

On the Political Economy of Housing's Tax Status*

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Abstract

The aim of this paper is to explain why the US tax system favors owner housing compared to business capital despite the efficiency losses involved. We build a simple dynamic general equilibrium model where households vote over the effective capital income tax rates for housing and business capital under a government budget constraint. We calibrate the model so that it roughly matches the joint distribution of total wealth and housing wealth among US households. The median voter turns out to have a large share of his wealth in the form of housing. The key trade-off he faces is that a low tax rate on housing 1) shifts the tax burden to wealthier households but 2) leads to a high tax rate on business capital and hence low wages and high interest rates. In our model economy, the first effect dominates, and the equilibrium tax rate on housing is much lower than the tax rate on business capital.

Keywords: Housing taxation, capital taxation, political economy

JEL Classification: E62, H31, P16

1 Introduction

The US tax system favors owner housing. The main tax advantage of housing is that, unlike the return to business capital, the return to owner housing - usually referred to as the imputed rent - is untaxed. In addition, mortgage interest payments are to a large extent tax deductible.¹ It is by now well understood that the preferential tax treatment of housing creates substantial efficiency losses. At the very least, it distorts households' consumption decision by affecting the relative price of housing and consumption goods. In a general equilibrium framework, it also crowds out business capital. Berkovec and Fullerton (1992), Hendershott and Won (1992), Poterba (1992), Skinner (1996), and Gervais (2002), among others, have evaluated quantitatively the effects of the tax favored status of housing in the US.² Especially the last two of these papers, employing dynamic models, find that increasing

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¹Most OECD countries have similar tax benefits for owner housing. See Hendershott and White (2000) for an international comparison of housing taxation.

²These papers focus on different aspects of housing and housing taxation all of which are not present in our analysis. For instance, Berkovec and Fullerton (1992) and Hendershott and Won (1992) take house price uncertainty into account. Our approach is similar to that in Skinner (1996) and Gervais (2002) in that we use a dynamic general equilibrium model. Rosen (1985) presents a survey of the earlier literature on housing

the effective tax rate on housing and lowering the tax rate on business capital would yield substantial efficiency gains.

An obvious question is then why the tax system favors housing despite the efficiency losses involved. The purpose of this paper is to answer this question by analyzing the tax status of housing from a political economy perspective. While there is a large literature on the political economy of capital income taxation, there seems to be no previous analysis focusing on the different tax treatment of housing and business capital. Given that the stock of housing capital is very large, comparable in size with the stock of business capital, this seems an important gap in the existing political economy literature on taxation.

The starting point of our analysis is the observation that while housing wealth makes up about half of all household wealth in the US, it is much more evenly distributed than non-housing wealth. In consequence, most households have most of their wealth in the form of housing and a low tax rate on housing wealth shifts the tax burden towards the very wealthiest households owning most of the non-housing wealth. By using a dynamic general equilibrium model with wealth and labor income heterogeneity we are able to assess whether such a distributional effect may dominate efficiency arguments.

We consider a situation where there are two assets available for the households: housing and a financial asset. We first assume that there is only owner housing, that is, the market for rental housing is closed. This allows us to focus on the distributional effect we are interested in. We frame the political problem as one of choosing the tax rates on housing and on the financial asset under a balanced budget constraint. Since the aggregate amount of the financial asset corresponds to the aggregate stock of business capital, the tax rate on the financial assets is also the effective tax rate on the return to business capital.

We calibrate the model so as to match the joint distribution of total wealth and labor income as well as certain aggregate ratios in the US data. The endogenously determined distribution of housing also roughly matches the data. In particular, housing wealth is much more evenly distributed than total wealth. We find that the median voter chooses to tax housing capital at a much lower rate than business capital even though this implies a small business capital stock and hence a low wage rate and a high interest rate. This result is closely linked to distributional issues. In the absence of wealth and labor income heterogeneity, the equilibrium tax rate on housing would be much higher, reflecting the usual efficiency cost of taxing business capital in a dynamic economy.

About one third of US households rent their housing and are likely to have very different policy preferences than homeowners. Therefore, we reconsider our results in a setting where a fraction of the households are renters. In this case, we assume that the return to rental

taxation.

housing is taxed at the same rate as the return to business capital. The equilibrium tax structure does not change substantially with the introduction of renters. Although the median voter is now richer in terms of total wealth and has a smaller share of his wealth in the form of housing, he still votes for a very low tax rate on housing. A low tax rate on housing shifts the tax burden towards renters as well as the richest households owning most of the non-housing wealth.

We proceed as follows. In the next section, we present data on the distribution of housing wealth and non-housing wealth. In section 3, we describe the model. We discuss calibration in section 4. The results are presented in section 5. In section 6 we introduce renters. We conclude in section 7.

