Housing Policy Impacts on Poverty and Inequality in Europe*

Guillaume Bérard † Alain Trannoy ‡

December 21, 2023

Abstract

Poor housing conditions are detrimental to household members' health, schooling, and social interactions. Developed countries have responded to the challenge of improving housing for the poor using two main instruments: cash housing benefits and/or social housing. In this paper, we assess how effective they are in reducing households' housing poverty and inequality by comparing them separately and combined, with a counterfactual situation with no housing policies, examining 27 European countries by using harmonized data from the EU-SILC and HBS datasets. We find that (1) cash housing benefits are more cost-effective than in-kind housing benefits (social housing) and more effective in reducing poverty than inequality. This is true even when accounting for the partial capture of cash housing benefits by landlords, as documented by many studies. (2) Some Nordic and Western countries, and especially Finland, achieve an impressive reduction in inequality and poverty (one-third) while spending as much as France and less than the UK. (3) Inequality in housing expenses is comparable to that in non-housing consumption expenditure, which is, in turn, much higher than inequality in housing services (a difference of 10 Gini points on average). Therefore, housing services are less dispersed than other goods and services consumption in Europe. (4) Based on an econometric estimate, we show evidence that in almost all countries outright ownership is the most advantageous tenure status after taking into account housing policies.

Keywords — Housing policy, Housing consumption, Inequality, Poverty

JEL Classification — D63, I32, D31, H23

*We warmly thank Laurence Bouvard for her help on the datasets, Gabrielle Fack, Laurent Gobillon, Thierry Magnac, Sonia Paty, Etienne Wasmer, the participants of the workshop ECHOPPE, the 9^{th} ECINEQ conference, the JRC European Commission seminar, the IRSEI Brown Bag seminar, and the Social Situation Monitor Research Seminar, the workshop on Housing Policy and Wealth Inequality for their helpful comments, and Marjorie Sweetko for her corrections. All remaining errors are our own. This work was supported by French National Research Agency Grants ANR-17-EURE-0020 and ANR-17-CE41-0008 (ECHOPPE).

†Luxembourg Institute of Socio-Economic Research (LISER) (email: guillaume.berard@liser.lu, website: https://sites.google.com/view/guillaume-berard), corresponding author

‡Aix-Marseille Univ, CNRS, EHESS, AMSE, Marseille, France (email: alain.trannoy@univ-amu.fr, website: https://www.amse-aixmarseille.fr/users/trannoy)

1 Introduction

Housing provides an example of a primary good *à la Rawls*. The specific egalitarianism pioneered by Tobin (1970) promotes the idea that housing should be subsidized more than other consumption goods because poor housing conditions may weaken the health of household members (Krieger and Higgins, 2002). While this can worsen the adults' productivity in the workplace, those who suffer most are children, whose ability to get a good education may be impacted (Goux and Maurin, 2005). Societies in the developed world have responded to the challenge of improving housing for the poor using two main instruments: housing cash transfers (housing benefits or allowances) and in-kind housing benefits (social housing). In many European countries, housing policies are under fire. Of course, it is understandable that all social programs are subject to a spending review in times of budgetary restraints. But beyond that, there is a concern about whether public spending is well used and meets the intended purpose of housing policies.

This paper examines the effectiveness of these two housing policies in reducing inequality and poverty in households' housing expenditure in more depth than previous studies (see, Section 2 devoted to the related literature). To do so, we develop counterfactual income distributions and specific housing services if housing policies were not implemented, by computing the households' (actual) housing expenses and cash advantage from each housing policy by tenure status, using EU-SILC[1] data. We then compare the counterfactual distributions to a natural benchmark, i.e., the disposable income without any housing public policies, to estimate the reducing effect on poverty and inequality, using Gini and FGT[2] indices. We also compare housing inequality with inequality in consumption expenditure (excluding housing costs) to see if a specific egalitarianism lies behind public policies on housing, using matched EU-SILC and HBS[3] data. As we focus on public policies dedicated to reducing housing poverty and inequality, it should be noted that we do not include homeowners-oriented policies like tax deductions or zero-interest loans.

