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Serena Fatica, Doris Prammer

Housing and the tax system: how large are the distortions in the euro area?

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Household Finance and Consumption Network (HFCN)

This paper contains research conducted within the Household Finance and Consumption Network (HFCN). The HFCN consists of survey specialists, statisticians and economists from the ECB, the national central banks of the Eurosystem and a number of national statistical institutes.

The HFCN is chaired by Ioannis Ganoulis (ECB) and Oreste Tristani (ECB). Michael Haliassos (Goethe University Frankfurt), Tullio Jappelli (University of Naples Federico II) and Arthur Kennickell act as external consultants, and Sébastien Pérez-Duarte (ECB) and Jiri Slacalek (ECB) as Secretaries.

The HFCN collects household-level data on households' finances and consumption in the euro area through a harmonised survey. The HFCN aims at studying in depth the micro-level structural information on euro area households' assets and liabilities. The objectives of the network are:

1) understanding economic behaviour of individual households, developments in aggregate variables and the interactions between the two;
2) evaluating the impact of shocks, policies and institutional changes on household portfolios and other variables;
3) understanding the implications of heterogeneity for aggregate variables;
4) estimating choices of different households and their reaction to economic shocks;
5) building and calibrating realistic economic models incorporating heterogeneous agents;
6) gaining insights into issues such as monetary policy transmission and financial stability.

The refereeing process of this paper has been co-ordinated by a team composed of Pirmin Fessler (Oesterreichische Nationalbank), Michael Haliassos (Goethe University Frankfurt), Tullio Jappelli (University of Naples Federico II), Sébastien Pérez-Duarte (ECB), Jiri Slacalek (ECB), Federica Teppa (De Nederlandsche Bank), Oreste Tristani (ECB) and Philip Vermeulen (ECB).

Abstract

This paper presents new evidence on the impact of the preferential treatment of owner-occupied housing in Europe. We find that tax benefits to homeowners reduce the user cost of housing capital by almost 40 percent compared to the efficient level under neutral taxation. On average, the tax subsidy translates into an excess consumption of housing services equivalent to 7.8 percent of the value of owner-occupied housing, or about 30 percent of financial asset holdings in household portfolios. The bulk of the subsidies stems from under-taxation of the return to home equity, while the average contribution of the tax rebate for mortgage interest payments is driven down by relatively low loan-to-value ratios in the data. However, at the margin, the tax–induced incentive to use mortgage debt to finance the purchase of the main residence is sizable.

Keywords: Taxation, Owner-Occupied Housing, User Cost

JEL Codes: H24, H31, D14

Non-technical summary

Considerable attention has been devoted to housing markets since the crisis has uncovered the macroeconomic risks created by property market bubbles and high household debt. Among the structural and institutional factors affecting residential real estate, the preferential tax treatment of owner-occupied housing is a source of major concern, in terms of incentives for housing and mortgage debt choices.

This paper evaluates the size of the preferential tax treatment of owner-occupied housing in the euro area borrowing the analytical framework of Rosen (1979, 1985), based on the user cost of capital – a normalised measure that estimates the annual tax-adjusted cost of owning and operating the main residence per additional euro invested in housing capital. Specifically, we simulate household-specific tax-induced subsidies to the user cost using the first wave of the Household Finance and Consumption Survey (HFCS), matched with the tax provisions relevant to owner-occupiers in the different countries.

Against the background of significant differences in homeownership rates, mortgage debt prevalence and loan-to-value ratios, we find that owner-occupiers are generally under-taxed. In particular, the user cost of owner-occupied housing is almost 40 percent below the efficient level under a neutral tax system where the net return to owner-occupiers is fully subject to taxation. The bulk of the average tax subsidy comes from under-taxation of the return to home equity, while the average contribution of the rebate for mortgage interest payments is driven down by relatively low loan-to-value ratios observed in the data. However, abstracting from endogenous financial choices, the marginal value of the tax break for mortgage interest is twice as large as its average value. By reducing the effective cost of debt, the tax relief for mortgage interest creates an important bias for high household borrowing.

Overall, under-taxation is associated with an inefficiently high level of consumption of housing services – around 7.8 percent higher than the level attainable under neutral taxation. The implied misallocation of individual savings might be substantial: on average, excess housing consumption accounts for 30 percent of the current holdings of financial assets in homeowners' portfolios in the euro area. The estimated annual efficiency costs – measured, in line with public finance literature, by the deadweight loss – are in the ballpark of half a percentage point of household income, and depend crucially on the responsiveness of housing supply. Hence, tax reforms that reduce the fiscal benefit to homeowners are complementary to policy measures aimed at enhancing flexibility on the supply side of the housing market.

The distributional implications of the favorable tax treatment of owner-occupiers stem from the combined effect of tax provisions and differences in households' economic and financial conditions. Specifically, we find that the mortgage interest tax relief has mild regressive effects in terms of (equivalised) household income, while it is progressive in term of net

wealth. All in all, the caps and other limitations to the amount of deductible interest reduce the regressive impact of the subsidy across income classes.

1. Introduction

After the crisis academics and policymakers alike have devoted considerable attention to housing markets. Among the structural and institutional factors affecting residential real estate, the fiscal treatment of owner-occupied housing is a source of major concern (Andrews et al., 2011; Norregaard, 2013; European Commission, 2015a, 2015b; European Systemic Risk Board, 2015). Specifically, tax breaks granted to owner-occupiers not only increase the net return to homeownership, but also reduce the financial cost of mortgage loans associated to the long term financing needs that accompany the purchase of residential real estate. As such, they may significantly affect housing market cycles and household debt dynamics, and ultimately have far-reaching consequences for macroeconomic and financial stability, as the crisis has shown.

Two main channels have been identified through which the preferential tax treatment of owner-occupiers may affect real and financial cycles. First, by altering relative prices, tax benefits would lead to excess investment in owner-occupied housing, thus potentially crowding out corporate investment (Gervais, 2002). Given the double nature of housing as a consumption good and as an asset, the level of real estate ownership that is optimal from the point of view of the consumption of housing services may differ from the optimal level from a portfolio point of view (Flavin and Yamashita, 2002)[1]. In a general equilibrium setup, the tax wedge on the return to different types of capital distorts the allocation of private investment and savings in household portfolios (Berkovec and Fullerton, 1992). In fact, housing wealth has been found to determine the composition of household portfolios (Arrondel and Savignac, 2010), particularly investment in risky financial assets (Chetty et al., 2016). In the presence of supply rigidities, tax subsidies to residential real estate are capitalized into higher real estate prices. Thus, they could ultimately make housing less affordable, running counter the policy objectives that purportedly motivate them. Moreover, since the housing stock represents a significant proportion of the fixed assets in an economy, price developments in the housing sector can affect the valuation of a broad range of financial assets, ultimately impacting the financial sector and the whole economy (ECB, 2009; Iacoviello, 2011). Second, by lowering the cost of debt, the tax relief for mortgage interest payments can incentivize household leverage. Mortgage debt has been identified as an important channel of transmission of macroeconomic shocks, as debtors are more likely to face liquidity constraints and thus adjust their consumption level dramatically in the wake of negative income shocks and/or a sharp reduction in the value of the property used as collateral (IMF, 2012; Sutherland and Hoeller, 2012).

While the contribution of imbalances in the housing and mortgage markets to the buildup and aggravation of the recent crisis motivates the increased attention towards these issues, public finance economists have long been concerned about tax design features that –

[1] Henderson and Ioannides (1983) analyze the implications of the dual role of housing for tenure decisions.

sometimes implicitly – translate into a beneficial fiscal treatment of owner-occupiers (Rosen, 1979; Poterba, 1984). Virtually the whole empirical literature quantifying housing tax benefits and their evolution over time following tax reforms focuses on the United States, where detailed analyses are made possible by the richness of household-level information (notably, the Survey of Consumer Finances) and the availability of consolidated microsimulation tools, such as the NBER TAXSIM model. Existing studies on the effects of the tax provisions for owner-occupiers focus broadly on the overall incentives created for consumption of housing services by homeowners (Poterba, 1992) as well as for their location choices (Albouy and Hanson, 2014; Sinai and Gyourko, 2004), or, more specifically, on the associated cost for public finances (Poterba and Sinai, 2008; Hanson and Martin, 2014) and on the impact on the housing market (Glaeser and Shapiro, 2003; Hanson and Martin, 2014). The distributional implications of housing tax benefits have also been investigated extensively (Poterba, 1992; Poterba and Sinai, 2011). All in all, the literature concurs in finding ample scope for reforming the current treatment of owner-occupied housing in the US tax code, both on efficiency and on equity grounds.

The aim of this paper is to gauge the impact of the tax rules applicable to owner-occupied housing in Europe. To do so, we borrow the analytical framework proposed by Rosen (1979, 1985), and used, among others, by Poterba and Sinai (2008, 2011) and Albouy and Hanson (2014), and apply it to newly available harmonized European household-level data. While we uncover significant heterogeneity in the tax treatment of main residences across Europe, under-taxation seems to be a general phenomenon leading to an inefficiently high level of consumption of housing services. In particular, we find that the user cost of owner-occupied housing is almost 40 percent below the efficient level achievable under a neutral tax system where the net return to owner-occupiers is fully subject to taxation. The bulk of the tax subsidies stems from under-taxation of the return to home equity (in the form of imputed rental income and capital gains), while the average contribution of the rebate for mortgage interest is driven down by the relatively low loan-to-value ratios observed in the data. However, the marginal value of the tax break for mortgage interest payments is twice as large as its average value. The consequent misallocation of individual savings might be substantial: on average, excess housing consumption accounts for 30 percent of the current holdings of financial assets in homeowners' portfolios in the euro area.

The rest of the paper proceeds as follows. In section 2 we sketch basic facts about housing markets in Europe and the structural features and policies, including taxation, affecting them. Section 3 lays out the analytical framework for our analysis, while section 4 describes the data. The main results of our simulations are reported in section 5. Finally, section 6 concludes.

