-added tax; pct., percent; p.c., per capita.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

expected negative sign and is consistently significant at common levels. 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 various controls. Caution is warranted for comparisons of coefficients estimated in the linear, nonspatial models versus simultaneous spatial models. The OLS and nonspatial 3SLS model show that the homeowner effect as well as the instrumental variable approach is not dependent on the spatial setting. However, as large values of Moran's I for the OLS and 3SLS disturbances show, both nonspatial models clearly fail to account for the spatial interaction processes governing property tax choice. This spatial autocorrelation in the error term can have consequences for the validity of the estimated model parameters as well as their misspecification tests. Therefore, OLS as well as nonspatial 3SLS results are not interpreted in more detail, and further analysis or robustness checks do not consider nonspatial models.

In the spatial models, depending on the exact specification, the spatial lag parameter lies between 0.411 and 0.851 and is always highly significant.⁴⁰ These results do not hinge upon the concrete definition of the spatial weighting matrix: replacing the nearest neighbors by inverse distance reduces the goodness of fit while only marginally changing the estimated coefficients for homeownership and the covariates.⁴¹ Including spatially lagged covariates in the model remarkably improves the fit but leaves most coefficients and the spatial dependence parameter almost unchanged vis-à-vis the spatial lag model. Hence, our second hypothesis can be confirmed as well.

Concerning the role of socioeconomic structure and political tastes in municipal property tax rate choice, the evidence is again in line with our 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 people, and more left-oriented political preferences. Both covariates capturing local fiscal conditions tend to be highly significant and carry plausible signs as well. Higher vertical tax transfers per capita relax local governments' budget constraints, and a bigger property tax base goes along with lower local property tax multipliers, *ceteris paribus*. Municipalities at state or federal borders tend to charge higher multipliers. Furthermore, all specifications yield highly significant coefficients of (unreported) city-size dummies which are able to better capture agglomeration effects in property taxation between rural municipalities (base case), medium cities, and metropolises. The full set of state dummies is included in every specification as well (unreported). The state dummies' highly significant coefficients indicate considerable differences in average property tax levels across states that remain unexplained by the given covariates. This finding can be explained by the multitiered structure of German public finances, which renders fiscal conditions very heterogeneous at the state level and makes unconditional tax multiplier levels highly dependent on states.

The coefficients estimated for our main variable of interest are always statistically significant and negative, ranging between -0.203 in the spatial lag specification with an inverse distance spatial weighting matrix and -0.225 for the first-round (or direct) effect in the spatial Durbin specification. This evidence clearly shows that higher shares of homeowners in local populations are indeed associated with systematically lower property tax levels. Our key result remains unchanged

⁴⁰ Fischer (2021) documents that spatial panel models tend to overestimate spatial interactions. However, we argue that in our cross-sectional setting, the risk of overestimating spatial dependencies is small as there is no time dimension which may distort the estimation.

⁴¹ Increasing the number of neighbors from 10 to 20 or 30 also yields larger dependence parameters with otherwise very similar results (Table A.1 in the Supporting Information).

when an instrumental variable estimation is carried out. The 3SLS approach teases 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. Thus 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 multichannel feedback playing out through the system of spatially interdependent jurisdictions, a 10 percentage point rise in the local homeownership would reduce the local property tax multiplier by 2 percentage points on average. For a typical single-family house worth 80,000 euros in assessed value, this direct effect would be equivalent to a roughly 1% 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.⁴²

Due to the strong spatial dependence on municipal property tax multipliers, the estimated direct effect of a change in homeownership in some municipalities 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 by altering their own multiplier, so will 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.⁴³ 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 10 percentage point rise in local homeownership shares across the entire sample.⁴⁴ In the spatial autoregressive model with 10 nearest neighbors, the average total effect is -5.4 , 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 is given by -3.6 . The resulting reduction in local multipliers of 4–6 points would correspond to an annual loss of 80–120 million euros or almost 1% of total property tax revenue across all municipalities in the sample.

