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# Impacts of Property Taxes on Planning and Settlement Development—Germany as a Living Lab

**Dirk Löhr**

Faculty for Environmental Business Economics and Environmental Business Law, Environmental Campus Birkenfeld, Trier University of Applied Sciences, Birkenfeld, Germany
Email: d.loehr@umwelt-campus.de

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## Abstract

From an international perspective, German property tax reform offers an interesting field of research, as several models now exist in parallel. The spectrum ranges from a tax based on the area (square metres) of the whole property, with a higher weighting on the building (Bavaria), to a tax on land value only (Baden-Wuerttemberg). These two extreme cases are examined with regard to their expected effects on settlement development and planning goals. The comparison is made within a framework of a simple centre-periphery scheme and completed by a burden shift calculation. With some exceptions, the results indicate that the inclusion of the building and a minor role of the land value in the tax base (Bavarian model) are not supportive of more compact forms of settlement, yet cause rising housing costs and lead to more inefficient use of land. The distributional effects also tend to be regressive with regard to the location of the property. Thus, the Bavarian model tends to run counter to important planning objectives. With regard to the criteria presented, the Baden-Wuerttemberg model works in the opposite direction. The other models applied in Germany are between these two poles.

## Keywords

Property Tax Reform, Property Tax Models, Real Options, Planning Goals, Distribution

## 1. Introduction

After decades of discussion about reforming property tax in Germany, the Federal Constitutional Court handed down a landmark decision on April 10, 2018. This decreed that the unit values ("Einheitswerte") dating from 1935 (Eastern Ger-

many) and 1964 (Western Germany), on which the old property tax was based, are deemed unconstitutional. The Court demanded new legislation by the end of 2019, after which the unit values can still be used for a maximum of five years, until the end of 2024 at the latest (BVerfG, 2018).

Although there was no consensus among the governing parties, the legislature was able to pass a new federal property tax law by the end of 2019. The political compromise was an opening clause for the federal states ("Laender"). Article 72 (3) No. 7 of the Constitution ("Grundgesetz") allows the states to deviate extensively from the federally regulated property tax and effectively replace it with their own model. The federal law was passed at the end of 2019; various state property tax laws followed.

The framework of the property tax as well as the responsibilities remain basically unchanged from the status quo, even for those states that have opted for the state opening clause (**Table 1**).

All new property tax regimes will be applied for the first time in 2025, based on assessment data as of 1.1.2022.

Consequently, a patchwork of different models can now be observed in Germany: 11 federal states have opted for the federal model. Two of them (Saxony and Saarland) have made minor modifications to the basic rate. The federal model uses a capitalised earnings value method for residential properties. However, the tax values differ from market values, since the federal model works with statistically surveyed average rents that do not differentiate by location (Loehr, 2020: p. 172). For non-residential properties (beyond agriculture and forestry), the federal model applies a rough cost-value approach.

Four federal states have opted for area-based models, mainly for the sake of simplicity. The conceptual starting point is the "space-only" model (SOM) of Bavaria. In its tax base, it weighs the square metre of floor space at 0.04 €/sqm and the square metre of building space at 0.50 €/sqm, with a deduction of 30% for residential use. The tax is thus mainly on the building. Depreciation is ignored. There is also no differentiation based on location. Hamburg, Hesse and Lower Saxony have adopted the Bavarian model, but with more or less pronounced location-related differentiations.

A unique approach has been taken by Baden-Wuerttemberg, which taxes only

**Table 1.** Framework of the property tax.

| | *Framework* | *Legislature* |
|---|---|---|
| | Tax base ("Bemessungsgrundlage") | Federal or state law. |
| x | Basic rate ("Steuermesszahl") | In charge: |
| = | Tax base value ("Steuermessbetrag") | Tax office |
| x | Tax rate ("Hebesatz") | Municipality |
| = | Property tax ("Grundsteuer") | (also gets the tax revenues) |

Source: Own presentation.

the land value (more accurately: the standard land value—"Bodenrichtwert", § 196 Building Code—"Baugesetzbuch"). Here, a deduction of 30% on the basic rate is granted for residential use. This model also pursues settlement policy objectives. Hence, it is referred to as land value tax (LVT).

Moreover, apart from Bavaria, all federal states allow municipalities to impose a heavier burden on undeveloped but developable land, called property tax C in the German context (Henger, 2018). With regard to the tax on agricultural and forestry land (property tax A), all "deviators" more or less follow the federal model.

Table 2 shows a spectrum in which the various property tax models are ranked according to whether the building space or the land value determines the tax base more strongly (for a more general differentiation, see Thiel & Wenner, 2018: p. 79 or Milan et al., 2016: p. 336).

Internationally, value-based systems (e.g. Cyprus, South Africa) and area-based systems (e.g. Vietnam, Nigeria), but also land value taxes (e.g. Australia, New Zealand, Denmark, Estonia, Jamaica, Kenya) can be found alongside rental value systems (e.g. India, Nigeria, Malaysia, Trinidad) (Norregaard, 2013: p. 24).