Table 1. Share of households owning their main residence

AT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	11.97	20.08	24.04	20.94	30.23	20.79
35 - 54	31.79	45.68	52.32	53.52	59.46	49.67
55 - 64	41.99	49.71	60.11	53.10	82.17	58.78
65 +	48.60	48.77	53.81	60.05	75.50	54.84
all	34.83	42.70	48.91	48.49	63.74	47.72

BE

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	16.11	43.48	48.24	75.75	67.78	46.43
35 - 54	41.54	62.49	62.95	86.46	83.14	69.95
55 - 64	57.03	63.71	80.68	88.07	89.09	76.54
65 +	71.59	76.90	74.52	92.16	94.41	79.85
all	45.23	65.89	66.93	85.84	84.69	69.65

ES

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	41.24	69.77	57.85	72.33	85.79	66.58
35 - 54	71.43	80.78	80.72	82.53	89.46	81.78
55 - 64	84.44	87.00	85.64	92.23	93.72	89.38
65 +	88.49	89.24	88.32	89.67	93.62	89.33
all	78.12	83.01	78.44	83.51	90.47	82.70

FR

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	5.22	14.12	31.29	44.76	51.09	25.66
35 - 54	27.56	47.62	64.71	69.34	77.12	57.81
55 - 64	46.99	50.94	67.62	77.88	84.46	68.98
65 +	50.13	54.55	64.99	73.57	80.56	64.12
all	29.51	44.06	58.63	67.19	76.99	55.27

GR

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	17.49	39.50	45.12	36.33	48.51	36.20
35 - 54	64.22	67.78	69.10	71.09	77.94	71.18
55 - 64	84.82	81.60	83.00	82.63	87.10	83.91
65 +	80.77	87.10	89.07	92.28	85.03	86.10
all	65.88	74.08	73.98	71.45	76.61	72.40

IT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	20.80	33.50	46.26	44.59	64.14	42.05
35 - 54	44.29	52.44	66.18	71.36	76.87	63.04
55 - 64	68.32	66.53	78.01	85.36	88.37	79.43
65 +	66.91	74.03	79.81	84.06	91.04	77.32
all	53.88	62.32	71.30	74.59	81.56	68.72

LU

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	20.01	26.98	62.15	66.10	60.80	44.33
35 - 54	37.87	41.92	72.18	78.72	79.21	62.28
55 - 64	57.62	66.62	77.11	93.85	91.93	79.10
65 +	75.95	79.59	86.94	94.61	93.88	85.84
all	45.22	50.27	75.97	82.38	81.87	67.11

NL

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	43.49	46.20	70.31	56.38	55.35	53.42
35 - 54	61.69	54.57	51.53	71.85	65.96	61.06
55 - 64	45.25	53.92	42.71	61.63	70.56	55.34
65 +	49.99	35.07	52.37	71.89	63.44	53.35
all	54.18	47.85	51.36	67.82	64.28	57.09

PT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	29.25	47.65	57.55	53.05	51.58	48.45
35 - 54	61.15	63.53	73.82	76.51	84.39	72.84
55 - 64	75.02	71.13	70.77	80.69	83.34	77.04
65 +	75.89	74.63	69.61	75.02	83.02	75.21
all	65.64	67.98	70.39	74.06	79.33	71.47

CY

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	66.64	65.27	73.59	82.58	75.27	75.15
35 - 54	66.28	66.37	81.93	90.86	91.55	80.65
55 - 64	53.51	62.08	82.38	91.07	94.05	80.35
65 +	63.49	60.60	61.52	84.28	98.72	66.93
all	63.61	63.71	77.20	88.12	89.90	76.49

DE

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	7.33	4.14	18.49	19.13	33.70	13.22
35 - 54	17.35	30.28	50.23	54.74	58.12	45.38
55 - 64	41.30	42.81	46.37	60.10	81.67	59.43
65 +	31.76	45.04	61.16	72.17	75.97	54.08
all	21.21	33.25	47.47	54.29	65.17	44.21

MT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	45.29	66.70	69.08	62.31	79.32	68.94
35 - 54	78.98	79.67	84.00	84.05	92.59	84.32
55 - 64	73.02	80.38	70.02	81.37	89.57	78.95
65 +	56.46	74.14	75.94	86.28	48.02	68.29
all	67.89	77.14	77.18	81.40	85.11	77.73

SI

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	20.76	100.00	72.03	55.67	43.79	59.83
35 - 54	61.28	80.64	91.06	93.13	86.40	82.97
55 - 64	59.30	90.00	78.47	79.71	98.70	84.55
65 +	94.40	79.76	87.61	100.00	100.00	89.64
all	71.33	84.47	83.68	86.82	83.44	81.84

SK

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	75.58	72.34	62.76	70.73	73.70	71.09
35 - 54	83.70	91.68	92.79	92.75	92.45	91.03
55 - 64	93.24	91.43	99.58	98.86	96.88	96.20
65 +	93.50	96.73	98.97	98.59	97.30	96.29
all	87.11	91.35	90.33	90.01	90.67	89.89

Notes: quintiles are based on equivalised household income.

2. Basic facts about housing and taxation in the euro area

To put our analysis in perspective, we provide background descriptive statistics on homeownership and related mortgage debt derived from the first wave of the Household Finance and Consumption Survey (HFCS). There is a significant degree of heterogeneity in homeownership rates, mortgage debt incidence and loan-to-value ratios both across and within euro area countries. Table 1 reports homeownership rates in the countries covered by the HFCS, broken down by (equivalised) gross household income (OECD definition) and by age class of the household head[2]. Overall, around 60 percent of households own their main residence. In turn, roughly 30 percent of owners took up a mortgage to finance the purchase. Ownership rates vary from 90 percent in Slovakia to below 50 percent in Austria and Germany, and, in general, reach their lowest at the bottom of the income distribution. The income gradient of ownership is very steep in Germany and France, where high-income households are three times more likely to own their residence than households in the first income quintile, while it is virtually flat in Slovakia. Independent of their position in the income distribution, young households (i.e. households whose head is up to 34 years old) are more likely renters compared to older households. This arguably reflects the fact that down payment requirements reduce housing affordability for people at the initial stages of wealth accumulation, particularly in the presence of financial market imperfections (Chiuri and Jappelli, 2003). By contrast, homeownership rates are generally the highest for the oldest age group, concurring to previous findings that the elderly do not seem to substantially decumulate housing equity (Chiuri and Jappelli, 2010), contrary to what life-cycle models would suggest.

Mortgage debt choices associated to the purchase of the main residence vary considerably across countries, both at the extensive and intensive margin. The incidence rates of mortgage loans are reported in table 2. In most euro area countries, less than 40 percent of owners have outstanding debt to finance the purchase of their main residence, with a low 10 percent recorded in Slovakia[3]. At the other end of the spectrum, the Netherlands stand out with more than three-quarters of owners holding mortgage debt, followed by Cyprus and Luxembourg, where about half of owner-occupiers are mortgagors.

The incidence of mortgage debt differs considerably across income classes. In general, it increases with income, although not necessarily in a monotonic fashion. In all countries, except Luxembourg and Slovenia, the highest proportion of outright owners is found in the lowest income quintile. This result is likely driven by pensioners who have already paid off

[2] We use the OECD equivalence scale which weights the household head with a factor of 1, household members over the age of 14 with 0.5, and under 14 with 0.3. The household gross income is divided by the sum of the individual weights of each member (so-called equivalence factor) to compute the equivalence weighted household income. We identify the household head with the reference person as defined by the Canberra Group (UNECE, 2011).

[3] In the early 1990s public real estate property was sold to former tenants at concessionary prices, which results in high ownership rates and low mortgage rates.

Table 2. Share of owner-occupier households with outstanding mortgages on their main residence

AT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	64.98	70.19	68.75	55.53	49.05	62.76
35 - 54	48.57	62.93	53.08	54.01	44.84	52.56
55 - 64	9.98	13.27	25.72	21.40	33.52	22.03
65 +	12.04	13.27	10.33	17.95	10.66	12.79
all	26.72	36.81	37.79	37.92	35.26	34.89

BE

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	76.79	83.44	93.90	89.70	75.96	85.87
35 - 54	55.09	70.18	62.35	73.30	69.28	66.59
55 - 64	8.07	20.39	17.00	21.55	27.25	19.36
65 +	3.00	4.06	3.08	4.37	1.64	3.33
all	26.84	29.76	46.20	54.84	47.03	40.92

ES

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	41.10	55.43	61.38	81.23	64.83	63.73
35 - 54	43.35	44.15	48.55	52.70	50.60	48.49
55 - 64	8.47	21.88	19.72	14.98	16.36	16.49
65 +	1.11	5.40	8.44	5.04	5.83	4.15
all	15.86	28.78	37.66	41.41	38.24	32.37

FR

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	64.19	78.96	80.55	78.61	75.86	77.07
35 - 54	43.23	61.81	54.45	50.36	48.31	52.00
55 - 64	10.97	14.44	17.23	17.48	12.49	14.60
65 +	1.68	2.04	2.82	4.90	2.29	2.56
all	20.67	34.50	36.40	33.98	27.78	30.67

GR

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	35.64	34.16	33.70	30.01	26.87	31.64
35 - 54	30.49	30.71	30.33	33.69	26.88	30.15
55 - 64	10.30	10.99	25.23	14.42	21.54	16.80
65 +	3.03	5.84	6.51	7.45	9.80	5.56
all	12.46	16.15	21.69	22.31	23.72	19.24

IT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	5.90	18.18	52.17	46.83	34.62	34.32
35 - 54	15.33	20.04	29.54	23.32	31.34	24.65
55 - 64	5.87	8.52	10.93	9.40	14.02	10.22
65 +	1.39	0.69	2.16	2.68	4.46	1.92
all	6.88	8.43	17.44	16.34	20.74	13.96

LU

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	88.28	93.08	80.67	83.94	93.91	86.56
35 - 54	68.55	78.41	68.92	71.82	69.06	71.03
55 - 64	55.42	48.37	28.19	36.39	25.04	38.04
65 +	4.88	0.29	14.47	16.73	8.10	8.00
all	47.23	43.83	49.70	52.08	51.44	48.85

NL

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	86.55	66.22	100.00	95.06	93.81	90.29
35 - 54	76.65	90.22	81.71	79.69	85.34	87.82
55 - 64	78.78	68.50	67.85	75.09	69.00	71.56
65 +	57.34	65.85	71.10	60.14	58.36	57.35
all	73.93	77.51	78.83	76.11	78.14	76.90