5.2 | Differences in the intensity of property tax mimicking

If homevoters 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 municipality but the

⁴² To further underline the economic importance of property tax income for local municipalities, we regress local communities' spending per capita in a spatial setting on property tax as well as business tax income per capita and our set of local covariates (Table A.13 in the Supporting Information). The results show that higher property tax income per capita goes in hand with higher municipal spending per capita. According to our yardstick competition model, this significant correlation may be interpreted as an indicator of the dominance of "good" local governments that provide public services at true cost and to not increase property taxes for appropriating a financial surplus. However, due to unavailable data on local amenities and municipal services, this aspect could not be examined in more detail.

⁴³ According to LeSage and Page (2009), the average total effect is given by the sum of the average direct as well as average indirect effects. More specifically, the average direct effect is averaged over all municipalities providing a summary measure of the impact on tax multipliers arising from uniform changes in the homeownership rate across all regions. In contrast, the average indirect effect measures the impact of a change in homeownership rates in all other municipalities on an individual municipality (spillover effect), again averaged over all municipalities.

⁴⁴ The actual homeownership rate exceeded 90% in 111 communities in 2011 (1.4% of the sample). The resulting error can be considered negligible.

TABLE 5 Spatial dependence of property tax in high- versus low-homeownership regions.

	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL 3SLS (10 N.N.)
Municipalities in high-homeownership regions (<i>N</i> = 4171)	0.719*** (0.021)	0.967*** (0.016)	0.739*** (0.021)	0.468*** (0.033)
Municipalities in low-homeownership regions (<i>N</i> = 3865)	0.488*** (0.023)	0.657*** (0.020)	0.573*** (0.023)	0.321*** (0.028)

Note: This table shows the spatial dependence parameters (λ) of four different estimations of the spatial tax rate choice model using a sample split clustering together municipalities within regions of high versus low average homeownership rates. The dependent variable is the municipal property tax multiplier in percent. HAC-robust standard errors are reported in parentheses.

Abbreviations: SL, spatial lag model; SD, spatial Durbin model; SL 3SLS; spatial lag three-stage least squares model; N.N., number of nearest neighbors used in the definition of spatial weighting matrices; Inv. D, inverse distance spatial weighting matrix.

****p* < 0.01, ***p* < 0.05, **p* < 0.1.

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 & 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 4171 jurisdictions, while in low-homeownership regions, we arrive at a number of 3865. The mean local homeownership rate is 72.8% in the "high" sample versus 62.8% in the "low" sample.⁴⁵ 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 5. Our results are perfectly in line with the theoretical prediction: for each specification, the estimated spatial dependence on property tax multipliers is considerably larger within the group of high-homeownership regions.⁴⁶ 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 0.66 for the low-homeownership subsample. Hence, we confirm our third hypothesis and conclude that in addition to the significant homeowner effect 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.

⁴⁵ With 62.8%, 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.

⁴⁶ Full regression results for the split regressions for high- versus low-homeownership regions are reported in Tables A.4 and A.5 in the Supporting Information.

5.3 | Discriminating between tax incidence and tax salience

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 ($\eta > 1$), the main portion of property tax burdens in economic terms will remain with landlords to better attract renters and avoid vacancies. Renters are expected to bear the main portion in “tight” or strong housing demand markets ($\eta \leq 1$) as landlords are easily able to find tenants. Since every household is expected to fully bear the tax, the partition of local housing into owner-occupied and rental properties should play less of a role in 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, according to Equation (9).

Discriminating among municipalities with 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.⁴⁷ It is plausible to assume that tenants’ bargaining power and the price elasticity of demand increase with higher local rental vacancies. This conjecture is strongly supported by a regression of the cumulative local growth in apartment rents from 2004 to 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.⁴⁸

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 75th percentile rather than the median. This ensures that we only have true excess housing jurisdictions in the high-vacancy group.⁴⁹

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 6 shows that the homeownership coefficients for the two subsamples of high- versus low-vacancy municipalities are always very close to one another, regardless of the specification considered.⁵⁰ In fact, the null hypothesis that the two

⁴⁷ For computation of the rental vacancy rate, we refer to the 2011 Census, taking into account only vacancies in nonsingle 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 renovation.

⁴⁸ Data on rents is only available at the district level, we use data at this spatial scale instead of the municipalities. Figure A.1 in the Supporting Information shows a scatter plot of local rent growth and vacancy rates.