There is extensive comparative literature on different property tax systems (e.g. Almy, 2013). However, most of this literature focuses on comparisons between different countries (e.g. Dye & England, 2010; Gayer & Mourre, 2012). This is difficult insofar as there are often very different economic and legal backgrounds, including valuation systems, tax rates and tax exemptions. This affects, among other things, the comparability of the data. For many impacts, only anecdotal evidence can be provided. Moreover, a considerable part of the literature deals with issues of administration, efficiency and the amount of tax revenues raised by different property tax systems (e.g. Bunn, 2022a; Norregaard, 2013). In contrast, the implications for planning and settlement development are mostly treated rather casually. Nevertheless, there has been some research that specifically focuses on the impacts of property taxation on planning and settlement development. Some of this work is also empirically based (Josten, 2000;

**Table 2.** Scope of German property tax models.

| Model | *Bavaria* | *Hamburg* | *Hesse/Lower Saxony* | *Federal Model* (*Used by* 11 *States*) | *Baden-Wuerttemberg* |
|---|---|---|---|---|---|
| Content | | Land + Buildings | | | Land |
| Characteristics | Space-only model (SOM) | Space model with rough location adjustment | Space model with location adjustment | Model, oriented to market value assessment | Land value tax (LVT) |
| Tax Burden Mainly on | Building/space | ← | | → | Land/value |

Source: Own presentation.

Milan et al., 2016), while others are primarily theoretical (e.g. Gaffney, 1969; Tideman, 1995). However, with few exceptions (e.g. Arnott, 2004), there was little recourse to specific spatial economic models. Moreover, the character of the land as a real option was not taken explicitly into account. This article attempts to fill this research gap. The model-based derivations are substantiated and supplemented by burden shift calculations. These calculations all refer to the same area (Germany) and allow for better comparability than data dealing with different countries.

The following considerations are limited to the taxation of residential property and undeveloped residential land, and thus to a sub-area of the so-called property tax B. Only the extremes of the spectrum (SOM and LVT models) are considered, as they cover the range within which the other property tax models fall.

Against the background of the planning objectives of compact settlement development and the avoidance of urban sprawl, affordable housing and the avoidance of segregation and gentrification, the following hypotheses are preliminarily tested:

1) A SOM leads to smaller and at the same time more expensive settlements than a LVT.

2) A SOM results in more inefficient use of the scarce resource land than a LVT.

3) A SOM is less supportive of more compact and dense settlement development than a LVT.

4) The distributional effects of a SOM tend to be more regressive.

Generally formulated and summarized it shall be shown that the objectives of a more sustainable planning and land policy of compact settlements and affordable housing tend to be hindered by a SOM and supported by a LVT.

Questions of constitutional permissibility of the different property tax models cannot be addressed, although these have been intensively discussed in the German debate on property tax reform.

The work is structured as follows: Section 2 first presents the theoretical framework without taxation and its spatial economic consequences as well as the methodical modifications by introducing taxation. In Section 3, the spatial economic consequences to be expected within the framework of the SOM and LVT are presented on the basis of the theoretical model and completed by burden shift calculations. Section 4 examines the consequences for welfare and distribution. Section 5 discusses some reservations and summarises the results. Section 6 draws conclusions.

## 2. Theoretical Framework

In the following, the theoretical framework is presented, on which the subsequent analysis is carried out. First, a basic model without taxes is presented (Section 2.1). The simple model aims to represent key characteristics of central and

peripheral locations, while considering land as a real option. Section 2.2 discusses the methods used to examine the effect of taxes in the model.

## 2.1. Starting Point: Reference Model without Property Taxes

The basic model consists of two components:

1) Centre-periphery scheme: The starting point is a simple spatial economic model that ultimately goes back to David Ricardo (Harrison, 2006: p. 36, Figure 2:2, here modified in **Figure 1**). This can be applied at various spatial levels, i.e. from the country to the municipality and also within the municipality. In this monocentric model, a distinction is made between spatial centre and spatial periphery, whereby these terms are to be understood functionally and not geographically. For example, in the state of Rhineland-Palatinate (Germany) the sparsely populated Hunsrueck region is the geographical centre, but nevertheless functional periphery. In the spatial centres, higher income (per unit of area) can be earned than in the spatial periphery. In the centre, transport costs are saved; highly productive economic activities that depend on intensive division of labour are concentrated here. For the sake of simplicity, **Figure 1** does not take into account the fact that population density also increases towards the centre. In order to consider this, the income gradient would have to be drawn not linearly, but exponentially rising towards the centre. The costs for the construction of the buildings of the same type (per square metre building area), on the other hand, do not differ as much across the space; the same costs per unit of area were assumed as a general rule. The difference between the potentially achievable income on real estate (imputed and actual rents) and the construction costs represents the land yield potential.

2) Land as a real option: However, land values do not only result from discounted residual land rents. Rather, land is a real option (more precisely: a call option; Geltner et al., 2007: pp. 729-755). An investor only earns a return on land if