PT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	40.75	74.62	56.86	55.46	91.40	65.77
35 - 54	40.55	47.39	53.03	60.51	69.44	55.57
55 - 64	6.42	13.89	31.26	27.25	32.56	23.09
65 +	1.37	1.94	11.70	8.99	5.35	4.81
all	16.77	23.84	39.47	40.87	50.33	34.25

CY

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	73.59	76.32	63.31	62.11	57.41	65.30
35 - 54	55.87	56.18	68.45	71.81	63.98	64.10
55 - 64	15.35	42.18	23.35	47.45	30.67	33.50
65 +	6.88	5.23	4.85	5.21	22.86	8.00
all	28.50	45.17	56.10	59.22	49.50	47.69

DE

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	42.57	50.18	60.85	32.90	79.56	51.84
35 - 54	49.65	71.42	59.20	64.50	63.64	62.56
55 - 64	21.90	59.98	34.41	50.66	41.85	41.88
65 +	11.05	11.08	10.80	28.46	17.34	14.19
all	24.20	42.98	38.87	50.44	47.77	40.81

MT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	37.88	41.03	46.05	31.28	36.28	36.99
35 - 54	15.96	17.41	13.08	26.48	45.54	24.68
55 - 64	2.93	1.79	2.17	3.61	9.18	4.02
65 +	0.00	0.00	0.00	0.00	0.00	0.00
all	8.62	9.25	8.76	18.34	32.77	15.52

SI

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	0.00	33.10	74.62	0.00	46.56	42.93
35 - 54	19.41	55.45	10.96	14.71	26.09	21.33
55 - 64	0.00	10.62	12.74	3.46	0.00	6.11
65 +	4.02	0.00	0.00	0.00	0.00	1.71
all	9.39	19.55	19.57	8.66	19.33	15.29

SK

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	22.99	22.99	29.90	29.60	36.22	28.67
35 - 54	13.17	20.69	10.55	10.46	13.67	13.25
55 - 64	2.00	3.11	6.04	2.09	4.79	3.61
65 +	0.00	0.00	0.00	0.00	0.00	0.00
all	8.30	9.73	9.76	10.74	13.13	10.33

Notes: quintiles are based on equivalised household income. Income quintiles and ages classes are calculated over homeowners.

their mortgages and have relatively low pension incomes. Indeed, a closer look at the data unveils that pensioners are over-represented in the first and (partly) in the second income quintiles, while they account for roughly one-third of the relevant population in all other income categories.

The share of mortgagors decreases with age in all countries, except Germany. The pattern is virtually the same for all income quintiles, thus confirming the presence of age-dependent constraints related to the accumulation of wealth over the life cycle for younger cohorts. Usually, the share of mortgage holders is less than 15 percent for home-owners aged 65 or more, except for the Netherlands, where outright owners account for only 43 percent of all elderly home-owners. This is likely a consequence of the peculiarities of the Dutch mortgage portfolio, characterized by loan contracts of unusually long duration and loan redemption often deferred until maturity[4].

Mortgage choices at the intensive margin can be gauged looking at loan-to-value ratios (table 3). On average, they range between 35 percent and 45 percent in most euro area countries. Loan-to-value ratios are the highest in the Netherlands (58 percent), were young households seem to finance their home entirely by debt. Young households in Portugal, Luxembourg and Spain are also highly indebted, with loan-to-value ratios of roughly 70 percent. By contrast, Slovenia stands out with a loan-to value ratio of only 14 percent (18 percent for young households). In all countries considered, this ratio decreases considerably with age, following progressing capital repayment with age. No clear picture emerges when it comes to the distribution of loan-to-value ratios across income quintiles. While in some countries they are lowest in the bottom income quintile (Belgium, France, Germany, Malta, Spain, Slovakia), in others loan-to-value ratios attain their lowest values in the highest income quintile (Cyprus, Greece, Italy). This likely reflects differences in credit constraints, possibly partly induced by regulatory provisions (e.g. in terms of debt-to-income ratios). In general, the distribution of the loan-to-value ratios appears smoother across the income quintiles than across age groups.

[4] Most mortgages in the Netherlands do not amortize, so called interest-only loans (DNB, 2014). However, households often combine these loans with amortizing loans or with mortgages that have a pledged savings account to be used for repayment at maturity. Moreover, voluntary repayment of the principal is also possible. As of 2013, interest deduction is limited to mortgages that are fully amortized within 30 years. Provisions applicable to existing mortgages are grandfathered.

Table 3. Average loan-to-value ratios

AT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	104.96	34.31	51.08	68.51	41.37	56.03
35 - 54	41.50	33.45	39.72	41.69	41.01	39.41
55 - 64	12.93	11.44	14.00	19.00	19.40	16.94
65 +	18.44	13.66	25.39	12.96	20.15	17.01
all	44.20	29.78	36.67	38.28	33.30	35.93

BE

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	51.97	74.03	57.27	56.29	59.42	59.12
35 - 54	24.26	29.20	27.82	31.52	26.54	28.23
55 - 64	17.71	29.93	18.64	8.14	19.47	19.58
65 +	10.67	28.34	23.57	10.10	33.52	20.55
all	30.10	40.42	36.83	35.83	30.22	34.69

ES

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	42.13	50.18	39.85	118.12	54.08	69.82
35 - 54	32.59	41.51	42.23	29.95	34.12	35.74
55 - 64	26.07	25.32	20.96	59.42	13.56	27.81
65 +	9.27	35.79	22.71	22.05	22.78	25.86
all	33.50	41.32	40.50	55.22	36.31	42.71

FR

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	59.05	57.23	54.54	58.32	56.09	56.73
35 - 54	31.42	33.38	31.46	33.85	35.54	33.44
55 - 64	22.64	28.60	21.66	25.45	17.73	22.27
65 +	7.69	14.74	19.53	14.91	28.13	19.03
all	33.57	37.31	37.75	38.46	37.13	37.13

GR

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	35.85	47.10	43.98	44.75	49.82	44.85
35 - 54	50.74	39.53	48.04	39.32	36.50	41.67
55 - 64	27.33	38.70	22.43	28.18	33.02	28.83
65 +	40.86	25.39	11.95	38.10	25.07	27.06
all	44.39	36.74	38.11	38.35	35.98	38.26

IT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	18.19	41.65	70.64	40.34	47.86	50.76
35 - 54	53.23	37.77	37.21	34.20	34.25	36.98
55 - 64	39.92	27.84	27.79	26.86	25.20	27.13
65 +	12.89	19.03	20.14	10.26	35.66	21.76
all	46.25	38.88	35.84	35.69	33.66	36.55

LU

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	84.26	51.64	73.76	79.58	63.05	69.94
35 - 54	31.24	31.12	30.75	28.01	36.23	31.95
55 - 64	6.91	26.64	13.66	14.23	14.99	15.50
65 +	1.36	25.00	58.77	34.13	5.29	23.88
all	36.28	28.51	42.01	38.81	36.72	36.68

NL

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	87.82	93.85	104.36	94.34	106.88	99.58
35 - 54	59.56	57.90	57.83	58.60	77.62	61.90
55 - 64	51.58	39.57	47.45	40.71	40.81	43.40
65 +	24.98	21.03	30.11	30.57	32.37	28.18
all	56.11	52.53	57.42	54.95	68.21	58.21

PT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	63.85	65.02	75.95	78.32	71.04	71.94
35 - 54	49.65	51.80	44.93	42.04	45.53	45.67
55 - 64	27.98	33.38	15.53	23.86	24.10	23.37
65 +	30.94	12.25	31.98	17.44	26.14	23.45
all	50.66	48.34	44.17	44.88	44.68	45.71

CY

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	45.00	39.96	46.43	53.04	48.18	47.85
35 - 54	40.54	41.34	36.18	35.53	35.23	36.94
55 - 64	18.77	35.37	46.21	41.71	18.87	32.00
65 +	39.52	12.45	78.13	43.49	23.79	29.89
all	38.82	38.94	42.58	38.42	33.99	38.64

DE

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	42.71	53.24	77.50	92.57	38.98	66.53
35 - 54	47.08	53.86	49.31	55.95	50.00	51.79
55 - 64	42.06	46.00	57.49	52.10	47.56	49.54
65 +	32.26	21.79	41.98	53.52	36.99	40.09
all	45.62	50.01	57.92	50.32	49.31	50.90

MT

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	0.00	23.75	33.48	30.63	34.89	32.38
35 - 54	13.95	14.12	35.00	21.90	27.21	23.69
55 - 64	11.24	15.32	4.63	8.66	2.97	6.93
65 +						
all	14.96	17.22	31.78	23.64	27.00	24.32

SI

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	13.84	0.00	5.72	0.00	73.14	17.60
35 - 54	0.00	14.90	12.29	22.69	14.01	14.89
55 - 64	0.00	3.60	3.04	16.43		5.05
65 +	1.65					1.65
all	11.83	9.62	6.75	21.69	25.29	14.43

SK

income quintile:	I	II	III	IV	V	*all*
age of household head:						
up to 34	41.93	51.86	59.10	48.70	77.02	57.70
35 - 54	26.53	43.79	33.46	28.55	28.33	33.09
55 - 64	24.12	22.16	14.06	22.83	10.07	16.27
65 +						
all	33.16	43.34	40.15	37.23	46.27	40.58

Notes: quintiles are based on equivalised household income. Income quintiles and ages classes are calculated over homeowners. Loan-to-value ratios are at the time of the survey. Average values calculated for mortgagors only.

Alongside demographic factors, regulatory, institutional and financial frameworks contribute to shaping the structural features of housing and mortgage markets. The very same choice between renting and owning is clearly influenced by the functioning of rental markets, including subsidies and regulatory provisions (Andrews et al., 2011). These latter include

measures covering rents and tenant-landlord relationships. While the direction of causality is unclear, countries with a relatively large rental sector, such as Austria, Germany and the Netherlands, tend to have comparatively strict rent control. Regulations pertaining to contractual aspects of tenant-landlord relations are also frequent in Europe, and tend to be comparatively strict in many continental countries, often the same with the more stringent rent controls. Arguably, rent controls and contractual regulations are to some extent complementary in granting tenure security, particularly when it comes to the regulation of existing contracts. Equity and social concerns also motivate the direct provision of social housing. The importance of social rentals varies across OECD countries. In some countries it accounts for the majority of rentals (e.g. in Austria, the Netherlands, the Nordic countries), while it plays only a minor role in others (e.g. Luxembourg and Portugal).