2 The distribution of non-housing wealth and housing wealth

In this section, we briefly look at the distribution of housing wealth and total wealth. We use family data from the 2001 wave of the Panel Study of Income Dynamics (PSID). We will use three variables. In PSID, households are asked to report their estimate about the market value of their house, this is what we call housing wealth. The other wealth variable we use is ‘total wealth’. Its main components are typically stocks, mortgages, bank deposits, as well as owner housing. When calibrating our model, we also need information about household’s labor income, which we define as the sum of labor income of the household ‘head’ and ‘wife’ together with private pension income. The data contain 7406 households. However, we exclude a number of households from the sample. First of all, we exclude all households who do not either own or rent their home. Second, we exclude households with information missing about any of the above mentioned variables. In addition, we need to exclude a small number of households which have negative total wealth together with a very low labor income, since they could not afford positive consumption in the model.³ After this procedure, we are left with 6691 households.

Figure 1 presents the cumulative holdings of total wealth and housing wealth of the 6691 households. Figure 2 in turn displays the total wealth and housing wealth distribution for only middle-aged homeowners. In sections 4 and 5 we will focus on this subsample.

³To be more specific, we exclude all households for which $0.1 * Total\ wealth + labor\ income \leq 0$.

Figure 1: Distribution of total wealth and housing wealth, all households.

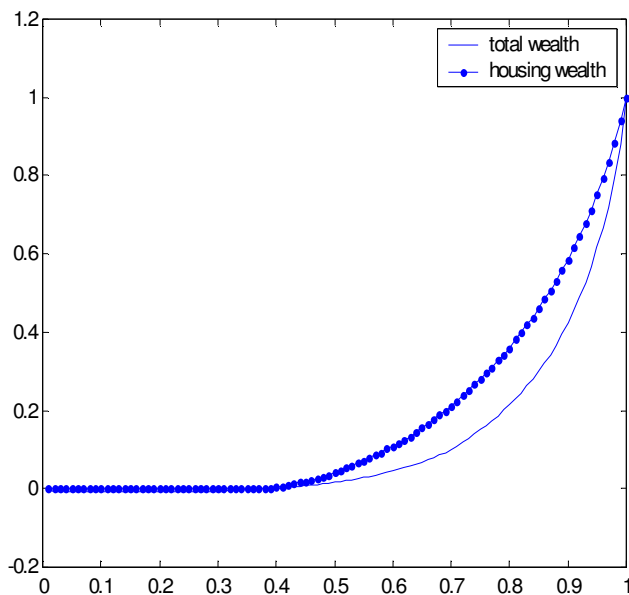
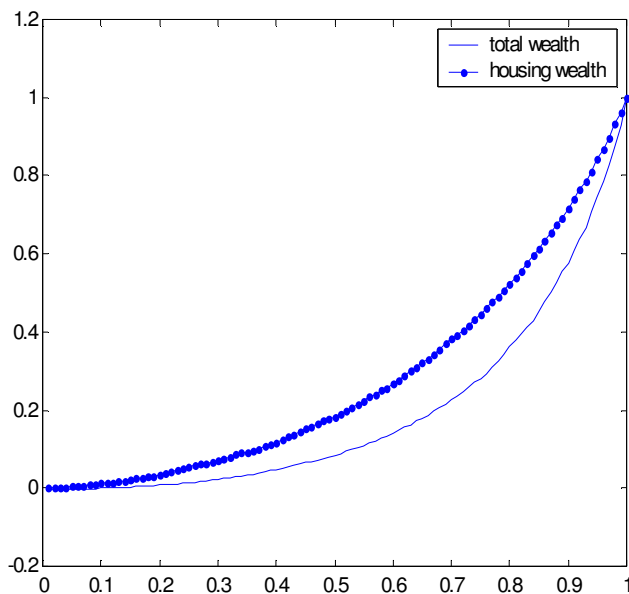


Figure 2: Distribution of total wealth and housing wealth, middle-aged homeowners.



About 30% of the households are renters. This shows up as a flat part in the cumulative distribution of housing wealth in the first figure. It is clear, however, that in both cases housing wealth is much more evenly distributed than total wealth. Since the aggregate value of the housing stock is about one half of the aggregate total wealth, these figures also imply that most households have most of their wealth in the form of housing.⁴ The main purpose of our theoretical analysis is to study how this is reflected in the politically determined tax status of housing.

3 The model

We consider a heterogenous agent version of the deterministic neoclassical growth model where the aggregate capital stock is disaggregated into business capital and housing capital. The tax code in the model differentiates between the interest income from business capital and the imputed rent from housing capital. An important feature of the model is that it allows any relative steady state distribution of total wealth. Furthermore, any steady state distribution of total wealth is compatible with any labor income distribution, as long as households can afford positive levels of consumption and housing.⁵

In this section, we first present the model economy with given tax rates and then discuss the voting process and the politico-economic equilibrium.

3.1 The neoclassical growth model with housing

Time is discrete and goes on forever. There are I types of infinitely lived households with different amounts of total wealth and different labor productivities. There is a continuum of households of each type. We use $m^i > 0$ to denote the mass of households of type i . The total mass of households is normalized to one.