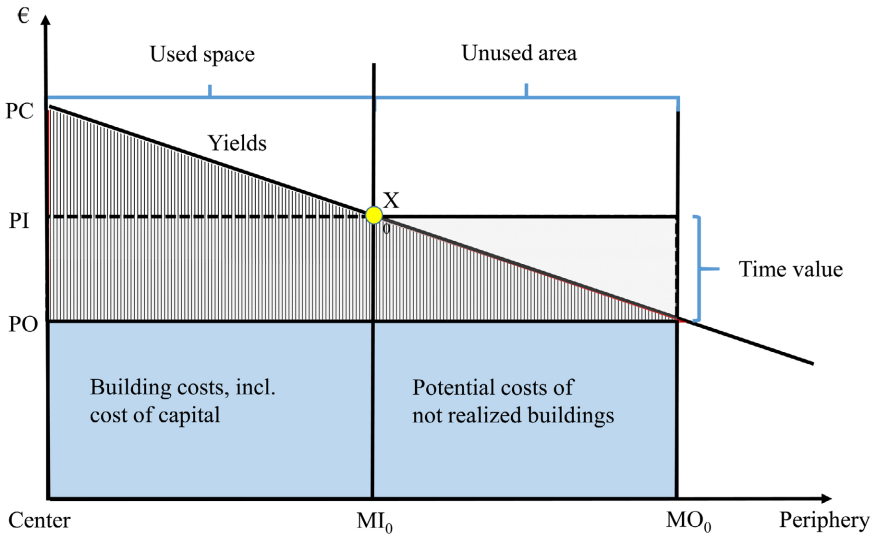


**Figure 1.** Reference model without taxation (Source: Loehr, 2019, modified).

he/she makes a follow-up investment (building) after acquiring the land. However, he/she can also postpone the subsequent investment in the building until the circumstances are favourable for him/her in the case of private landownership indefinitely. Accordingly, the land value is composed of the potential discounted land rents ("intrinsic value of the option") and the value of "being able to wait" ("time value"). The land yields are a residual that results when the costs of construction (including financing) are paid out of the income. The residual value method frequently used by developers follows the same logic. In addition to risk premiums, land yields also include the land rent. Only the latter is value-creating. The time value can be used to analytically capture what is often vaguely referred to as "speculation" in the land policy discussion. As with financial options, the time value is positively dependent on the interest rate, the volatility of revenues (revaluation expectations), the term (in the case of private property mostly infinite) and negatively on the dividend. The latter is to be understood as everything that financially burdens the postponement of the follow-up investment (building). There are good reasons to assume that the time value can be considerable, especially in the case of high appreciation potential. Little is known about the magnitude in central and peripheral locations. To simplify matters, a linear course across the space is assumed in **Figure 1**. The ordinate shows the cost or value per sqm of building area, the abscissa indexes the distance from the centre in the monocentric agglomeration.

However, the (private) investor cannot realise the intrinsic value (hatched triangle in **Figure 1**) and the time value (between PI and P0 in **Figure 1**) at the same time. The construction of a building facility realizes the intrinsic value, but the time value gets lost. The benefit of being able to wait then turns into opportunity costs. The potential investor must therefore take into account both the costs of the building (plus return on capital incl. risk premium) and the opportunity costs of the lost time value, which arises with the construction (Loehr, 2019).

The time value therefore sets a minimum price PI for the building land even if it is not backed by correspondingly high land rents (between $MI_0$ and $MO_0$). Let's call $MI_0$ the "inner margin", in distinction to the "outer margin" $MO_0$. Left of $MI_0$ or $X_0$, in case of construction the loss of the time value is overcompensated by correspondingly high land rents. To the right of $MI_0$ or $X_0$, the lost time value would exceed the rents that can be generated by building on the land. Therefore, it is rational to refrain from building between $MI_0$ and $MO_0$. Beyond the inner margin there is thus a threat of inefficiencies on the land market. Schiller and Gutsche (2009: pp. 193-195) also describe this phenomenon, although they do not explain this on the basis of the real options approach.

The possible objection that most investors do not know the real option approach does not hold. Market participants do not need to know the economic laws in order to behave according to them.

Although there is no investment in buildings in the right of $MI_0$, municipalities still have to maintain infrastructure facilities. In this respect, municipalities

are in the role of the writer of the real option land.

## 2.2. Modification: Model with Taxes—Research Method

### 2.2.1. Effects on Land Yields and Land Values

Taxes either reduce purchasing power or increase costs. Therefore, the American economist Gaffney (2009) worked out that taxes always end up reducing the residual land rents as residual (hatched triangle in **Figure 1**), and thus also land values. Gaffney described this phenomenon with the acronym ATCOR ("all taxes come out of rent"). In addition, excess burden of taxation can reduce land yields. Gaffney named this phenomenon with the acronym EBCOR ("excess burden comes out of rent"). Excess burden means the costs of resource-intensive economic detours taken to avoid taxes, costs of compliance to the tax laws, or discouragement effects.

However, valid empirical studies on the relevance of the ATCOR and EBCOR effects do not exist. Nonetheless, there is evidence for their relevance from a macroeconomic perspective. If ATCOR and EBCOR apply, a higher tax burden must lead to lower land values. Assuming that land values are a key determinant of property values both in space and in time (Knoll et al., 2017), property prices can therefore be used as a proxy. However, in particular differences in GDP per capita also lead to different levels of property prices in different countries. To determine the influence of taxation on house prices, they should therefore be set in relation to gross income. If Gaffney's thesis holds, the lower the overall tax burden (in per cent of GDP), the higher the relative house prices must be, and vice versa. **Figure 2** illustrates for 35 OECD countries, which have been selected