Public intervention in housing markets, particularly directed towards homeowners, takes also place via the tax code[5]. Importantly, taxation has been identified among the policies that influence housing market dynamics most strongly (Kuttner and Shim, 2013). A house constitutes a capital asset for homeowners and generates housing services for the occupant. Both aspects are relevant to taxation and would call for a specific tax treatment. The distinction between the two attributes of investment and consumption good is explicit in the case of privately rented property, not so in the case of owner-occupied housing. In practice, the latter benefits from a favourable fiscal treatment in many countries.

The extent to which tax systems favour owner-occupied housing can be assessed using tax neutrality as a benchmark. Under this theoretical benchmark, the rental income from residential real estate would be subject to taxation, after deduction of the costs incurred in order to generate it, including maintenance costs and interest payments in the case of debt-financed purchase. In this way, only the net return to the investment would be subject to taxation. Capital gains on housing sales would also need to be taxed to achieve neutrality vis-à-vis other assets in countries where realised capital gains are normally subject to taxation.

In practice, the current treatment of housing in personal income taxation leaves the implicit rental income of homeowners largely untaxed[6]. While imputed rents are generally not taxed, all the euro area countries in the HFCS survey – except Malta – levy recurrent taxes on real estate property. For the part levied on homeowners, such taxes could be considered an efficient substitute for imputed rent taxation if set at an adequate level. However, in Europe they are generally set at relatively low levels, generating equally modest revenues. This is mainly the result of a tax base that falls short of market values, and is rather determined by cadastral values that are not updated regularly (European Commission, 2015b).

Capital gains on owner-occupied housing are always taxed only in Cyprus. In the other countries we consider, they benefit from exemption clauses often made conditional on the

[5] Interventions on the housing market via direct subsidies or transfers and subsidized rental markets are out of the scope of this paper.
[6] In the Netherlands and Luxembourg the imputed rental income is taxed, but at a very low level.

length of the holding period of the main residence (which has to be longer than 2 years in Germany, Austria and Slovakia, or 3 years in Slovenia) or to the reinvestment of the gains for purchasing an alternative residence (such as in Spain and Portugal). These provisions, while aimed at deterring speculation on the real estate market, de facto create a discrepancy with respect to the tax treatment of gains on most other assets, including financial holdings.

The majority of euro area countries allows for some kind of mortgage interest tax relief (MITR). Provisions to grant the rebate include both tax credits and tax allowances. Moreover, the MITR might be claimed either on annuities and/or interest payments, fully or up to certain caps. Caps are used relatively frequently in euro area countries, and often they are adjusted on the basis of household features, e.g. the presence of dependants, etc. Some countries limit the possibility of MITR to first-time home buyers, or the younger population, or inversely grant even more generous provisions to them. When mortgage interest payments are deducted from taxable income (rather than from the gross income tax liability), the overall value of the rebate depends on the rate structure of the personal income tax schedule of a country. In other words, in countries where debt financing costs are deducted from taxable income, and not from the gross tax liability, the rebate is likely more beneficial to high-income earners, who are taxed at higher marginal tax rates, attain high rates of homeownership, and purchase more expensive residences. At the same time, existing caps are likely binding at the upper end of the income distribution. Thus, evaluating the generosity of the mortgage tax relief is ultimately an empirical issue.

3. The user cost of housing

The analysis in this paper revolves around the concept of user cost of housing capital. The user cost is derived from the equilibrium condition in the housing market stating that the expected annual cost of owning a house should not exceed the annual cost of renting an equivalent property, denoted the imputed rental value (Poterba, 1984). This arbitrage condition implies that if the annual cost of owning increases above the level of rents, house prices must decrease to incentivize potential homebuyers to buy. The opposite must occur if annual ownership costs fall[7].

The user cost (c), which captures the annual financial and economic cost associated with owning and operating the property, is expressed, per euro of housing value, as:

$$R/P = c \qquad (1)$$

[7] Although the user cost hinges upon an arbitrage condition between renting and owning, in the paper, particularly when deriving and discussing the distortions stemming from favorable tax treatment in subsection 3.1, we focus only on the intensive margin of homeownership. This is not at odds with the underlying theoretical framework, which, adopting an asset-market approach, envisages marginal adjustments to the optimal flow of housing services consumed. Housing is thus treated as a divisible investment good.

where R denotes the imputed annual rental value (analogous to the dividends on a stock), and P is the house price.

To see how taxes affect housing decisions, we define first a simple benchmark case. In particular, following the literature (see Poterba (1984, 1992), Himmelberg *et al.* (2005), Poterba and Sinai (2008, 2011) and Albouy and Hanson (2014)), we consider the hypothetical situation where the net real economic return to homeownership would be fully taxed under the personal income tax system at tax rate t. Taxing the net return entails adding the rental value of the house to other types of taxable income and providing for full taxation of capital gains (at a rate t_{CG}) as they accrue, while allowing for deduction of all associated costs. In particular, economic depreciation and maintenance, interest paid on the mortgage and property taxes, under the assumption that they are not benefit taxes, would all be deductible costs. For this benchmark model, the equilibrium condition defined in (1) hence results in:

$$0 = \{R - P * [r_T + \beta + m + t_P - \pi^e(1 - t_{CG})]\} * (1 - t), \quad (2)$$

and the corresponding benchmark user cost, denoted by c^*, is:

$$c^* = r_T + \beta + m + t_P - \pi^e(1 - t_{CG}), \quad (3)$$

The first two terms of the user cost capture foregone interest on the housing asset[8]. We follow Poterba (1992) and Poterba and Sinai (2008, 2011) in the treatment of the risk-adjusted cost of funds, and thus depart from early literature. In particular, the formulation of the user cost in equation (3) assumes implicitly that the appropriate pre-tax financial cost is given by the medium-term risk-free interest rate, r_T, plus a pre-tax risk premium, captured by the parameter β. This is admittedly a shorthand for a more complete analysis of owner-occupied housing as a portfolio asset, which goes beyond the purpose of our paper. The rationale is that, since the total return to an investment in owner-occupied housing is risky, households would apply an effective discount rate higher than the riskless rate to any stream of future housing services. In practice, the risk premium β summarizes the higher risk of owning versus renting. As such, it captures both the asset-class risk and the idiosyncratic (that is, house-specific) component of the risk associated with housing investment as a part of household portfolios. However, this does not mean that when households adjust their portfolios in response to tax changes they only draw down risky assets with risk premium β.

The component m of the user cost represents the combined cost of maintenance and economic depreciation, expressed as a fraction of the house price. It is indeed assumed that owners incur expenditures on maintenance and repairs in order to maintain the physical condition of the house constant.

Another component of the annual cost of homeownership is the recurrent property tax, denoted by t_P in equation (3). This formulation assumes that property taxes are levied as

[8] In this benchmark case of tax-neutrality, financing decisions do not play any role.

excise taxes (Miezkowski, 1972; Zodrow, 2001). The underlying assumption here is that homeowners do not receive any benefits in return for their property tax payments. If instead that would be the case, the contribution of property taxation to the user cost would be reduced proportionally to the extent of the perceived value of the benefits received by the taxpayers.

Finally, the user cost needs to be reduced by nominal capital gains, namely the expected rate of appreciation of the house, indicated with π^e. As explained above, the nominal revaluation would be subject to capital gains taxation, at a rate of t_{CG}.

Replacing the benchmark model by a model that reflects the most common tax treatment of owner-occupied housing allows us to gauge the preferential tax treatment of owner-occupied housing (Poterba and Sinai, 2008, 2011). In line with previous studies, a general formulation of the tax-adjusted user cost under current tax treatment reads as:

$$c^{TA} = [1 - (t_M \phi \lambda + t_Y(1 - \lambda))]r_T - t_M \phi \lambda (r_M - r_T) + (1 - t_Y)\beta + m + t_P - \pi^e. \qquad (4)$$

Equation (4) conflates a number of components adding up to the total annual unit cost for homeowners, net of potential offsetting benefits[9]. As in the benchmark model, the first component captures the foregone return, r_T, which would have accrued to homeowners in case of an alternative investment. Taxation of such alternative return, assumed at a marginal rate of t_Y, reduces the user cost of housing in proportion to the amount of equity held in the house, namely $(1 - \lambda)$, where λ denotes the prevailing loan-to-value ratio.

A second important component is the cost of mortgage finance. In fact, tax relief for mortgage interest payments entails an offsetting benefit to the cost of homeownership. This is denoted by the term $t_M \phi \lambda$ in equation (4), where t_M is the marginal rate of rebate that applies to mortgage interest, while ϕ is the fraction of interest payments that benefit from the tax relief, defined by taking into account provisions of the tax code on caps to the tax subsidy to mortgage debt[10]. A prominent role in the user cost is indeed played by the cost of finance, which should account for both the opportunity cost of holding equity in the house and mortgage finance. As Himmelberg et al. (2005) point out, the mortgage interest rates include not only the risk-adjusted required return on a housing loan, but also a premium for the refinancing and default options that the borrower buys from the lender (Campbell and Cocco, 2003). De facto, the tax system subsidizes these options, thus reducing the risk of homeownership from the borrower's perspective. Assuming that these options are fairly priced at a rate r_M, the extent of the subsidy is proportional to the spread on the risk-free

[9] Diaz and Luengo-Prado (2012) adopt a formulation that accounts for convex transaction costs linked to housing investment.

[10] In practice, $\phi = \min\left[\left(\frac{cap}{interest\ payments}\right), 1\right]$, where the numerator in the fraction indicates the maximum annual amount of interest that can be deducted, and the denominator the overall amount of interest payments.

rate[11]. The term $t_M \phi \lambda (r_M - r_T)$ reflects this. Importantly, in equation (4), we distinguish between the rate of relief that applies to mortgage interest, t_M, and the marginal rate of taxation that applies to investment income, t_Y. In theory, the two rates would not be necessarily different, depending on the specific tax provisions. In practice, however, against the background of significant heterogeneity in tax rules, t_M and t_Y are usually set at different levels in the countries we analyze.