The contribution of this study is fourfold. First, whereas the previous literature focused on a single policy or the redistributive effect of including imputed rents in income, we estimate and disentangle the effects of the two main housing policies aimed at reducing inequality and poverty: cash housing benefits and social housing. Second, we estimate these effects for all types of tenure status, whereas most previous studies focused on owners or social housing renters alone, and we propose a detailed comparison of housing inequality and poverty rates in 27 European countries using the EU-SILC dataset. To the best of our knowledge, this is the first paper to assess the total impact of housing

[1]European Union Statistics on Income and Living Conditions.
[2]Foster-Greer-Thorbecke.
[3]Household Budget Survey.

policies on inequality and poverty for all European countries using harmonized data, and disentangling the effects of both cash housing benefits for all types of tenure status and in-kind housing benefits for renters below market-rents. Third, we provide a first account of the redistribution impact of the partial capture of cash housing benefits by landlords documented by many studies. Indeed, cash housing benefits have been found to increase rents in various countries, where some papers find that more than 70% of the cash housing benefits accrued to landlords, at least in the rental housing markets with inelastic supply and elastic demand. This partial capture of the subsidies by landlords is worrying because it raises the marginal cost of public funds for this particular use. In doing that, we go further than adopting a pure accounting answer, since the agent's behavioral responses and partial equilibrium adjustment are somewhat integrated even if we do not allow households' tenancy choices to differ absent housing benefits. Fourth, we compare households' housing services and expenses to non-housing consumption expenditure to see whether specific egalitarianism holds for housing outlay.

Our main results show that cash housing benefits are more cost-effective than in-kind housing benefits (social housing), and more effective in reducing poverty than inequality. Simulations performed by applying a partial capture of the cash housing benefits by landlords (50 %) confirmed these findings, at least for poverty.

European countries use different policies to help households meet their housing expenses, and their public spending on housing differs significantly (see, Whitehead and Scanlon, 2007). We show a positive correlation between inequality- and poverty-reducing effects and the level of public spending on housing at the national level. Nevertheless, some countries achieve better results in reducing inequality and poverty while spending much less than others. For instance, the United Kingdom, which spends around 1% of its GDP on housing policies—between 1.2 and 3.7 times more than other Western and Nordic European countries—obtains a reduction in inequality comparable to that of Germany, France, Ireland and Finland, while its poverty rate has only fallen in proportions less or equal to that of Sweden, the Netherlands, Ireland, and Finland. In all dimensions, the performance of that last country is impressive. It is not the case for all countries, with France and Denmark performing poorly in cost-effectiveness for inequality and all poverty indices of the FGT class, or Germany for poverty solely. This difference in public spending effectiveness could be explained by countries' use of targeted housing policies instead of universal ones. Germany and Sweden, for instance, which have a low share of households benefiting from housing policies (14% and 13% respectively), or Finland, which has much more degressivity by quintile of equivalized disposable income, perform similarly or even better at reducing both inequality and poverty than Ireland, France, the United Kingdom, or Denmark, which have high shares of households benefiting from housing policies (50%

- 20%) and less degressive shares in the top quintiles of equivalized disposable income[4].

Using a statistical matching method on the EU-SILC and HBS datasets, we retrieve the households' total consumption expenditure (excluding housing costs) and compare it with housing services and expenses. The analysis in terms of Lorenz curves shows that inequality in housing expenses is comparable to that in non-housing consumption expenditure, which is, in turn, more unequally distributed than housing services. In the EU-27, the mean difference in Gini coefficients is about 10 points on average between housing services and expenses, and between housing services and non-housing consumption expenditure. This provides additional evidence that housing policies reduce housing expenses burden for the poorest households, thereby reducing housing services inequality which becomes less salient than inequality in consumption of other goods and services, illustrating Tobin's specific egalitarianism.

Finally, econometric estimates show that after including cash and in-kind housing benefits, in almost all countries, the most advantageous tenure status is that of outright owner. But, of course, this is only an accounting or static assessment (i.e., usage costs comparison) and does not take into account households' lifetime spending (i.e., housing as an asset investment: real estate value + potential capital gain/loss, and the user cost as defined by Poterba, 1984).

In the final section, we performed our own computation of the imputed rents as a robustness check. We use a regression approach (with Heckman correction) with an additional error correction term to maintain the rent distribution. It confirms that our main results are robust to the choice of the imputed rent estimation method.