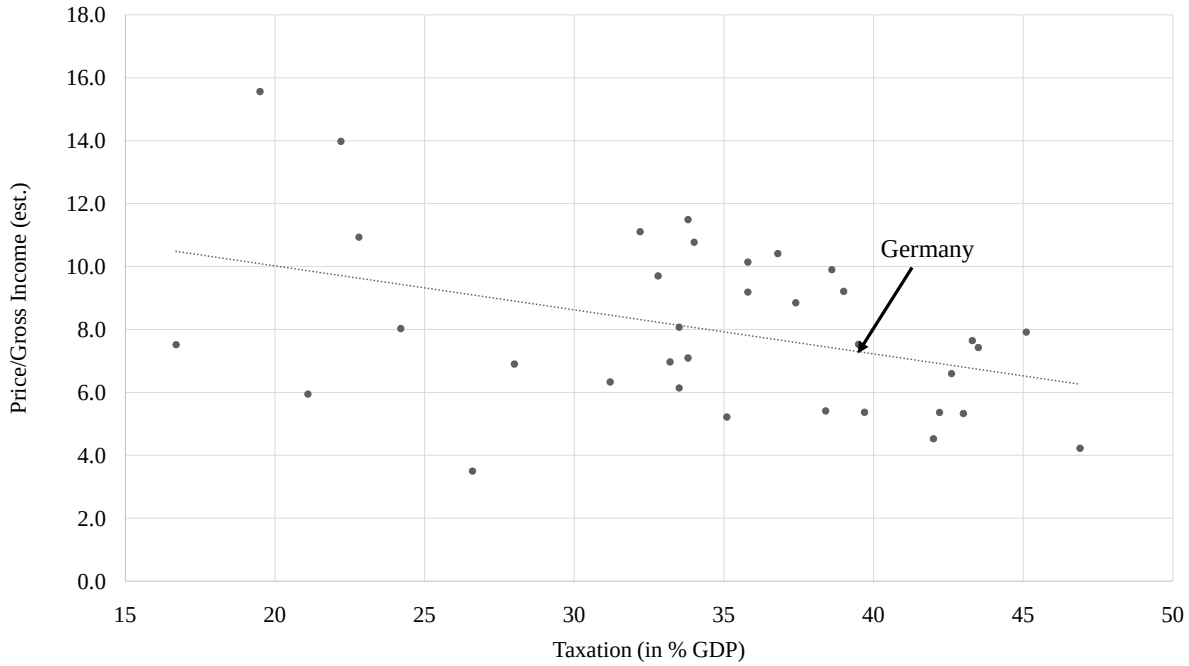


**Figure 2.** Price to gross income ratio and taxation (in % of GDP), data from 2021 (Source: OECD, 2022; Numbeo, 2022, own calculations).

according to data availability, that this tends to be the case (South-Korea was excluded as a statistical outlier).

The correlation between the taxation (in per cent of GDP) and the price/gross income ratio in the dataset is only moderately strong (−0.40 at a significance level of 0.05), as other factors (economic situation, real interest rate level, etc.) also influence house and land prices. Nevertheless, some dampening influence of taxation on property prices is indicated. This supports Gaffney's hypothesis.

Thus, the SOM is expected to have a dampening effect on both land rents and land values. LVT, on the other hand, does not influence the total volume of land revenues, but merely redistributes a share of the land rents in favour of the public sector. Nevertheless, land values fall here as well. This is because the intrinsic value of the real option land decreases with the reduced land rents in private hands. Furthermore, as the tax is on the land value, the time value of the real option land also decreases ("dividend").

### 2.2.2. Burden Shift Calculation

In order to be able to make reliable statements about the effects of the two extreme cases SOM and LVT, a tax burden shift calculation is carried out. For the purpose of better comparability, it is assumed in the calculation that the respective models are applied to Germany as a whole and not only in the respective states. Where necessary, national average land values were used accordingly. The calculation is based on the methodology developed independently by Henger and Schaefer (2015) and Loehr (2017). The latter model was later supplemented, among other things, by the inclusion of non-residential properties (Loehr, 2020). The residential uses considered include typical single-family houses (SFHs), two-family houses (TFHs) and multi-family houses (MFHs), primarily based on data from the 2011 census and its updates, as well as unused plots (UPs). For each house type, as for the non-residential buildings, a statistically representative property in an average location is assumed. The individual tax base for each house type can then be determined within the framework of the various property tax models. By multiplying the individual tax base of each house type by the number of economic units of each type, the aggregated tax base attributable to each type of house can then be calculated. Afterwards, for each property tax model an own tax rate is chosen in such a way that the total tax revenues remain unchanged compared to the status quo (overall "revenue neutrality"). On this basis, it is finally possible to determine the aggregated tax revenue allotted to each house type and each individual average unit. In addition, it is calculated for each type of house in the various property tax models how the tax burden changes if a poor and a good location is assumed instead of an average location. For this purpose, corresponding variations are made with the building and floor space as well as with the value of the land of the diverse house types in different locations. Due to statistical gaps, however, there are some uncertainties, especially with regard to the property tax B-relevant magnitude of the areas of unused properties and non-residential uses. The data refer to 2020 (they can be provided by the author

on request).

## 3. Influence of Taxation on Settlement Development

The subsequent Section 3.1 deals with the effects of SOM and LVT on land use, land yields and land values. Finally, in Section 3.2 statements are made about the influence on land use efficiency and settlement structure. This section is structured as follows: First, the expected effects based on the theoretical model described above are outlined. Then, based on the burden shift calculations, an attempt is made to quantify the effects in question.

### 3.1. Influence of Taxes on Land Use, Land Yields and Land Values

#### 3.1.1. Effects to Be Expected Theoretically

On the basis of the ATCOR and EBCOR thesis and the burden shift calculations outlined above, statements are now made about the spatial economic effects of the two models.

In the SOM, the absolute tax burden per sqm building area is expected to be almost the same for every type irrespective of the location, if the low tax burden on the floor area is disregarded. The tax burden is to the detriment of the land rent. Basically, the apportion ability of the tax to tenants does not change this, especially since it is at the expense of the net cold rents that can be earned in the future. The tax effects are further increased by the excess burden. The expected effects are illustrated in Figure 3.