Each household derives utility from consumption of a composite consumption good, c , and housing, h . In addition to housing, households can save (or borrow) using a financial asset, a .

There is also a government. Each period, it needs to finance an amount G of public consumption and an amount Tr of transfers that it pays to the households. The transfers

⁴We are by no means the first to stress the fact that for most households housing is the single most important component of their total wealth. See, for instance, Flavin and Yamashita (2002) who focus on homeowners' portfolio choice.

⁵Krusell and Ríos-Rull (1999) present a detailed analysis of this issue in the context of a very similar model. See also Caselli and Ventura (2000).

are equal to all households and they are paid in a lump-sum fashion. The government has three tax instruments at its disposal, a capital income tax, τ_k , a tax on housing (i.e. on the imputed rent), τ_h , and labor income tax, τ_l . It faces a balanced budget constraint which we specify below.⁶

The problem of a household of type i in period s is

$$\max \sum_{t=s}^{\infty} \beta^t u(c_t^i, h_t^i) \quad (1)$$

subject to

$$c_t^i + a_t^i + h_t^i = [1 + (1 - \tau_{k,t})r_t]a_{t-1}^i + (1 - \tau_l)\varepsilon^i w_t + (1 - \delta_h - \tau_{h,t}r_t^{ir})h_{t-1}^i + Tr, \quad (2)$$

where $\sigma > 0$ denotes the inverse of the intertemporal elasticity of substitution, $\gamma > 0$ the housing share parameter, $\beta \in (0, 1)$ the discount factor, and $\varepsilon > 0$ labor productivity. The interest rate is r and the imputed rent from housing is r^{ir} . The depreciation rate of housing is $\delta_h \in (0, 1)$.

The imputed rent is defined as the market value of housing services net of depreciation. Even though there is no rental housing, it is easy to see what the rental rate would be. In the absence of uncertainty, the return to rental housing must equal the return to the financial asset. The rental rate of housing would thus be equal to $r_t + \delta_h$. The imputed rent is therefore simply $r_t^{ir} = r_t$.

The holdings of the financial asset can be negative. In that case we could think of them as mortgages. Note also that we assume that interest payments on loans ($a < 0$) are tax deductible. We do this because in the data most of household borrowing corresponds to mortgages and mortgage interest payments are indeed largely tax deductible within the current US tax system.

The supply side of the economy consists of an aggregate production function which combines business capital and labor to produce output goods. The output goods can be costlessly transformed into business capital, consumption goods, and housing. The production function is of the usual Cobb-Douglas form. The labor productivity parameters are normalized so that aggregate effective labor is one (i.e. $\sum m^i \varepsilon^i = 1$). The aggregate stocks of business capital, housing, and consumption are

$$H_t = \sum_{i=1}^I m^i h_t^i, K_t = A_t = \sum_{i=1}^I m^i a_t^i, C_t = \sum_{i=1}^I m^i c_t^i \quad (3)$$

⁶Transfers make the distribution of total income more equal. They are therefore important in shaping the distribution of housing relative to the distribution of total wealth.

and the resource constraint is

$$C_t + K_t - (1 - \delta_k)K_{t-1} + H_t - (1 - \delta_h)H_{t-1} + G = K_{t-1}^\alpha, \quad (4)$$

where $\delta_k \in (0, 1)$ denotes the depreciation rate of business capital and $\alpha \in (0, 1)$ the capital share in the production function.

The interest rate and the wage rate are given by

$$r_t = \alpha K_{t-1}^{\alpha-1} - \delta_k \quad (5)$$

and

$$w_t = (1 - \alpha)K_{t-1}^\alpha. \quad (6)$$

Finally, the budget constraint of the government is

$$\tau_l w_t + \tau_{k,t} r_t A_{t-1} + \tau_{h,t} r_t H_{t-1} \equiv T = G + Tr. \quad (7)$$

We allow the tax rates on business capital and housing to be negative as long as the government budget constraint is satisfied.

3.2 Politics

The mechanism of collective decision making we consider is direct voting. At period t households vote over the tax rate on housing for the following period, $\tau_{h,t+1}$. The tax rate on business capital, $\tau_{k,t+1}$, is determined as a residual from the government's budget constraint. The tax rate on labor income is assumed to be constant. We assume that households take future housing tax rates as given. In other words, when the households consider different tax rates on housing, they do not take into account how this period's voting outcome affects the voting outcome in the following period through its effect on the wealth distribution. This assumption is sometimes referred to as 'political myopia'. Households do, however, take into account how the choice of τ_h affects τ_k and factor returns in the future periods given fixed τ_h . We look for a steady state equilibrium where both tax rates are constant over time.