⁴⁹ See Figure A.2 in the Supporting Information for the empirical frequency distribution of local rental vacancy rates. The 75th percentile is 8% of vacancy, which already signals a considerably slack housing market. The median is 5.6% 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%).

⁵⁰ Regression results for the local housing vacancy rate split are listed in Table A.6 in the Supporting Information.

TABLE 6 Spatial regression results for the homeownership-vacancy interaction term.

	SL Model (10 N.N.)	SL Model (Inv. D.)	SD Model (10 N.N.)	SL 3SLS (10 N.N.)
Pct. owner-occupied * D (high vacancy)	−0.205*** (0.059)	−0.197*** (0.061)	−0.221*** (0.064)	−0.192* (0.108)
Pct. owner-occupied * D (low vacancy)	−0.218*** (0.061)	−0.216*** (0.064)	−0.232*** (0.066)	−0.228* (0.116)
<i>p</i> -value of test on equal coefficients	0.310	0.174	0.391	0.914

Note: This table shows the estimated interaction term coefficients of four 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. HAC-robust standard errors are reported in parentheses.

Abbreviations: SL, spatial lag model; SD, spatial Durbin model; SL 3SLS, spatial lag three-stage least squares model; N.N., number of nearest neighbors used in the definition of spatial weighting matrices; Inv. D, inverse distance spatial weighting matrix.

****p* < 0.01, ***p* < 0.05, **p* < 0.1.

coefficients be equal can never be rejected at common significance levels. Thus, our fourth hypothesis holds regardless 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.

5.4 | Robustness checks

Alternative model specifications: To further stress our results of the tax rate choice model, we also account for spatial interactions in the error term. To do so, we estimate a spatial error model and a so-called spatial autoregressive combined model, which contains both a spatial lag in the dependent variable and a spatially autocorrelated error term. Additionally, we check the robustness of our 10-nearest-neighbor contiguity matrix by replacing this baseline matrix with a 20- and 30-nearest-neighbor contiguity matrix in our spatial autoregressive model. As shown in Table A.1 in the Supporting Information, the results of all these alternative model specifications are in line with our main results.

2SLS estimation: To address the endogeneity problem more thoroughly, we expand our instrumental variable approach and reestimate our tax rate choice model with 2SLS. More specifically, we reuse our instruments, war-related housing damage rates, and historical homeownership rates and include them as a pair of instruments in Table A.2 and as interacted instruments in Table A.3 in the Supporting Information. Both tables show highly significant first-stage regression results and confirm our causal effect of interest with very high Wald statistics. Moreover, when both instruments are included, a test for overidentifying restrictions (Sargan–Hansen test) confirms its null hypothesis at a 10% level (both instruments are valid). In a spatial context, the second-stage results in the respective tables underline our main findings with an estimated homeowner effect of −0.360 (two instruments) and −0.351 (interacted instruments). Both coefficients are significant at a 10% level. Nonspatial results show effects of similar size and significance as our main results.

Property tax payment per capita: As mentioned, in the German property tax scheme, historical assessed values on the municipal level were determined for the last time in 1964. As a consequence, municipalities with comparably low assessed values may have increased property tax multipliers extensively in the following years to reach the same amount of property tax income

as municipalities with comparably high assessed values. To rule out this situation, we use a new dependent variable in our tax rate choice model and replace the local property tax multiplier with the actual property tax payment per capita. The results of this robustness check are displayed in Table A.7 in the Supporting Information and confirm our baseline estimations. The estimated, negative coefficients for local homeownership are again highly robust across all specifications and have a similar economic magnitude. The same holds for various other controls in the model and the spatial dependency parameter.

Associated municipalities: Using fine-grained data from 8036 Western German municipalities may lead to a noisy estimation of our spatial tax rate choice model as the size of individual municipalities varies considerably in terms of population size (stated in Table 1). Therefore, we aggregate the data to the level of 3445 associated municipalities, which are of a similar population size, to reduce spatial noise. The results for associated municipalities are listed in Table A.8 in the Supporting Information and are in line with our expectations. Due to aggregating the data, the spatial dependency parameter decreases significantly. As a consequence of these lower indirect effects, the average direct effect of homeownership on the property tax is more than doubled.