For reasons of simplification, it is also assumed that the SOM, which mainly affects the buildings, has no influence on the time value of the real option land at all. Under the SOM, land rent per sqm building area decreases by the same absolute amount in central and peripheral locations (see ATCOR and EBCOR). The yields after tax are lower, compared to the yields before tax. Hence, the inner

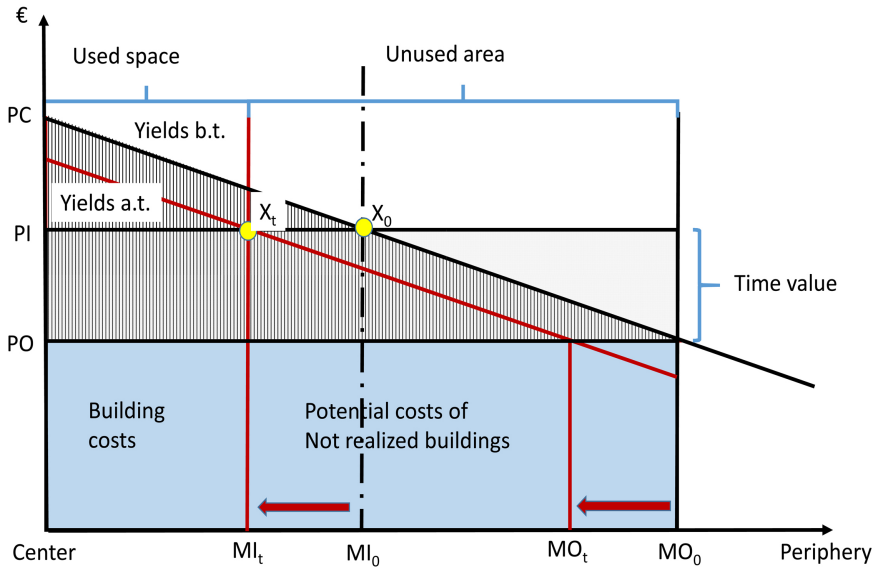


Figure 3. Effects of the SOM in space (Source: Loehr, 2019, with modifications).

margin will shift inwards towards the centre (from $MI_0$ or $X_0$ towards $MI_t$ or $X_t$), as it is determined now by the intersection $X_t$ of the time value curve with the after-tax yields. However, also the outer margin $MO_0$ is shifted inwards to $MO_t$, because it is the intersection between the yields after taxes and the potential costs of buildings PO that matters here. Thus, the volume of unused space increases. The latter could be specifically counteracted through the use of a property tax C, which reduces the time value of the real option land. However, this is only possible up to the new outer margin $MO_t$. Moreover, in fact, the use of property tax C is not provided for in Bavaria.

Since the yield gradient remains almost unchanged and the inner margin is moved towards the centre, the area used decreases within the SOM (now: Center to $MI_t$). Therefore, the average housing costs per unit of space must increase. At the same time, the time value of the option is hardly burdened. Hence the analysis of Capozza and Helsley (1990), according to which a higher time value of the real option land puts a hurdle, which leads to smaller and on average more expensive cities, must apply to a greater extent to the SOM.

With LVT, the same relative tax burden results in each location. This corresponds to an absolute tax burden that increases towards the centre. It should be noted that the land value in the outer margin is lower than in the reference model without taxation, as the LVT also acts as a dividend on the real option land. Section 4 shows that hardly any excess burden has to be expected from the land value tax. **Figure 4** illustrates the effects.

The yield curve after tax is obtained by applying the linear tax rate to the after tax land value. For the marginal land at the outer edge ($MO_0 = MO_t$), the tax base is only the time value of the real land option, which itself is dampened by the LVT. Towards the centre, land values increase with the yield potential of the land, and with them the absolute amount of the tax. With LVT, the inner margin $MI_0$ or $X_0$ is expected to shift outwards to point $MI_t$ or $X_t$. Since the time value is

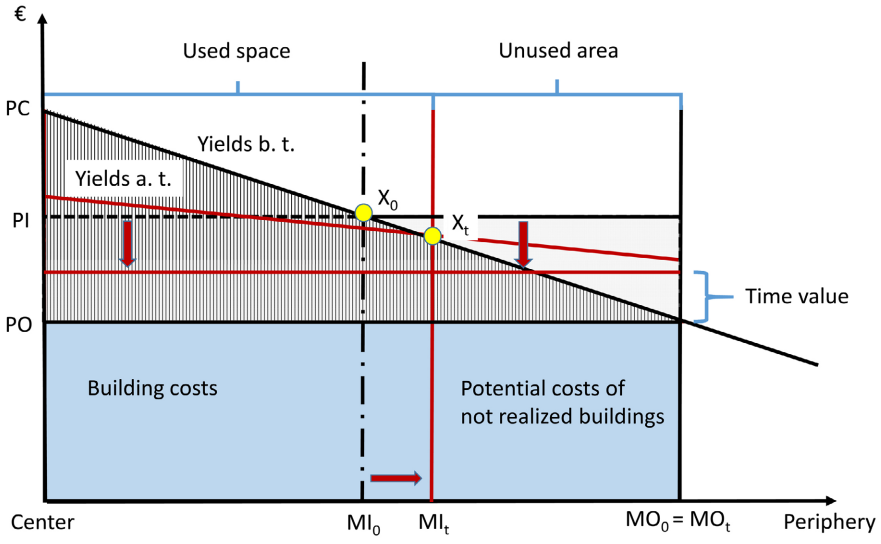


**Figure 4.** Effects of LVT in space (Source: Loehr, 2019, with modifications).

reduced, the intersection of the yield curves after tax and before tax is of relevance here. Therefore, the share of used land is extended. For a given yield curve before tax, the average housing costs, measured in terms of yields per unit of used space, will therefore fall. The settlements get bigger and less expensive. Since the intersection between the yields after taxes and the costs of the development PO does not change due to the LVT, the outer margin remains unchanged ($MO_0 = MO_t$). In addition, if a property tax C is applied, the time value of the unused land between $MI_t$ and $MI_0$ can be further decreased.