Our equilibrium concept differs from the recursive political equilibrium with fully forward looking agents presented in Krusell et al. (1997). The reason for adopting the simpler approach is that it results in dramatically lower computational cost which in turn allows us to have a relatively large number of different household types. Having many household types is important here. In the first model we calibrate, there are two exogenous distributional features, the steady state wealth distribution and the labor income distribution. In the extension, we introduce a third dimension, namely renters vs. homeowners. With a small number of different household types, we would have to sort the households in the data along

a single dimension. The problem with this approach is that the resulting equilibrium tax rate is then likely to depend on the sorting criteria. With the simpler equilibrium concept we use, we can have a sufficiently large degree of heterogeneity in the model. That is, we can divide the households in the data according to all the exogenous distributional dimensions of the model and use the resulting groups as a basis for our calibration. In the benchmark case, we sort homeowners into 25 groups according to their labor income and total wealth.

In solving for the political equilibrium, we need to check that the policy preferences of the households are such that the median voter theorem applies. A sufficient condition for this is that the preferences are single-peaked. With single-peaked preferences, the equilibrium tax rate determined by direct voting of the households coincides with the median tax rate in the distribution of the most preferred tax rates of the households. In all the cases that we looked at, the policy preferences were indeed single-peaked.

3.3 Definition of steady state equilibrium

A politico-economic steady state equilibrium of this economy consists of aggregates $\{K, H\}$, household policies $\{a^i, h^i, c^i\}_{i=1}^I$, prices $\{r, w\}$, and tax rates $\{\tau_k, \tau_h\}$ such that:

- 1) Prices satisfy (5) and (6).
- 2) Household policies $\{a^i, h^i, c^i\}$ solve household's problem in (1)-(2) (together with a transversality constraint).
- 3) Markets clear:

$$\begin{aligned} \sum m^i a^i &= K \\ \sum m^i h^i &= H \\ \sum m^i c^i &= C \\ C + \delta_k K + \delta_h H + G &= K^\alpha \end{aligned}$$

- 4) Government budget constraint (7) is satisfied.
- 5) τ_h wins any other feasible tax rate τ'_h in a pairwise voting with majority rule.

3.4 Solving for the steady state equilibrium

We find the politico-economic steady state equilibrium in the following way. We first guess the equilibrium housing tax rate. Using the steady state conditions, we can then find the equilibrium tax rate on business capital and the steady state housing distribution. Starting from this distribution of business and housing capital, we consider other tax rates on housing for the following period. In practice we consider tax rates on a discrete grid with a step

size of 0.01. Each tax rate on housing in the following period is associated with certain transitional dynamics (including varying business capital tax rates which are determined by the government budget constraint) implying a certain discounted sum of future periodic utilities to each household type. Thus, for each possible tax rate, we need to solve for the corresponding transitional dynamics. Given the structure of the model, this is easily done by solving a system of non-linear equations that consists of the first-order conditions, the government budget constraint, and the aggregate resource constraint for each period during the transition. Once we have calculated the utility associated with each housing tax rate for each household type, we can find the most preferred tax rates of the different households. If any feasible tax rate wins the current tax rate (our guess for the steady state tax rate) in the voting, we conclude that our guess for the steady state housing tax rate was wrong. We then adjust our guess until we find a tax rate that wins all other tax rates in a pairwise voting.

4 Calibration

In this section, we describe our benchmark calibration. We first fix all tax rates at empirically plausible levels and then calibrate other parameters so that, given those tax rates, the model replicates the empirical distributions of total wealth and labor income as well as certain aggregate ratios. When considering the politically determined tax rates, we keep other parameters constant.

We consider only homeowners between 35 and 55 years of age (the age of the household head). We focus on middle-aged households because our model abstracts from life cycle features. The resulting housing distribution matches the data much better when we exclude very young and very old households from the sample. With only middle-aged homeowners there are 2380 households in our sample.

We consider 25 different types of households who differ in terms of their labor income and steady state total wealth. We first determine for each household in the data the total wealth quintile and the labor income quintile it belongs to. This creates the 25 groups of households. Table 1 below shows the share of households in each group. Note that the groups are of very different size.⁷ The smallest groups consist of very wealthy households with modest labor income and poor households with high labor income.

⁷Of course, in principle each wealth and labor quintile should have 20% of the total mass. However, since we have a finite number of households in the data with households having very different weights attached to them, the quintiles end up being of slightly different sizes.

Table 1: Population shares (%).

Wealth quintile	Labor income quintile				
	1	2	3	4	5
1	8.1	5.0	3.9	2.7	0.7
2	4.7	4.8	5.0	4.1	1.2
3	3.4	4.4	4.5	4.8	2.9
4	2.7	2.9	3.5	4.8	6.2
5	2.3	2.2	2.7	3.6	9.0

For each of these 25 groups, we compute the average total wealth and the average labor income. We then divide the average total wealth in each group by the average total wealth in the whole sample and similarly for the labor income. Table 2 shows the resulting total wealth and labor income distributions. For instance, 0.06 in the first row of the first column of the table means that the average total wealth of households belonging to the first wealth quintile and the first labor income quintile is 6% of the average total wealth in the whole sample.