As above, we account for the combined cost of maintenance and economic depreciation, m, and recurrent property tax, t_P, which is in general not deductible from income taxation in Europe – in contrast to the US.

The tax adjusted user cost is reduced by the untaxed expected rate of appreciation of the house, π^e . While financial returns realized in the form of capital gains are in general taxed, gains on primary residences often benefit from a special fiscal treatment. In particular, some tax systems envisage outright tax exemption, whereas others make taxation conditional on a number of occurrences, notably the length of ownership or of actual occupancy of the dwelling. Since these conditions are rarely met, our formulation assumes that capital gains on the primary residence are de facto untaxed.

3.1 Distortions from the favourable tax treatment of owner-occupiers

Our analysis focuses on the distortions at the intensive margin. Since the academic literature has reached mixed conclusions on the impacts of taxation at the extensive margin (own vs. rent decision), we prefer to remain silent on the potential adjustments in tenure choices stemming from the tax subsidy[12].

Using equations (3) and (4) above, we can now define the deviation from the benchmark user cost as the discount (or the ad valorem subsidy) created by the current preferential tax treatment of owner-occupied housing as:

$$\sigma = (1 - \mathrm{c}^{TA}/c^*). \qquad (5)$$

[11] This simple framework does not account for the complexities of a full optimizing model of household portfolio choice. Arguably, changes in the tax treatment of mortgage interest would bring about not only changes in the financing of housing purchases but also changes in the level and timing of housing consumption, household saving and investment into financial instruments, and the consumption of non-housing goods. Moreover, it is implicitly assumed that global capital markets determine both pre-tax rates of return and risk premia, which means that they are unaffected by changes in the tax treatment of mortgage interest.

[12] The link between tax breaks and housing tenure decisions was first analyzed by Rosen (1979) and Rosen and Rosen (1980). They find that differences in the relative prices of renting and owning drive tenure choices, and that a higher net price of housing services from owner-occupation may discourage homeownership. Rosen and Rosen (1980) further find a positive contribution of the favorable treatment of owner-occupied housing in the US tax code to the growth in homeownership rates in the post-World War II period. More recently, however, Hanson (2012) finds that the preferential taxation of owner-occupied housing creates an incentive to buy a larger house but does not have any effect at the extensive margin.

The presence of a positive tax subsidy to homeownership entails that the demand for housing services from owner-occupied residences is above the level that would prevail under tax neutrality, as defined above. In turn, since the level of consumption of housing services is determined by the ownership of residential real estate, the tax subsidy can be immediately related to the share of housing assets in homeowners' portfolios[13]. Hence, as a first measure of the behavioral distortions brought about by the tax subsidy to homeownership, we calculate owners' excess demand for housing services (D). From consumer's theory, this measure is obtained directly from the tax discount and the elasticities of demand and supply for housing services, as follows:

$$D = \sigma\tilde{\varepsilon}, \tag{6}$$

where $\tilde{\varepsilon} = -\varepsilon^{cd}\varepsilon^{s}/(-\varepsilon^{cd} + \varepsilon^{s})$. Thus, the excess consumption of housing services from owner-occupation is proportional to the tax subsidy to homeowners, and to the parameter $\tilde{\varepsilon}$, namely the harmonic sum of the compensated price elasticity of demand (ε^{cd}) and the supply elasticity (ε^{s}). Ultimately, the extent to which prices and/or quantities adjust to accommodate demand pressures depends on the elasticity of supply, which, in turn, is affected by institutional and regulatory arrangements (Gattini and Ganoulis, 2012). Importantly, departing from previous studies that assume a perfectly elastic supply for housing services, we allow for rigidities on the supply side of the housing market by using a finite elasticity of supply. Accordingly, the resulting excess consumption will be lower than in the perfectly elastic case because part of the removal of the subsidy is offset by a lower pre-tax price.

A related measure of the tax-induced distortions is the standard deadweight loss, or excess burden of taxation (Rosen, 1979, 1985). As a share of income, the deadweight loss from excess housing consumption is:

$$\frac{DWL}{income} = 1/2D\sigma s = 1/2\sigma^{2}\tilde{\varepsilon}s \tag{7}$$

where *s* represents the share of income spent on housing and the remaining variables are as before. As it is well known, the deadweight loss is proportional to the square of the tax parameter. Thus, all other things being equal, the larger the tax discount, the larger the deadweight loss will be.

Where does the bulk of the tax-induced distortions come from? The easiest way to answer this question is by taking a step back to equation (5), where we define the discount on the user cost as the proportional difference between the tax-neutral user cost and the user cost

[13] A full optimizing model of household portfolio choice in the presence of preferential treatment of owner-occupied housing, which is not in the scope of the current analysis, would recognize that changes in the tax treatment would change level and timing of housing purchases and housing consumption as well as household savings and non-housing consumption. However, we suppress these possible effects in our analysis.

under the beneficial tax treatment generally granted to owner-occupied housing. The (absolute) tax subsidy can indeed be decomposed into several components, each of them identifying a specific instance linked to homeownership, that receive a particular tax treatment, as discussed above. The decomposition gives:

$$c^* - c^{TA} = \underbrace{t_M \phi \lambda r_T}_{\substack{mortage\ interest\ tax \\ relief}} + \underbrace{t_Y(1-\lambda)r_T + t_Y\beta}_{\substack{untaxed\ return\ on\ equity: \\ imputed\ rental\ value}} + \underbrace{\pi^e t_{CG}}_{\substack{untaxed\ return\ on\ equity: \\ capital\ gains}} + \underbrace{t_M \phi \lambda (r_M - r_T)}_{\substack{value\ of\ the\ tax\ subsidy\ to \\ prepay\ or\ default\ on\ the\ mortgage}}. \quad (8)$$

The first term on the right hand side of equation (8) captures the impact of the mortgage interest tax relief. The magnitude of this component depends not only on the relevant tax rules – namely the rate of relief and possible caps to it – but also on financial conditions, reflected in the risk-free interest rate r_T and on the household-specific loan-to-value ratios. The second and third terms reflect the untaxed return on housing equity in the form of implicit rental income and capital gains, respectively. The former comprises, in addition to the risk premium β associated with ownership, the tax exemption of imputed rental income, which, up to the tax factor, is proportional to the equity held in the house and to the risk-free interest rate. The last element of the difference reflects the value of the tax subsidy to the insurance provided by the mortgage loan in terms of prepayment and default options on the debt. As discussed above, this additional term reflects the fact that, in our framework, the interest rate on the mortgage is modelled as a payment for the insurance granting the possibility to prepay or default on the loan[14].

4. Data and parameterization

The main source of data is the first wave of the HFCS, which we match with the relevant country-specific tax rules in order to calculate the user cost of homeownership at the household level. The HFCS collects micro-level information on households' economic and financial conditions, including some consumption choices, in 15 euro area countries[15]. Most importantly for our purposes, the survey characterizes in a detailed way household portfolios, both on the asset and on the liabilities sides. In this context, detailed information is provided on the household's main residence. In particular, respondents are surveyed not only on the most relevant features of the asset, such as its age and current and past market value, but also on the financing choices associated with its purchase, such as the loan-to value-

[14] Normally, the impact of the subsidy to the mortgage is of second order. Thus, we focus on the other elements of the tax discount when discussing the results.
[15] Detailed information on the survey can be found at https://www.ecb.europa.eu/home/html/researcher_hfcn.en.html.

ratio, the loan terms at the time of take-up, the amount of currently outstanding main residence mortgage debt, the mortgage interest rate and the amount of monthly payments.

In order to fully characterize incentives for housing consumption embedded in the tax system, we need information on the relevant tax regime (including tax exemptions and reliefs) applicable to homeowners. Detailed provisions on personal income taxation – under which housing-related tax reliefs are typically granted – as well as on taxes more directly related to housing, such as the fiscal treatment of imputed rents and of capital gains from financial and real assets are obtained mainly from the International Bureau of Fiscal Documentation (IBFD), complemented with various national sources. To ensure consistency, the tax rules used in the simulations are those applicable at the time the relevant variables in the HFCS are measured in the respective country. Table 4 summarizes the main variables used to calculate the user cost for each homeowner in our sample of countries. They are derived as follows:

Mortgage finance variables: we take from the HFCS household-specific loan-to-value ratios and nominal interest rates on mortgage loans taken up to finance the purchase of the main residence.

Taxes: the tax parameters in the user costs are derived by matching the country-specific tax rules, obtained from the IBFD and various national sources, with the relevant household's economic and demographic characteristics.

First, for each household, we need to impute the rate of relief applicable to the interest paid on the mortgage. We calculate the rate on the basis of the applicable tax rules, factoring in any specific provisions based on household and loan characteristics (including limitations to the possibility of rebate), as reported in the HFCS. Depending on the tax system, the relief, when in place, may be granted as a tax deduction, i.e. a reduction of the taxable base, or as a tax credit, i.e. a reduction of the tax liability. In countries where the rebate takes the form of reduction in the tax liability, we use the statutory tax credit rate, as reduced by potential caps, if binding for the specific household. By contrast, where granted as a deduction from taxable income, the value of the rebate coincides with the marginal tax rate levied on personal income. To this purpose, we calculate the marginal tax rates on personal income of the household head, implicitly assuming that he/she is the one holding the mortgage, and thus potentially eligible to the mortgage interest deduction. Specifically, we start from gross income, as reported in the HFCS, and reduce it by the amount of social contributions paid by the individual, calculated using the relevant social insurance rates[16]. Then, we apply the income tax schedule to the net amount in order to obtain the marginal tax rate on personal income. In particular, in addition to the information on the tax brackets and the rates, we take account of general allowances and tax deductions specific to the individual, for instance for earned employee income, as well as of other deductions that depend on observable family

[16] We consider wages, income from self-employment and pensions, and apply the relevant social contribution rate schedule.

characteristics, such as the deductions for children. Moreover, we take into account specific taxation regimes (such as joint taxation of couples). We face the standard limitation of microsimulation exercises that we cannot account for other tax reductions, such as those granted to personal expenses, in so far as the necessary information on the underlying household choices is not available in the HFCS. Since both the type and the generosity of these tax reductions vary considerably across countries, we prefer to exclude them from our calculations instead of imputing some approximated values for the underlying unobserved expenditures, in order to reduce the incidence and size of measurement error in the simulated tax rates. As mentioned above, the actual rate of rebate on mortgage interest depends on the presence of upper limits to the amount of interest that can be deducted, if binding for the household. The information on the household monthly payments for the mortgage reported in the HFCS allows us to quantify the fraction of interest benefitting from the tax rebate, and, consequently, to calculate the household-specific actual rate of tax relief.