The findings support Hypothesis (1) and Hypothesis (2): With SOM, settlements tend to be smaller and more expensive than with LVT. Moreover, more building land remains unused.

### 3.1.2. Quantification of the Expected Effects

In the burden shift calculation, excess burden is roughly taken into account at a lump rate of 10% for developed land in the SOM model and 0% in the LVT model (see more in Section 4). Table 3 shows how much the land values per square metre of land area are reduced in both tax models (revenue neutrality provided).

If Table 3 is read horizontally, almost no difference between the taxation of SFH and TFH within the different locations appears within the SOM. Particularly with regard to MFHs, Table 3 provides additional information compared to Figure 3, which refers only to the square metre of building area. Since in MFHs there is more building area per square metre of floor space (density), the tax burden per square metre of floor space is significantly higher in the case of MFHs than in less dense developments (SFHs, TFHs).

Table 3. Tax per square meter land value (%).

| SOM | *SFH* | *TFH* | *MFH* | *UP** |
|---|---|---|---|---|
| Poor Location | 0.60 | 0.66 | 1.04 | 0.12 |
| Average Location | 0.18 | 0.18 | 0.31 | 0.04 |
| Good Location | 0.13 | 0.15 | 0.21 | 0.02 |
| LVT | *SFH** | *TFH** | *MFH** | *UP** |
| Poor Location | 0.30 | 0.27 | 0.31 | 0.31 |
| Average Location | 0.31 | 0.31 | 0.31 | 0.31 |
| Good Location | 0.31 | 0.31 | 0.31 | 0.31 |
| FI: Status Quo | *SFH* | *TFH* | *MFH* | *UP** |
| Average Location | 0.26 | 0.25 | 0.52 | 0.05 |

* No excess burden considered (Source: Henger & Schaefer, 2015; Loehr, 2020; updates).

This means that when the tax burden is capitalised, SOM under the premise of ATCOR and EBCOR reduces the land value relatively more in the dense MFHs than in the non-dense SFHs and TFHs, whereas LVT is neutral (everywhere approx. 0.31% per sqm). The land rent gradient is thus depressed by SOM, but not affected by LVT (Dwyer, 2014: pp. 764-777).

Nevertheless, it cannot necessarily be concluded from this that SOM promotes denser building due to lower land values in the centres of agglomerations. For this to be the case,

- the impact on the mobilisation of undeveloped construction land

and

- the impact of taxation on the investment activity itself

must be taken into account.

The right column in **Table 3** illustrates the relative tax burden of both systems on undeveloped but buildable land (per notional housing unit). It becomes clear that LVT has a significantly higher mobilisation effect than SOM. Especially in good locations, the pressure of use under SOM is minimal. This all supports in particular Hypothesis (2).

The impact on investment activity for the different building types is discussed in Section 3.2 below.

## 3.2. Influence on the Settlement Structure

### 3.2.1. Effects to Be Expected Theoretically

Planning generally aims for more compact settlement structures. This supports lower land and energy consumption. However, the planning goals are better supported by the property tax if land-intensive forms of housing (especially SFH) are subject to a higher tax burden than land-saving forms of housing (especially MFH).To check this, the tax burden must be put in relation to the total value of the property.

The SOM tends to ease the relative tax burden for compact housing (MFH), compared with SFH and TFH. In LVT, two opposing effects on compact housing should be noted: On the one hand, the tax per square metre living space decreases with the building area that is erected on a plot (building density). This tends to favour multi-family houses. However, this effect is curbed by the fact that a higher settlement density normally also results in higher land values. Here, an optimum is to be expected at the land value at which the tax per residential unit is minimised (Loehr, 2018: p. 86).

### 3.2.2. Quantification of the Expected Effects

**Table 4** illustrates the tax burden per unit of living space for the two property tax models considered. In the SOM, an additional tax burden of 10% was again assumed. In order to capture the effects on building development, **Table 4** must also be read horizontally.

While the old property tax is almost neutral for average locations, land-saving forms of housing are relieved in both SOM and LVT. However, with regard to

Table 4. Tax burden, relative to the market value of the entire property (%).

| SOM | *SFH* | *TFH* | *MFH* | *UP** |
|---|---|---|---|---|
| Poor Location | 0.15 | 0.17 | 0.09 | -/- |
| Average Location | 0.08 | 0.08 | 0.06 | -/- |
| Good Location | 0.06 | 0.06 | 0.04 | -/- |
| LVT | *SFH** | *TFH** | *MFH** | *UP** |
| Poor Location | 0.07 | 0.07 | 0.03 | -/- |
| Average Location | 0.14 | 0.14 | 0.06 | -/- |
| Good Location | 0.14 | 0.13 | 0.07 | -/- |
| FI: Status Quo | *SFH* | *TFH* | *MFH* | *UP** |
| Average Location | 0.12 | 0.11 | 0.10 | -/- |

*No excess burden considered (Source: Henger & Schaefer, 2015; Loehr, 2020; updates).

the load ratios, LVT favours land-saving housing forms more than SOM and the old property tax (ratio SFH or TFH to MFH). This result supports Hypothesis (3).