The left-hand part of the table shows that, in each wealth quintile, the distribution of wealth is quite equal across different labor income quintiles. The wealthiest quintile makes an exception though. In that group, differences in wealth are substantial across labor income groups: the average wealth in the fifth labor income quintile is twice the average wealth in the fourth income quintile. The right-hand part of the table shows a similar pattern. For the middle income groups, the average income does not vary much when the wealth quintile changes. All in all, labor income is much more evenly distributed than total wealth.

Table 2: Distribution of total wealth and labor income.

Wealth quintile	Total wealth					Labor income				
	Labor income quintile									
	1	2	3	4	5	1	2	3	4	5
1	0.06	0.06	0.05	0.05	0.00	0.23	0.54	0.79	1.14	1.75
2	0.21	0.21	0.22	0.22	0.23	0.23	0.54	0.82	1.13	1.79
3	0.43	0.43	0.45	0.46	0.42	0.21	0.56	0.81	1.14	1.82
4	0.85	0.87	0.86	0.88	0.92	0.14	0.51	0.83	1.17	1.85
5	2.99	2.27	2.35	2.22	4.65	0.13	0.53	0.79	1.16	2.93

In calibrating the model, we match the distributions of total wealth and labor income presented in table 2. As discussed above, we match them perfectly. In contrast, the model

does not have enough degrees of freedom to perfectly match the housing distribution. However, we will find that our calibration matches reasonably well the housing distribution as well.

We take the model period to be 4 years. We set $\sigma = 3$, a standard value in the related literature. Greenwood et al. (1995) have estimated the share of business capital in the production function when total capital stock is disaggregated into housing and business capital. Based on their estimate we set $\alpha = 0.29$. The depreciation rates of business capital and housing are set at $\delta_k = 0.1$ and $\delta_h = 0.06$. The National Income and Product Accounts (NIPA) suggest a depreciation rate for housing capital around $\delta_h = 0.015$. By choosing a higher depreciation rate, we want to take maintenance costs into account.

Rest of the parameters are chosen so that with empirically plausible tax rates the model matches certain aggregate ratios in the data. There are various estimates for the effective tax rates on housing, business capital, and labor income in the US. We set the tax rate on labor income at $\tau_l = 0.34$ which is roughly the sum of average effective tax rates on labor income and consumption in the US as estimated by Mendoza et al. (1994). We set the housing tax rate at $\tau_h = 0.15$. This is in the upper end of the range of estimates for the effective tax rate on housing presented by Fullerton (1987).⁸ We did not want to assume a much lower tax rate on housing because that would have implied an implausibly high tax rate on business capital in our model. We then choose parameters β, γ , and T so as to match the following aggregate ratios. 1) Business capital-to-housing ratio $K/H = 1$. 2) Total capital-to-total output ratio $(K + H)/(4Y) = 3.0$, where $Y = K^\alpha + rH$. 3) Government expenditure-to-total output ratio $T/Y = 0.28$. 4) Transfers-to-total government expenditure ratio $Tr/T = 0.33$. The first two of these targets are based on the NIPA. We interpret all business capital in the model as private non-residential assets and housing capital as private residential assets. The third target is from the OECD Revenue Statistics.⁹ The fourth target corresponds to calculations in Krusell and Ríos-Rull (1999) about the share of transfers of all government expenditures. These targets imply the following parameter values: $\gamma = 0.1895$, $\beta = 0.9555$, $G = 0.1509$, and $Tr = 0.0754$. The tax rate on business capital is determined as a residual from the government budget constraint and is $\tau_k = 0.4004$.

We now compare the distribution of housing in the model with that in the data. For table 3, we have calculated the average amount of housing in each of the 25 wealth-income

⁸The estimate of the effective tax rate on housing depends in part on whether property taxes are included. If property taxes are not considered as taxes on housing (but rather as fees for community services) the effective tax rate on housing is lower.

⁹According to the OECD, the share of total tax revenue of GDP has increased from 26.9% in 1975 to 28.9% in 1999.

groups. The table presents this average housing divided by the average housing among all homeowners. For instance, figure 0.29 for households in the first total wealth and the first labor income quintile means that households in that group own, on average, 29% of the average amount of housing in the data. In the model, the corresponding figure is 30%.

Table 3 shows that our model roughly matches the distribution of housing in the data. Both in the data and in the model, households in a given wealth quintile own more housing as their labor income increases. In the same manner, in any given labor income quintile, wealthier households own more housing than poorer households. The largest discrepancy between the distributions in the data and in the model is that the wealthiest low income households own too little housing while the poorest high income households own too much housing in the model. This may reflect an income effect with poor households spending a larger fraction of their total expenditure in housing than richer ones. However, we believe these differences to be reasonably small, especially given that (as table 1 shows) the groups in question are the smallest in our sample.