Second, we use the tax rate on interest income as the relevant rate to account for the impacts of taxation on the opportunity cost of holding home equity (t_Y). In most European countries interest income is taxed via withholding taxes levied at flat rates. Thus, we use the country-specific statutory rates of these withholding taxes in our calculations. They range between 15 percent and 30 percent. Again, we are not able to account for potential tax allowances given the level of detail of the information in the HFCS.

Third, since payments for recurrent property taxes at the household level are not reported in the HCFS, we calculate the recurrent property tax rate (t_P) using the methodology of Mendoza et al. (1994)[17]. Practically, this entails obtaining a country-specific effective property tax rate from aggregate data. In particular, we use revenue data from recurrent property taxes falling on households (taken from the OECD Revenue Statistics) over the (maximum possible) base, which we proxy with the value of the dwellings stock in the household sector (obtained from Eurostat). In our sample the upper bound of the country-specific effective rates is slightly above 1 percent[18].

We calibrate the capital gains tax rate (t_{CG}) using the actual tax rates applied to the realized gains on financial assets (shares). Often, these tax rates are aligned with those applicable to interest income and dividends in order to avoid distortions in individual financial decisions on asset holding induced by a differential tax treatment of alternative forms of return. By contrast, in some countries, capital gains on financial assets are tax exempt, presumably on the grounds of the potential risk of a lock-in effect.

[17] Note that, since, in practice, the property tax base is very often decoupled from market values (see European Commission, 2015b), applying the statutory rates to the self-reported value of the household main residence (available in the HFCS) would largely overestimate the effective rate of recurrent property taxation.

[18] The order of magnitude is reasonably consistent with the values for the US reported in Poterba and Sinai (2008), who obtain an average rate of 1.04 percent by dividing self-reported property taxes paid by self-reported house values.

Expected house price inflation: as standard in the user cost literature, we employ observed inflation instead of expected price changes. In this way, we avoid modelling explicitly expectations on house price developments. Thus, we use the average of past annual house price inflation as the relevant variable. To smooth out the effects of the housing market cycle, we consider a period of at least ten years, resorting to longer series whenever they are available for specific countries.

Housing demand and supply elasticities: in line with Albouy and Hanson (2014), we set the compensated housing demand elasticity for housing services at -0.5, a rather conservative value. Supply elasticities for the euro area countries are obtained from Caldera and Johannsson (2014), who use an error-correction model to estimate the responsiveness of housing supply to price changes. For countries not covered by the Caldera and Johannsson (2014) paper, we use the median value of the available estimates.

Interest rates: we follow the literature (Campbell and Cocco, 2003) and consider the 10-year government bond rate as the relevant yield in case of fixed rate mortgages and the 1-year Eonia Swap rate as the reference yield for variable rate mortgages.

Other parameters: For consistency with previous studies, and also to allow for comparison with them, we set the combined annual depreciation and maintenance cost (m) at 2.5 percent of the house value. The risk premium from owning over renting (β) is calibrated at 200 basis points, a value obtained from Flavin and Yamashita (2002) and used also by Poterba and Sinai (2008, 2011)[19]. Finally, we calculate the average share of income spent on housing (s) using individual data from the EU-SILC dataset. We obtain aggregate national averages ranging from around 11 percent in Cyprus and Malta to 35 percent in Greece[20].

[19] Consistent with the framework of Flavin and Yamashita (2002), the calibrated value does not account for potential dampening factors such as the insurance value of owning a house in hedging risk associated with future changes in rents (Sinai and Souleles, 2005).
[20] As a reference, the ratio for the US is calibrated at 25 percent in Poterba (1992) and at 16 percent in Albouy and Hanson (2014).

Table 4. Simulation parameters

country	MITR	property tax effective tax rate (%)	tax rate on interest income (%)	capital gains tax: on housing	capital gains tax: on financial assets (tax rate, %)	housing supply elasticity
AT	d, cap	0.03	25	no if tenure MR>2y	0	0.234
BE	d, cap	0.67	15	no if tenure>5y	0	0.315
CY	no	0.22	10	no if tenure >5y	0	*
DE	no	0.13	26.38	no if tenure MR>2y	26.38	0.428
ES	c, cap	0.69	19	no if MR and reinvested	21	0.452
FR	c, cap, i	1.06	30.10	no on MR	30.1	0.363
GR	c, cap, i	0.08	10	no	21	*
IT	c, cap	0.41	27	no on MR	12.5	0.258
LU	d, cap, i	0.14	10	no on MR	0	*
MT	no	0.00	15	no if tenure MR>3y	35	*
NL	d, i	0.06	30	no	0	0.186
PT	c, cap	0.46	20	no if MR and reinvested	20	*
SI	no	0.10	20	no if tenure MR>3y	0	*
SK	no	0.10	19	no if tenure MR>2y	19	*

Note: MITR: d: deduction; c: tax credit; i: interest payments only are tax favored; cap: tax favored amount is capped; MR: main residence. * set equal to the median value in the sample. Tax provisions are those applicable at the time the HFCS was fielded.

5. Simulation results

Table 5 reports our main simulation results (average values, unless otherwise indicated).

5.1 The user cost

Cross-country differences in the user cost of housing capital are substantial. Expressed as a percentage of the house value, the country averages of the user cost under neutral tax treatment range between 2.7 percent in Belgium and 11 percent in Slovenia. The overall average is 5.6 percent. The differences in the tax-neutral user cost cases are mostly due to the economic variables, namely house price inflation and interest rates, and to a lesser extent to the differences in the treatment and tax rates applicable to financial capital gains. In fact, even if the economic variables are averaged over several years to smooth the influence of discrepancies in cyclical developments, the results point to a significant degree of heterogeneity in the underlying medium-term financial and housing market conditions in the euro area. As a result, the incentives to consume housing services are correspondingly heterogeneous across euro area countries even in the benchmark case where we abstract from tax-induced reductions in the annual cost of homeownership.

Expectedly, in all countries the user cost of capital actually faced by homeowners – calculated including all the relevant tax provisions and exemptions – is lower than its tax-neutral benchmark. On average, it ranges from 1.4 percent in the Netherlands to almost 10 percent in Slovenia. In a cross-country perspective, the observed user cost of housing in Slovenia is about twice the value observed in Portugal, Greece and Germany, and seven times higher than in the Netherlands, the country where the average user cost is the lowest. The size of the tax subsidy varies accordingly across countries. In France and the Netherlands current tax rules reduce the user cost by roughly 60 percent with respect to the tax-neutral benchmark, while

in Slovenia, Luxembourg and Cyprus the reduction is slightly above 10 percent. On average, the favourable tax treatment to homeownership reduces the user cost of housing by roughly 40 percent compared to the tax-neutral benchmark.

Breaking down the total tax subsidy into its components sheds light on the drivers of the observed gap. Overall, the largest contribution comes from the tax subsidy to home equity in the form of untaxed imputed rental income. On average, this component accounts for almost two-thirds of the discount on the user cost. Accordingly, the average reduction in the benchmark user cost is around 23.5 percent, and can be as high as 38 percent in the Netherlands. The fiscal treatment of capital gains, which largely go untaxed for long-term owners, determines an additional significant reduction in the opportunity cost of home equity. The order of magnitude varies from 7 percent to 30 percent, and averages 13 percent of the tax-neutral cost, its size being determined, for a given rate of house price inflation, by the tax rate on financial capital gains in the different tax systems. All in all, the subsidy to home equity, which combines the effect of leaving untaxed both imputed rental income and realized capital gains on the house, is on average 36 percent, with values ranging from 10.4 percent (Slovenia and Luxembourg) to almost 60 percent (France).

Statutory provisions for mortgage interest tax relief differ markedly across national tax codes. As discussed above, the relief can be granted as a tax credit (i.e. reduction of the tax liability proportional to the payments made on the loan), or as a deduction against income (i.e. a reduction of the tax base). Caps to the deductions or other forms of limitations, such restricting the entitlements to first time buyers or to young families only, are also in place in the euro area. Hence, gauging the actual generosity of the tax rebate is ultimately an empirical issue. We find that the mortgage tax relief reduces the user cost, although in general less significantly than the tax exemption granted to the return to equity. This is partly due to the relatively low loan-to-value ratios (see section 2), likely reflecting specific economic and institutional conditions (credit constraints for younger households, binding prudential regulations, e.g. in terms of loan-to-income ratios, progressive repayment of mortgage debt for older households). Perhaps not surprisingly, the noteworthy exception is the Netherlands, where the combined effect of an uncapped deduction and high top marginal personal income tax rates lead the mortgage tax relief to reduce the user cost by more than one-fourth. Overall, in the countries where a rebate for mortgage interest payments is in place, the presence of a cap to the deductible amounts and/or the fact that the relief is granted as a tax credit at rates usually lower than the top marginal personal income tax rates keep its impact at around 6 percent of the tax-neutral user cost on average.