## 4. Distributional and Welfare Effects

Regarding distribution, a distinction has to be made between first-round and second-round effects. The first-round effects examine how the various taxes burden the properties in the different locations relative to the market value of the property as a whole. Second-round effects discuss the economic pass-through possibilities that are relevant to tenancies. This question is closely related to that of welfare effects, although this is a question of allocation, not distribution. However, only the first-round effects can again be substantiated on the basis of the burden shift calculations.

### 4.1. First-Round Effects

With SOM, it is to be expected that the first-round effects will tend to be regressive, as there is no reference to location in the tax base. With LVT, on the other hand, a progressive course is to be expected, especially since the property value is largely determined by the land value. This expectation is provisionally confirmed when reading Table 4 (Section 3.2) vertically.

For example, with SOM, the property tax for a THF in a poor location is 0.17%, but in a good location it is only 0.06% of the market value of the total property. The same type of property would be taxed at only 0.07% under LVT in a poor location, but at 0.13% in a good location. These findings are in line with Hypothesis (4).

However, there is broad agreement among real estate economists that, in the short term, an apportionment is economically possible in all models, especially if the existing rents have fallen far behind the new rents (rent gap).

### 4.2. Second Round Effects

As already noted above, in Germany property tax is legally apportionable to tenants (§ 2 No. 1 Operating Costs Ordinance—"Betriebskostenverordnung"). Economically, this is not at all so clear, especially since the apportionment of property tax potentially affects the rents that can be earned in the future. Particularly in the longer term, the incidence can therefore be different from that shown in Section 4.1, with consequences for rents and property prices. In this context, the economic apportionment possibilities must be seen in close connection with the excess burden generated by the tax, which are also responsible for welfare losses of taxation. While **Figure 3** and **Figure 4** largely address the effect of taxation in space, the analysis presented below refers to a fictitious equilibrium point.

With SOM, the tax mainly affects the building. It is an apportionable quantity-based cost tax. At the same time, the supply curve for buildings has a certain price elasticity in the long term (see **Figure 5**).

Since the tax has to be paid by the tenant, the after-tax demand curve ($D_t$) runs below the pre-tax demand curve ($D_0$). As in **Figure 3**, the absolute amount of tax per square metre of space is independent of the amount of space X demanded.

With SOM, the owner can limit his tax burden by foregoing expansion investments (Difu and Vhw, 2017: p. 21). Only to the left of point Z does the supply of housing become profitable, as then the demand after taxes $D_t$ exceeds the supply. If many landowners act in this way, there is a price increase for housing (from $P_0$ to $P_{tD}$) due to shortage effects (from $X_0$ to $X_t$). However, the price increase does not include the entire tax; a part of the burden is borne by the owner (difference between $P_0$ and $P_{tS}$). The welfare losses caused by investment abstinence are represented by the loss of producer and consumer surplus, which is

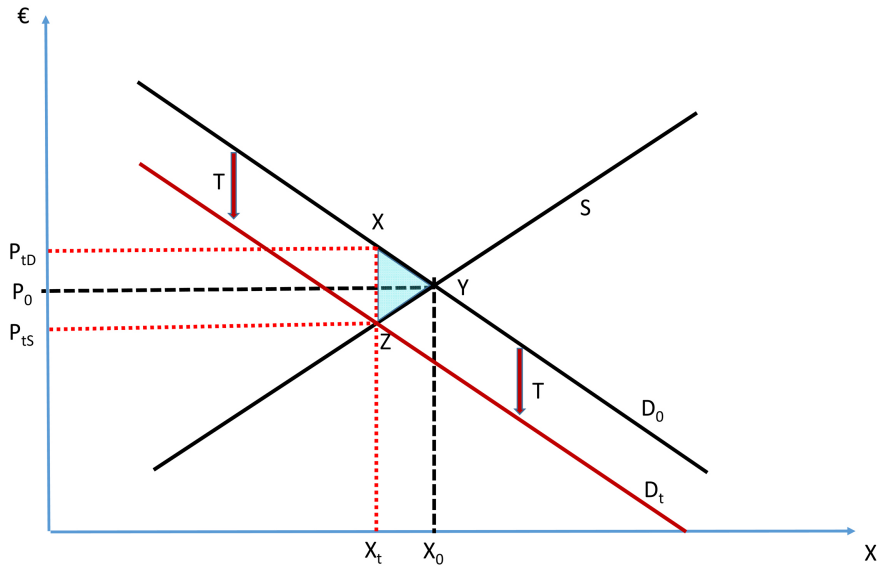


**Figure 5.** Incidence in SOM (Source: Own presentation).

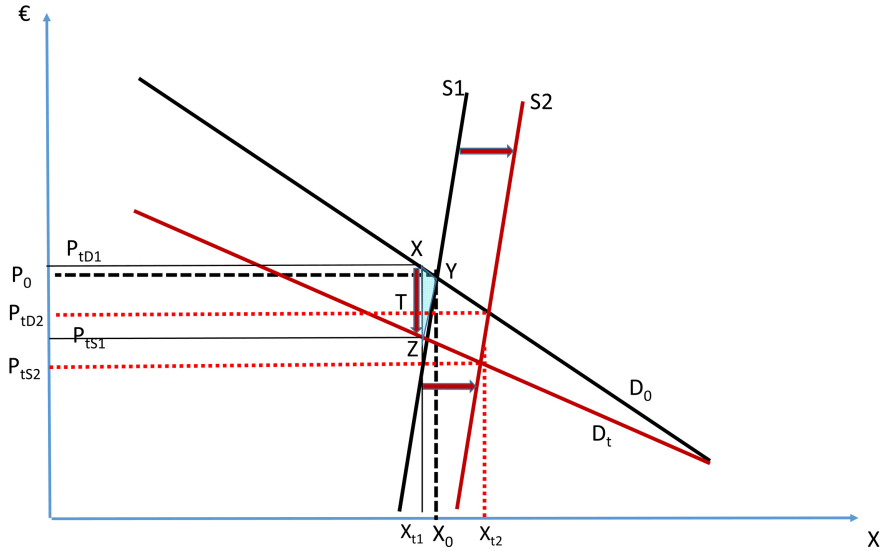


**Figure 6.** Incidence in LVT (Source: Own presentation).

described by the triangle XYZ in **Figure 5**. Since with SOM the tax burden is mainly on buildings, significant effects on the time value of the real option land, which could lead to a shift in the supply curve, therefore do not arise.