Table 3: Distribution of housing; data (left) and model (right).

Wealth quintile	Labor income quintile									
	1		2		3		4		5	
1	0.29	0.30	0.45	0.50	0.48	0.65	0.75	0.87	1.00	1.25
2	0.43	0.35	0.56	0.53	0.68	0.71	0.82	0.90	0.94	1.32
3	0.70	0.37	0.76	0.59	0.86	0.75	1.10	0.97	1.18	1.38
4	1.03	0.43	0.82	0.66	1.04	0.86	1.17	1.08	1.42	1.51
5	1.32	0.91	1.37	1.00	1.26	1.18	1.67	1.38	2.41	3.05

Comparison with the left-hand part of table 2 shows that housing wealth is much more evenly distributed than total wealth. Without a rental market consumption of housing is tied to ownership. Consumption of housing in turn is related to total income. Since labor income is more evenly distributed than total wealth, consumption of housing is more evenly distributed than total wealth.

The model distribution of housing is the steady state distribution given the empirical tax rates described above. To the extent that the tax rates on business capital and housing are different in the politico-economic equilibrium, the distribution of housing is also different. However, in all politico-economic equilibria considered in the following section, the distribution of housing differs only marginally from this distribution.

5 Results

In the politico-economic steady state equilibrium the tax rate on housing is $\tau_h = 0.10$. This tax rate on housing implies a tax rate on business capital $\tau_k = 0.460$. This is our main result: consistently with the actual US tax system, and in contrast to normative analyses, in our model economy the equilibrium effective tax rate on housing is substantially lower than the tax rate on business capital. The median voter belongs to the third labor income and the third total wealth quintile. In the politico-economic equilibrium, his total wealth is 45% of the average total wealth and his housing wealth is 75% of the average housing wealth. That implies a housing-to-total wealth ratio of about 0.83 while the aggregate ratio is 0.48.

As one would expect, households have very different policy preferences. In table 4, we show the most preferred housing tax rate for each household type in the politico-economic steady state equilibrium. For the table, we consider housing tax rates between 0 and 1. Wealthier households prefer a higher housing tax rate than poor households. Indeed, all households in the first total wealth quintile would prefer zero or even a negative tax rate on housing, while all households in the fifth quintile would prefer a tax rate equal to or above 1.¹⁰ In addition to total wealth, labor income also matters. In a given wealth quintile, homeowners with higher labor income tend to prefer a lower tax rate on housing. This is because they consume more housing than households with lower labor income. This difference in policy preferences is not explained by higher labor income being accompanied by higher total wealth. As table 1 shows, in the third and the fourth wealth quintiles the total wealth is almost the same across different labor income quintiles.

Table 4: The most preferred housing tax rates.

Wealth quintile	Labor income quintile				
	1	2	3	4	5
1	0	0	0	0	0
2	0	0	0	0	0.01
3	0.42	0.13	0.1	0.08	0.05
4	1	1	0.58	0.34	0.20
5	1	1	1	1	1

¹⁰It is important to understand, however, that apart from the most preferred tax rate of the median voter, the tax rates in this table do not correspond to any politico-economic steady state equilibrium. If, starting from the steady state with $\tau_h = 0.10$, some other household than the median voter was allowed to choose the tax rate, his most preferred tax rate would first change over time before the economy converges to a new steady state. This partly explains the ‘extremism’ that we observe here.

In order to clarify the role of distributional issues, we reconsider the model with a single group. Since wealth and labor income heterogeneity does not affect aggregate variables in this model, the calibration is in all other respects exactly the same as above with 25 different groups. When the housing tax rate equals the empirical estimate ($\tau_h = 0.15$), all households then have housing-to-business capital ratio equal to one, which was one of our aggregate targets in the calibration.

We also consider different values for the intertemporal elasticity parameter, σ , which is the only free preference parameter we have. In addition to $\sigma = 3$, used in the benchmark calibration, we try $\sigma = 2$ and $\sigma = 4$. For both these values, we recalibrate the model setting again $\tau_h = 0.15$ and matching all the previously discussed targets.¹¹ In table 5, we present the equilibrium tax rates as well as the main aggregate ratios in all the four cases considered.

Table 5: Equilibrium tax rates for different model specifications.

Model specification	τ_h	τ_k	K/H	$(K + H)/(4Y)$	T/Y
Benchmark	0.10	0.460	0.933	2.890	0.282
$\sigma = 2$	0.18	0.368	1.035	3.048	0.279
$\sigma = 4$	0.06	0.525	0.867	2.760	0.284
One group	0.43	0.148	1.228	3.321	0.274

With only one group, the steady state equilibrium tax rates are $\tau_h = 0.430$ and $\tau_k = 0.148$. Without distributional incentives, the median voter is less willing to distort business capital accumulation. This reflects the usual efficiency cost of introducing a tax wedge on savings in similar infinite-horizon models. In consequence, without the distributional conflict, the model economy would end up with a dramatically higher capital-to-output ratio. Changes in the preference parameter σ affect the equilibrium tax rates as well. A higher value of σ means a lower intertemporal elasticity of substitution. Households then become less willing to lower the tax rate on business capital because for the poor households the benefits would come at the cost of lower consumption during the first periods of transition. Consequently, the tax rate on business capital is higher and the tax rate on housing is lower.