In addition to tax design features, differences in financial and economic conditions, notably the level of the medium term interest rates and, above all, the household-specific loan-to-value ratios, naturally contribute to the observed cross-country heterogeneity in the impact of the mortgage interest tax rebate. Moreover, since, as discussed in section 2, the presence and amount of outstanding mortgage debt has a clear pattern over the life cycle, the average tax subsidy in the data is also influenced by demographic factors. To single out the impact of

taxation, we purge the results from the endogenous financing choices as they appear in the data. Hence, we obtain two alternative measures of the tax subsidy that can be interpreted as the marginal (as opposed to the average) subsidy to housing debt and to home equity, i.e. the tax rebate on the additional euro of interest paid on the mortgage and of imputed rental value obtained from the household main residence (Follain and Ling, 1991) [21]. This counterfactual exercise is particularly informative of the incentives for households to take up mortgage debt, or the potential demand effect for mortgage finance, embedded in the current tax systems. The results are reported in the third panel of table 5. The marginal subsidy from the exemption of imputed rent is roughly in line with the average value, except for the Netherlands, where it rises above 50 percent of the benchmark user cost (from a country average of approximately 40 percent). By contrast, we find that the marginal value of the rebate granted to mortgage interest payments is twice as large as the average value. Indeed, it reaches 12 percent of the tax-neutral user cost for mortgagors, against an average observed value of roughly 6 percent. As expected, the highest marginal subsidies are recorded in the countries where a deduction against taxable income is in place and marginal tax rates on personal income are relatively high, namely the Netherlands, Belgium and Austria. By contrast, in the countries where a tax credit is granted to interest payments, the marginal value of the rebate is 10 percent on average.

Table 5. User cost of owner-occupied housing and the impact of taxes

	User cost of housing capital		Average tax subsidy				Marginal tax subsidy	
			Overall	*of which from:*				
	actual tax treatment	tax-neutral benchmark		mortgage interest tax relief	tax exemption of imputed rent	untaxed capital gains	from mortgage interest tax relief	from tax exemption of imputed rent
AT	3.12	4.45	29.79	6.46	28.05	0	21.46	30.47
BE	1.87	2.72	31.22	11.24	26.92	0	38.55	29.55
CY	3.84	4.42	13.02	0	13.02	0	0	14.94
DE	4.74	6.39	25.79	0	18.36	7.44	0	21.01
ES	3.88	5.95	34.89	3.34	18.05	15.52	8.67	19.93
FR	2.09	5.24	60.16	2.65	28.73	30.46	4.54	30.94
GR	5.60	7.06	20.66	5.24	9.62	10.11	13.24	10.16
IT	3.32	5.35	37.92	4.73	28.56	9.11	13.31	29.55
LU	3.90	4.41	11.60	3.66	10.42	0	11.05	11.71
MT	3.29	5.77	43.01	0	15.69	27.32	0	16.11
NL	1.36	3.22	57.84	25.94	38.01	0	43.27	53.70
PT	5.21	7.32	28.82	4.83	17.92	10.39	10.75	20.23
SI	9.88	11.03	10.42	0	10.42	0	0	10.57
SK	2.79	4.74	41.29	0	22.86	18.42	0	23.51
euro area	*3.55*	*5.61*	*38.17*	*5.77*	*23.52*	*12.91*	*12.16*	*26.10*

Notes: the user cost is expressed in percentage of the house value. The tax subsidy is expressed in percentage of the tax-neutral benchmark. The tax subsidy from mortgage interest tax relief is calculated over homeowners with outstanding mortgages only.

5.2 The efficiency cost of tax distortions

In a standard model setup, consumption of housing services enters individual utility functions. In turn, the interaction between demand and supply of housing determines the

[21] In particular, we obtain the marginal subsidy to mortgage debt by setting the loan-to-value equal to 1 in the first term of equation (8). Likewise, the marginal subsidy to home equity due to untaxed imputed rent is obtained, net of the risk component, by setting the loan to value to 0 in the second term of equation (8). We assume that the same cap to the tax relief as in the baseline (average) case is applicable at the margin.

equilibrium level of housing consumption. In a broader perspective, given the double nature of houses – as a consumption good, or source of residential services, and as an asset –, tenure choices determine the size and composition of household portfolios. Indeed, after having made the discrete choice of ownership, households must hold the exact amount of housing asset needed to provide for their desired consumption of housing services. This affects not only the allocation of savings into alternative (financial) assets, but also the composition of liabilities, notably when mortgage debt has to be taken up to finance the purchase of the main residence. All in all, homeownership choices affect the overall allocation of capital, also in the productive sector, and thus determine general equilibrium effects (Berkovec and Fullerton, 1992; Gervais, 2002).

The standard public finance framework to quantify efficiency losses from taxation focuses on quantities rather than prices. The same framework lends itself to evaluate the distortions in consumption of residential services, and, thus, investment in residential assets, brought about by the current tax treatment of homeownership. As section 3 illustrates, by modelling the user cost discount as an ad valorem subsidy we can simulate its impact on consumption of housing services at the intensive margin[22]. In particular, we focus on the excess consumption taking place under favorable tax treatment with respect to the consumption level associated to our hypothetical tax-neutral benchmark. The relevant behavioral parameters are the demand and supply elasticities (see section 4). Specifically, we set the demand elasticity constant across countries and households – its level being fixed at the conservative value of -0.5. This might seem a restrictive assumption, because, arguably, the responsiveness of demand to price changes might effectively be determined by individual characteristics, and thus vary across households. For instance, Rosen (1979) estimates the uncompensated elasticity to be a declining function of income, although his specification has the drawback of implying a positive own-price elasticity for households with very high income. However, since recent and robust evidence on household-specific elasticities is lacking, we stick to the value of -0.5, the same used in Albouy and Hanson (2014). As discussed above, the calibration of the supply elasticity allows us to introduce some variability across countries, and thus, to implicitly capture structural and institutional features of national housing markets. Ideally, one would like to factor in a more detailed account of the supply conditions in local housing markets, differentiating for instance between cities and rural areas within each country[23]. The use of a national average value is again due to the lack of alternative reliable estimates at a finer level of disaggregation within countries.

Table 6 displays different measures of the behavioral distortions determined by the favorable tax treatment of homeownership. The first column reports the increase in housing

[22] Using the intensive margin implies that housing is treated, to some extent, as a divisible good. That is, it is assumed that household can move into smaller or bigger residences as a result of changes in the user cost of housing capital.

[23] For instance, Albouy and Hanson (2014) use the elasticities estimated by Saiz (2010) using local geological features for the US metropolitan areas.

consumption that results from the user cost discount, calculated ruling out any positive externalities stemming from additional housing consumption. All in all, we find that, on average, housing consumption per capita is roughly 7.8 percent higher than the efficient level that would be attained in the absence of tax subsidies to homeownership. Again, the cross-country variability is sizable, with the average rate of excess consumption ranging from 2 percent of the current house value in Slovenia to 13 percent in France.

To put that in perspective given the current composition of household portfolios, we report the value of the excess housing consumption as a percentage of current financial asset holdings (excluding public and occupational pensions) reported in the HFCS. While a fully-fledged portfolio model would be needed to pin down an optimized asset allocation (Flavin and Yamashita, 2002), at the very least, this simple exercise is informative of the amount of savings that, in our stylized theoretical framework, could be redirected from real to financial assets. The results show that, on average, excess housing consumption accounts for roughly 30 percent of the current holdings of financial assets in homeowners' portfolios. The calculated values range from 12 percent in Belgium to 83 percent in Slovakia, where the level of financial asset holdings is relatively low.

The overall efficiency cost associated with the tax-induced overconsumption of housing services can be summarized by a standard measure of deadweight loss, following Rosen (1979, 1985) and Poterba (1992). On average, assuming again that there are no positive externalities from consuming additional housing services, the deadweight loss amounts to 0.33 percent of household income, with extreme values ranging from 0.02 percent for the countries recording low tax subsidies to as much as almost 0.7 percent of income in the Netherlands and France. Converting these figures in monetary amounts using as benchmark household gross income gives an overall total loss of almost EUR 7 billion per year in the euro area.

Naturally, the calculated distortions, including the deadweight loss, depend crucially on the calibration of the elasticities. While we stick to our conservative value of the demand elasticity due to lack of alternative evidence, we check the sensitivity of the results to a different calibration for the responsiveness of supply. In particular, we substitute the country-specific supply elasticities with the average US value. Caldera and Johansson (2014) estimate a long run responsiveness of housing supply of 2 in the US – a value that is significantly larger than the average elasticity in the euro area. In our setup, larger elasticities, that is, more flexible housing markets on the supply side, imply a more marked adjustment of quantities for a given tax-induced reduction of the user cost of owning, ceteris paribus. Hence, not surprisingly, the aggregate deadweight loss from the tax subsidy doubles compared to the baseline case with country-specific elasticities. When it comes to the country-specific distortions, when we use the US elasticities the deadweight loss can be above one percent of household income like in France, and even reach 2 percent (the Netherlands).

Table 6. Tax-induced distortions in consumption of owner-occupied housing

	Excess housing consumption		Deadweight loss			
			with country-specific supply elasticities		*with US supply elasticity*	
	as a % of house value	as a % of financial asset holdings	*% of income*	*EUR bn*	*% of income*	*EUR bn*
AT	4.75	19.50	0.15	0.10	0.38	0.25
BE	6.03	11.85	0.22	0.24	0.46	0.50
CY	2.91	12.48	0.02	0.00	0.04	0.00
DE	5.95	17.76	0.23	1.71	0.40	2.96
ES	8.28	46.99	0.27	0.65	0.45	1.10
FR	12.65	40.62	0.67	1.77	1.28	3.37
GR	4.61	34.69	0.17	0.10	0.31	0.18
IT	6.45	45.34	0.20	0.99	0.48	2.33
LU	2.59	13.09	0.02	0.00	0.04	0.00
MT	9.60	37.61	0.23	0.01	0.41	0.01
NL	7.84	25.19	0.69	1.32	2.03	3.90
PT	6.43	29.16	0.15	0.07	0.26	0.12
SI	2.33	31.32	0.02	0.00	0.03	0.00
SK	9.21	83.37	0.40	0.03	0.72	0.06
euro area	*7.82*	*30.60*	*0.33*	*6.96*	*0.67*	*14.70*

Note: distortions calculated over the whole sample of homeowners. Financial assets in household portfolios do not include public and occupational pension plans. The demand elasticity is calibrated at -0.5.

5.3 Distributional implications

The distributional implications of the tax subsidy stem from the combined effect of tax design and differences in households' economic and financial conditions. Table 7 reports the user cost discount from equation (5) across income and net wealth quintiles.