**Figure 6** shows the incidence of LVT, which is completely different from SOM. As in **Figure 4**, the absolute amount of tax is higher at higher land prices and vice versa. This explains the rising difference between the after- and versus pre-tax demand curve ($D_0$ - $D_t$) towards the centre.

In a first step, the price also rises with LVT, but due to the inelastic land supply, it rises much less than with SOM (from $P_0$ to $P_{tD1}$). The lion's share of the tax (difference $P_0$ to $P_{tS1}$) is borne by the landowner. Thus, the part of the tax that can be passed on to the tenant (in rent) in the longer term ($P_0$ to $P_{tD1}$) is significantly lower than with SOM. The welfare loss due to excess burden is also much lower than with SOM (triangle XYZ in **Figure 6**). The landowner is always burdened in the same way regardless of the development; there is no potential for tax reductions by foregoing investments. Accordingly, initially the supply only decreases from $X_0$ to $X_{t1}$.

With LVT, however, a second effect takes place: unlike with SOM, the tax weighs solely on the land and has a dampening effect on the current time value as a "dividend". This damping makes the effective supply rise from $X_{t1}$ to $X_{t2}$ (due to the rightward shift of the supply curve from $S_1$ to $S_2$). Ideally, there can be compensation or even overcompensation of the first step, resulting in a price reduction and welfare increase. The price reduction (to $P_{tD2}$ resp. $P_{tS2}$) would be at the expense of the landowner alone.

Also, the results of the second round consideration support Hypothesis (4).

## 5. Discussion

The study is subject to the reservation that empirical based statements on the

magnitude of the time value of the real option in central and peripheral locations could not be made. The same applies to empirically supported statements regarding the incidences of both tax models. In addition, with regard to the location, only the comparison to a clean slate could be made within the burden shift calculations. The German Federal Constitutional Court rejected the old unit values as a basis for assessment precisely because they no longer follow a comprehensible logic of taxation. Therefore they cannot be modelled accurately for different locations. Thus, the informative value of the burden shift calculations is admittedly limited.

Finally, property tax in Germany only accounts for 2 percent of total tax revenue, if social security contributions are added, the figure is only about 1 percent. For comparison: In the USA, the share of property taxes in total tax revenues is about 12 percent (Bunn, 2022b). The low property tax burden in Germany means that the mechanisms described can easily be overlaid by other effects.

## 6. Conclusion

With its various property tax systems, Germany is an interesting field of observation for the future in terms of how different models work. The present study was limited to a comparison of the two poles in the scale of property tax models with regard to their effects on settlement policy: on the one hand, the area-based tax in Bavaria (SOM), which is mainly charged on the building, and on the other hand, the land value tax in Baden-Wuerttemberg (LVT). The federal model applied by most of the states lies between these poles: on the one hand, it does not differentiate between locations with regard to rents (like SOM), on the other hand, the land value is included in the tax valuation (like LVT).

The expected influence of the two cases studied on land values, the settlement structure and housing costs were considered theoretically, and substantiated by means of burden shift calculations.

The findings provisionally support the hypothesis formulated at the beginning.

- Area-based taxes, which are primarily levied on the building (SOM), basically don't support the pursuit of sustainability-related planning objectives such as compact settlements and affordable housing. They set a hurdle for compact housing developments, and work towards smaller and more expensive settlement bodies. The mobilisation effects on undeveloped land are minimal. In this respect, they tend to promote tendencies toward urban sprawl.
- In contrast, value-based property taxes, which are mainly levied on the land (LVT), are neutral or even supportive of planning or land policy (Kiepe, 2019). Settlement bodies are larger, denser and housing costs fall on average. Pressure is exerted on the development of unused building land.

All of this argues for assigning increased weight to land value in the tax base (as in Pennsylvania, USA; Vincent, 2019) or taxing only land value (LVT).

A LVT could also help bring about better compliance with planning, as there is pressure to use the land according to planning guidelines. Planning should always

have primacy, however, because the diverse demands on space for use cannot be weighed solely in terms of economic considerations.

As shown in Section 5, however, a land value tax must be levied at a certain level in order to have any spatial economic effects at all. In countries such as Germany, where the property tax has so far played a rather subordinate role, a significant increase would be required. Since the property tax is mostly designed as a municipal tax, the municipalities would benefit from the increase in tax revenues. On the other hand, other taxes would have to be lowered (e.g. income tax) in order for a strengthening of the property tax to be politically enforceable (tax shift). However, if this resulted in revenue losses for other authorities, this could be politically difficult. Therefore, to the extent that increased property tax revenues accrue to the municipalities, other municipal taxes should be reduced accordingly. In Germany, for example, lowering the business tax is an option.

Nonetheless, it should be interesting to revisit the topic in a few years and examine the extent to which the statements presented here regarding the predicted effects of the various tax models have proved to be true.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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