6 Introducing renters

With the current US tax system, the main tax benefit of housing - the non-taxation of the imputed rent - is related to owner housing since the rental income received by landlords is

¹¹With $\sigma = 2$, we have $\beta = 0.9555$, $\gamma = 0.2412$, $G = 0.1509$, and $Tr = 0.0754$. With $\sigma = 4$, we have $\beta = 0.9555$, $\gamma = 0.1489$, $G = 0.1509$, and $Tr = 0.0754$. The corresponding tax rates on business capital are $\tau_k = 0.368$ and $\tau_h = 0.525$, respectively.

subject to capital income taxation. As a result, renters should have very different policy preferences than homeowners. Therefore, in this section, we consider how introduction of renters affects the conclusions of the previous analysis.

We do not attempt to endogenize the tenure choice. We simply assume that some households rent their housing while others are homeowners.¹² We also assume that rental income received by a landlord is subject to the same tax treatment as the return from business capital. This pins down the tax treatment of rental housing with respect to owner housing and business capital.¹³

The problem of homeowners remains exactly the same. However, we rewrite the household's problem so that it applies to both renters and homeowners. The problem of a household of type i in period s is now:

$$\max \sum_{t=s}^{\infty} \beta^t u(c_t^i, s_t^i + h_t^i) \quad (8)$$

subject to

$$c_t^i + a_t^i + h_t^i = [1 + (1 - \tau_{k,t})r_t]a_{t-1}^i + (1 - \tau_l)\varepsilon^i w_t + (1 - \delta_h - \tau_{h,t}r_t^{ir})h_{t-1}^i - r_t^h s_{t-1}^i + Tr, \quad (9)$$

where s denotes rental housing and r_t^h is the rental rate in period t . For homeowners, $s = 0$ and $h > 0$, for renters $s > 0$ and $h = 0$. As already discussed in section 3, $r_t^h = r_t + \delta_h$ and $r_t^{ir} = r_t$.

The aggregate stock of business capital is now

$$K_t = \sum_{i=1}^I m^i (a_t^i - s_t^i). \quad (10)$$

The government budget constraint is as in (7). Defining $S_t = \sum_{i=1}^I m^i s_t^i$, we can write the aggregate resource constraint as:

$$C_t + K_t - (1 - \delta_k)K_{t-1} + (H_t + S_t) - (1 - \delta_h)(H_{t-1} + S_{t-1}) + G = K_{t-1}^\alpha \quad (11)$$

¹²Gervais (2002) presents a life cycle model where the tenure choice stems from the interreaction of a borrowing constraint and the tax preferential treatment of owner housing. In his model, a down payment constraint forces the poorest households to be renters even though owner housing is tax favored compared to rental housing. Given that in the data most renters are relatively poor in terms of total wealth, this might seem a reasonable way to model the tenure choice in our analysis as well. However, in our infinite-horizon model, all borrowing constrained households would accumulate wealth so as to be able to eventually afford the amount of owner housing they wish to have. Hence, renters and homeowners could not co-exist in a steady state. See also Henderson and Ioannides (1983) for a model that incorporates several other aspects that may be relevant for the tenure choice.

¹³Many poor households probably receive direct subsidies for rental housing. Therefore, it is not clear whether rental housing is treated that differently from owner housing. We consider the extreme case where there are no subsidies to rental housing at all.

In order to understand the tax status of the two different types of housing in the model, let y denote ‘cash-on-hand’ that consists of the financial asset and housing together with net interest and rental payments and labor income. Consider a household with current cash-on-hand y_t who wishes to transfer an amount y_{t+1} of cash-on-hand to the following period. Then the budget constraint can be written as (for notational convenience, we drop time indices from the tax rates and prices):

$$c_t + a_t + h_t = y_t \quad (12)$$

and

$$y_{t+1} = [1 + (1 - \tau_k)r]a_t + (1 - \tau_l)\varepsilon w - (r + \delta_h) s_t + (1 - \delta_h - \tau_{ir}r) h_t. \quad (13)$$

Solving the latter equation for a and plugging into the first one gives

$$c_t = y_t - \frac{y_{t+1} - (1 - \tau_l)\varepsilon w}{R} - \frac{r + \delta_h + r(\tau_h - \tau_k)}{R} h_t - \frac{r + \delta_h}{R} s_t \quad (14)$$

where $R = 1 + (1 - \tau_k)r$. Hence, if $\tau_h = \tau_k$, the cost of rental housing (in terms of current consumption) is the same as the cost of owner housing. If $\tau_h < \tau_k$ ($\tau_h > \tau_k$) the cost of owner housing is lower (higher) than the cost of rental housing.