In general, differences in the tax subsidy across income quintiles are not particularly marked, whereas the tax subsidy is regressive (that is, increasing with income) in Belgium, Austria, and the Netherlands. Looking at the average contributions of the tax break for mortgage interest payments and for imputed rental income sheds light on the incidence of the different components. In particular, the mortgage tax relief appears mostly regressive, benefitting relatively more high-income households, irrespective of the specificities of its design. This likely reflects mortgage debt incidence and the different loan-to-value ratios, and also implies that the deduction limits might not be binding for households at the low end of the income distribution. The evidence is consistent with the results in European Commission (2015a), that finds mild regressive effects of the tax rebate on households' tax liabilities. The conclusions are reversed when net wealth quintiles are considered, reflecting the larger amount of housing equity associated with higher levels of net wealth. Thus, the under-taxation of equity contributes correspondingly more to the overall tax subsidy for the wealthier homeowners than for the ones at the bottom of the net wealth distribution.

Table 7. Tax-related reduction to the user cost by income and net wealth quintiles

country		average tax subsidy			contribution of:					
					mortgage interest tax relief			imputed rent tax exemption		
		by quintile of:			by quintile of:			by quintile of:		
		income (equivalised)	net wealth	net housing wealth	income (equivalised)	net wealth	net housing wealth	income (equivalised)	net wealth	net housing wealth
AT										
	q1	29.19	28.29	27.95	1.11	5.69	7.23	28.26	23.98	22.49
	q2	29.75	30.13	30.03	1.63	1.91	1.40	28.34	28.49	28.83
	q3	30.01	30.22	30.43	2.65	0.93	1.11	27.82	29.48	29.52
	q4	29.98	30.37	30.32	3.33	1.93	0.80	27.63	28.91	29.73
	q5	30.03	29.95	30.27	2.58	0.82	0.54	28.20	29.41	29.89
BE										
	q1	28.92	32.24	32.76	1.14	10.49	12.25	28.05	22.76	21.64
	q2	29.62	31.80	31.99	2.77	5.16	5.15	27.32	26.97	27.10
	q3	31.99	30.86	30.88	6.18	2.90	3.13	26.40	28.05	27.90
	q4	32.92	30.96	30.27	7.09	2.32	1.31	25.91	28.48	28.95
	q5	32.68	30.25	30.20	5.83	2.11	1.11	26.92	28.38	29.06
CY										
	q1	13.79	11.58	10.20				13.79	11.58	10.20
	q2	13.11	13.07	13.14				13.11	13.07	13.14
	q3	12.45	13.27	13.72				12.45	13.27	13.72
	q4	12.57	13.45	13.96				12.57	13.45	13.96
	q5	13.19	13.75	14.20				13.19	13.75	14.20
DE										
	q1	27.03	21.63	21.07				19.60	14.20	13.64
	q2	25.70	25.90	26.25				18.27	18.47	18.81
	q3	25.57	26.77	26.88				18.14	19.33	19.45
	q4	25.21	27.24	27.63				17.77	19.81	20.20
	q5	25.44	27.47	27.83				18.01	20.03	20.39
ES										
	q1	35.41	33.85	33.72	0.56	3.22	3.22	19.21	14.37	14.25
	q2	35.34	35.20	35.21	1.24	0.94	1.02	18.32	18.55	18.47
	q3	35.40	35.13	35.11	1.60	0.63	0.60	17.86	18.84	18.87
	q4	34.02	35.10	35.21	1.38	0.40	0.42	16.83	19.13	19.19
	q5	34.27	35.19	35.22	0.62	0.23	0.12	18.05	19.39	19.56
FR										
	q1	60.52	58.59	58.56	0.40	2.65	3.07	29.59	24.99	24.45
	q2	59.84	59.96	59.79	0.76	0.60	0.57	28.44	28.77	28.64
	q3	59.88	60.61	60.52	0.99	0.35	0.25	28.27	29.70	29.76
	q4	60.26	60.80	60.89	1.16	0.19	0.13	28.40	30.12	30.28
	q5	60.29	60.84	61.03	0.76	0.29	0.06	28.93	30.05	30.50
GR										
	q1	20.50	21.13	21.08	0.70	2.46	2.40	9.75	8.85	8.84
	q2	20.47	20.56	20.67	0.76	0.74	1.08	9.72	9.74	9.58
	q3	20.62	20.61	20.55	1.06	0.83	0.58	9.55	9.73	9.86
	q4	20.73	20.52	20.52	1.16	0.57	0.55	9.53	9.86	9.87
	q5	20.97	20.46	20.42	1.36	0.43	0.30	9.53	9.90	10.00
IT										
	q1	38.11	36.64	36.46	0.43	1.75	1.87	28.93	26.89	26.70
	q2	38.21	38.05	37.99	0.42	0.58	0.63	28.91	28.70	28.62
	q3	37.82	38.44	38.37	0.81	0.22	0.30	28.34	29.23	29.12
	q4	37.80	38.31	38.47	0.77	0.35	0.20	28.42	29.05	29.25
	q5	37.68	38.18	38.43	0.88	0.41	0.21	28.19	28.91	29.24
LU										
	q1	11.33	10.85	10.66	0.58	3.55	4.58	10.48	7.92	7.35
	q2	11.66	11.74	11.78	0.65	0.86	0.97	10.81	10.63	10.76
	q3	11.52	11.78	11.76	0.82	0.31	0.23	10.21	11.11	11.24
	q4	11.90	11.72	11.74	1.45	0.20	0.17	10.26	11.25	11.30
	q5	11.63	11.70	11.71	1.30	0.49	0.03	10.35	11.24	11.51
MT										
	q1	43.29	42.53	42.56				15.97	15.21	15.24
	q2	43.25	43.15	42.98				15.93	15.83	15.66
	q3	43.12	43.25	42.99				15.80	15.93	15.67
	q4	42.95	43.06	43.25				15.63	15.74	15.93
	q5	42.46	43.09	43.32				15.14	15.77	16.00
NL										
	q1	50.71	64.14	64.26	12.87	45.24	49.38	39.22	19.45	16.38
	q2	57.00	59.12	59.55	18.95	24.82	27.43	38.87	34.31	31.96
	q3	59.04	56.53	56.58	20.93	15.09	12.93	38.09	41.63	43.01
	q4	60.07	54.88	55.07	19.97	8.26	6.67	38.80	46.85	48.16
	q5	62.43	54.51	53.68	27.01	6.16	3.00	35.05	47.89	50.74
PT										
	q1	29.73	26.83	26.61	0.85	3.61	3.79	18.97	15.14	14.89
	q2	29.26	28.93	28.41	1.25	1.56	1.96	18.53	18.09	17.54
	q3	28.54	29.32	29.57	1.89	1.17	0.94	17.65	18.62	18.94
	q4	28.56	29.44	29.65	1.95	1.05	0.87	17.52	18.74	18.99
	q5	27.99	29.56	30.07	2.33	0.87	0.46	16.91	19.00	19.57
SI										
	q1	10.49	10.25	10.20				10.49	10.25	10.20
	q2	10.44	10.34	10.41				10.44	10.34	10.41
	q3	10.48	10.51	10.46				10.48	10.51	10.46
	q4	10.45	10.54	10.52				10.45	10.54	10.52
	q5	10.24	10.47	10.52				10.24	10.47	10.52
SK										
	q1	41.51	40.14	40.03				23.08	21.72	21.60
	q2	41.28	41.45	41.48				22.86	23.02	23.05
	q3	41.33	41.54	41.41				22.90	23.11	22.99
	q4	41.31	41.62	41.78				22.89	23.20	23.35
	q5	40.99	41.69	41.76				22.57	23.26	23.34

Notes: The tax subsidy is expressed in percentage of the tax-neutral benchmark user cost. Quintiles are calculated over homeowners only.

6. Conclusions

This paper examines the effects of the favourable tax treatment of owner-occupied housing on the incentives to consume housing services for euro area households, as embedded in the user cost of capital. We use household level data from the first wave of the HFCS, and match it with the tax rules relevant to owner-occupiers in the different countries.

We document significant differences in homeownership rates, mortgage debt prevalence and loan-to-value ratios, both across and within countries, likely shaped by equally different economic and institutional features of the housing and mortgage markets. Against this background, while specificities of tax design vary across countries, under-taxation of owner-occupiers seems to be a general phenomenon leading to an inefficiently high level of consumption of housing services.

In particular, we find that the user cost of owner-occupied housing is almost 40 percent below the efficient level under a neutral tax system where the net return to owner-occupiers is fully subject to taxation. The bulk of the average tax subsidy comes from under-taxation of the return to home equity (in the form of imputed rental income and capital gains), while the average contribution of the rebate for mortgage interest is driven down by relatively low loan-to-value ratios. However, the marginal value of the tax break for mortgage interest payments is twice as large as its average value. By reducing the effective borrowing cost, the rebate provides an incentive to take up mortgage debt to a larger extent than the average subsidy would suggest. Overall, the tax benefits to homeownership lead to an inefficiently high level of consumption of housing services – around 7.8 percent higher than the level attainable under neutral taxation. The implied misallocation of individual savings might be substantial: on average, excess housing consumption accounts for 30 percent of the current holdings of financial assets in homeowners' portfolios in the euro area.

In the public finance literature the overall efficiency cost associated with the tax-induced overconsumption of housing services is summarized by a standard measure of deadweight loss. On average, assuming that there are no positive externalities from consuming additional housing services, the deadweight loss amounts to 0.33 percent of household income, or EUR 7 billion per year in the euro area. Supply rigidities in the housing market, leading to adjustment of house prices in the wake of demand pressures stemming from the tax subsidy, reduce the deadweight loss. This suggests that tax reforms that reduce the fiscal benefit to homeowners are complementary to policy measures aimed at enhancing flexibility on the supply side of the housing market.

The distributional implications of the favorable tax treatment of owner-occupiers stem from the combined effect of tax design and of differences in households' economic and financial conditions. We find that the mortgage interest tax relief has mild regressive effects in terms of equivalised household income, while it is progressive in term of net wealth. All in all, caps

and other limitations to the amount of deductible interest keep the tax break from having distributional implications across income classes as pronounced as in the United States.

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Serena Fatica
European Commission, Joint Research Centre (JRC), Ispra, Italy; email: serena.fatica@ec.europa.eu

Doris Prammer
Oesterreichische Nationalbank, Wien, Austria; email: doris.prammer@oenb.at

Postal address	60640 Frankfurt am Main, Germany
Telephone	+49 69 1344 0
Website	www.ecb.europa.eu

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