Potential bad controls: Local property tax rates critically depend on local fiscal conditions. Poor municipalities might want to improve their budget situation by setting higher property tax rates, while rich municipalities do not have the need to do so. Therefore, to better account for the possibly confounding role of fiscal circumstances, we ignore a potential bad controls problem and include 2010 levels of local public spending, municipal debt, and business tax revenue in our tax rate choice model as an additional robustness check. The results are shown in Table A.9 in the Supporting Information and display small, plausible, and highly significant coefficients for the additional covariates. The significant influence of local homeownership on property tax multipliers as well as spatial dependencies persists and is of a similar size. Based on this robustness check, we confirm that municipalities with higher spending and more constrained fiscal conditions tend to have higher property tax multipliers.

Business tax multipliers: As outlined, in the German municipal tax scheme, local governments may alter the property tax and business tax multipliers each calendar year. To exclude the possibility that municipalities with larger shares of homeowners substitute lower property tax multipliers for higher business tax multipliers, we reestimate our tax rate choice model with the local business tax multiplier as the dependent variable in Table A.10 of the Supporting Information. These results indicate no substitution effect between both tax multipliers. More precisely, it is shown that homeowner communities are in favor of lower business tax multipliers as well. This significant effect is less strong than in the case of property taxation. In line with the literature, very small spatial dependencies in the setting of business tax multipliers are found as well.

Homeowners and municipal spending per capita: If homeowners have different tastes with respect to levels of public spending, these conditions in turn systematically differ with respect to the local share of homeownership (Oates, 2005). Therefore, we transform our tax rate choice model into a spending decision model by substituting the property tax multiplier with the level of municipal spending in Table A.11 in the Supporting Information. These results underline our main results as they do not document homeowners' preferences for higher or lower public spending on a municipal level.⁵¹

⁵¹ Due to economies of scale, the costs of service provision in densely populated areas should be cheaper. In rural areas, where the share of homeowners is higher, people may be willing to pay higher taxes to reach the same level of local amenities. However, the correlation coefficient between population density and municipal spending (per capita) is 0.1049.

Population-based weighting scheme: Following the approach of Brueckner and Saavedra (2001), we reestimate the specifications of the tax rate choice model with a population-weighted 10-nearest-neighbor spatial weighting matrix. Blending population and distance in generating weights accounts for a possible higher degree of property tax mimicking between neighboring municipalities with a similar population size. The results of these robustness checks are given in Table A.12 in the Supporting Information. Again, the estimated coefficients confirm the validity of our baseline estimations as they are of similar magnitude and significance. In contrast to our expectations, the spatial dependency parameters do not increase significantly due to the population-based weighting scheme.

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 from 8036 German local jurisdictions, this article has presented representative and large-scale empirical evidence in favor of an economically meaningful homevoter 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 on municipal tax multipliers and endogeneity in homeownership, we are able to compute the average total effect of a hypothetical change in homeownership rates on property tax revenue. We estimate that local tax multipliers would, on average, be 4–6 points lower if the homeownership rate was 10 percentage points higher across all municipalities in our sample. Such a reduction in local multipliers would correspond to an annual 80–120 million euros or almost 1% 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 the endogeneity of homeownership levels.

Interacting municipal homeownership rates with an indicator of rental housing demand elasticity—the local nonsingle family housing rate of vacancy—suggests that our key result even holds in “tight” housing markets, that is, even when tenants are expected to bear very similar property tax burdens in economic terms as their fellow owner-occupying neighbors. We also 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 homeowners force them to do so. We interpret this as evidence that the homeowner effect originates from differences in the salience of the property tax between owner-occupiers and renters rather than from differences in tax incidence.

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

Indicating, that public spending is higher in dense areas due to a higher level of service provisions or because of inefficient or lower public spending. Due to unavailable data on local service provisions, this matter may not be investigated further.

structurally comparable local jurisdictions. Second, our finding of a homevoter effect in property taxation is driven by varying tax salience between renters and homeowners. This mechanism indicates that the property tax should be levered in a more transparent way so that renters are more aware of paying property taxes. Examining the question of whether local governments attempt to compensate lower property tax revenues resulting from the higher local political power of homeowners by charging higher fees and nonproperty taxes is a fruitful avenue for future research. In addition, future studies might also investigate which other political decisions at the municipality level are driven by the homeowner effect.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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