The policy preferences of renters would not display substantial variation; all renters obviously prefer a high tax on housing since that shifts the tax burden towards all other households and increases business capital accumulation. For this reason, we consider all renters as a single group while sorting homeowners in the same way as previously into 25 wealth-income groups. As before, we consider households of age 35-55. There are now 3416 households in the sample, the renters constituting 29% of the total population (when family weights are taken into account).

The average total wealth and labor income in our sample fall with the introduction of renters. Therefore, homeowners are now on average wealthier and have a higher labor income in relation to the total population. More specifically, while the average total wealth in our sample without renters is 308170 dollars, it is 231620 dollars with renters. Therefore, in order to obtain a table corresponding to the left-hand part of table 2, each figure for the 25 groups of homeowners should be multiplied by $308170/231620 \simeq 1.33$. The average total wealth among renters is 38280 dollars, which is about 17% of the average total wealth. The average labor income in turn falls from 74420 to 63820 dollars when renters are included. The figures in the right-hand part of table 2 should therefore be multiplied by about 1.16. The average labor income among renters is 37070 dollars, and consequently their labor income is about 58% of the average labor income.

We calibrate the model as in the previous case with only homeowners. Again we start by fixing the tax rate on labor income at $\tau_l = 0.34$ and the housing tax rate at $\tau_h = 0.15$. We

then choose the remaining parameters so as to match the same aggregate ratios as in section 4. This procedure implies now parameter values $\gamma = 0.1814$, $\beta = 0.9495$, $G = 0.1475$, and $Tr = 0.0737$. The tax rate on business capital is $\tau_k = 0.3308$.

The equilibrium tax rates are now $\tau_h = 0.02$ and $\tau_k = 0.461$. The corresponding aggregate ratios are $K/(H+S) = 0.873$, $(K+H+S)/(4Y) = 2.784$, and $T/Y = 0.284$. The tax rate on housing is thus lower than with only homeowners while the tax on capital income is almost the same. The median voter is now in the third wealth quintile and the first labor income quintile. In the politico-economic equilibrium, the average housing-to-total wealth ratio is 0.47. The median voter has 57% of the average total wealth and 51% of the average housing. Hence, his housing-to-total wealth ratio is 0.45.

Table 6 presents the policy preferences of the households in the steady state politico-economic equilibrium. Again, wealthy households prefer a high tax rate on housing. In addition, homeowners in the third and fourth wealth quintiles prefer a lower tax rate on housing when their income increases. In fact, households with high labor income in the fourth wealth quintile prefer a lower tax rate on housing than low income households in the third wealth quintile. Renters, who are relatively poor in terms of total wealth, have similar policy preferences as the very richest homeowners.

Table 6: The most preferred housing tax rates.

Homeowners	Labor income quintile				
Wealth quintile	1	2	3	4	5
1	0	0	0	0	0
2	0	0	0	0	0
3	0.02	0	0	0	0
4	1	0.52	0.11	0.01	0
5	1	1	1	1	1
Renters	1				

Introducing renters affects the voting outcome in two ways. First, part of the housing stock is now effectively taxed by the same tax rate as business capital. This is why the equilibrium tax on business capital is almost the same as without renters even though the tax rate on housing is somewhat lower. By voting for a low housing tax rate, poor homeowners shift the tax burden not only towards the richest households but also towards renters. Second, the identity of the median voter changes because all renters prefer a very high housing tax rate.

7 Conclusions

We have analyzed the political economy of housing's tax status. As is well known, tax systems in most OECD economies strongly favor investing in owner housing instead of financial assets. This is likely to be related to how housing and non-housing wealth are distributed among households. At least in the US data - and we suspect the same to be true for other economies as well - housing wealth is distributed much more evenly than total wealth. Therefore, the median voter has a very large share of his overall wealth in the form of housing. The key trade-off he faces is that a low tax rate on housing 1) shifts the tax burden to wealthier households but 2) leads to a high tax rate on business capital and hence low wages and high interest rates. In our calibrated model economy, the first effect dominates, and the equilibrium tax rate on housing is much lower than the tax rate on business capital. Adding renters does not change the overall picture. A low tax on housing then shifts the tax burden towards renters as well as the wealthiest households owning most of the non-housing wealth.

Perhaps the most interesting extension in future work would be to take life cycle aspects into account. Age might be an important determinant of policy preferences in itself. In addition, a life cycle model would allow to model the tenure choice based on borrowing constraints. We chose to use a simpler infinite-horizon framework because it makes it easy to focus on the effect of the asymmetric distribution of housing and non-housing wealth. We believe that this distributional aspect would be important for the political economy of housing taxation also in otherwise more elaborate models.

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