In the remainder, Section 2 provides a literature review. Section 3 presents the methodology. The Section 4 is dedicated to presenting the data and spotting some stylized facts. This is followed by stating the results in Section 5 following a pure accounting methodology. Section 6 accounts for a partial capture of cash housing benefits by landlords and a pass-through in rents. The penultimate Section 7 is devoted to the robustness check and precedes the conclusion. Many tables, figures and further methodologies precision are reported in the Appendix.

2 Related literature

This paper is related to several strands of the literature devoted to empirical findings about housing inequality. The economic literature on housing inequality primarily addresses housing wealth inequality. Albouy and Zabek (2016) estimate the variation in inequality in the US housing prices and rents over the 20^{th} century. They find that these

[4]See, subsection 4.4.

inequalities declined in the middle of the 20^{th} century, before rising to pre-war levels, reflecting (U-shaped) patterns of income inequality. This trend is mainly due to changes in the relative value of locations (i.e., an increase in demand for particular places and differential increases in land values). For Germany, Albers et al. (2022), combining several data sources, find that housing inequality decreased over the past century due to the valuation of housing wealth for the top and the bottom distribution. Dewilde and Lancee (2013) study the relationship between inequality and access to housing for low-income homeowners and renters at market rents using the EU-SILC dataset. They show that higher income inequality increases the likelihood of affordability problems for low-income renters, that inequality leads to crowding issues, and that higher income inequality is associated with lower housing quality.

On the redistributive effect of imputed rents and housing policies, the literature has focused mainly on including imputed rents in households' disposable income, to make cross-national or international comparisons of inequality and poverty. Among the first studies are Lerman and Lerman (1986) and Smeeding (1993). Most find that including housing consumption in the standard of living reduces inequality and poverty because imputed rents are more equally distributed than monetary income. Frick and Grabka (2003) show a declining effect of imputed rents on poverty and inequality in Germany, the US, and the UK. Frick et al. (2010) find similar results for Belgium, Germany, Greece, Italy, and the UK, regardless of the country's proportion of each tenure status. Fessler et al. (2016), working with imputed rents from the EU-SILC dataset, show that in Austria, imputed rents accruing to homeowners and tenants at reduced rents have an equalizing effect on the distribution. Finally, List (2022) also find an inequality-decreasing effect of non-cash income from imputed rents for 20 European countries using HFCS[5] dataset. In a series of articles, Maestri (Maestri, 2012, 2013, 2015) uses cross-country comparisons based on imputed rents from the EU-SILC dataset to confirm that including imputed rent not only reduces inequality and poverty but may also generate a considerable amount of income re-ranking. Finally, Figari et al. (2017) also show that we can increase tax revenue without increasing inequality, by including net imputed rent in taxable income.

Interestingly, deducting housing expenses from household disposable income has the opposite effect. For Germany, Dustmann et al. (2022) obtain a large increase in income inequality after accounting for housing expenditure because they are regressive along the income scale due to declining relative costs of homeownership versus renting, changes in household structure, declining real incomes for low-income households and residential mobility towards larger cities. Most of the country-specific studies that investigate how imputed rent for social renters impacts income distribution conclude that social housing

[5]Household Finance and Consumption Survey.

reduces inequality and poverty (see, Olsen, 2001 for the US; Gibbs and Kemp, 1993 for the UK; Heylen, 2013 for Belgium; and Trevien, 2014 for France). Moreover, most studies show a significant reducing effect of cash housing benefits on inequality. For example, Figari et al. (2019) perform a micro-simulation using EUROMOD on 7 European countries. They estimate that mortgage interest tax relief is a regressive, inequality-increasing housing policy instrument, contrary to cash housing benefits.

Regarding the causal impact of housing policies, cash housing benefits have been found to increase rents in different countries, where some studies find that more than 70% of the cash housing benefits accrued to landlords (e.g., from 16-46% in the US, to between 30-70% in Finland, and 78% in France), at least in the rental housing markets with inelastic supply and elastic demand[6]. This partial capture of the subsidies by landlords is worrying because it raises the marginal cost of public funds for this particular use. Public or social housing cannot suffer from the same drawback. Still, they have been accused of participating in urban segregation (see, Jacquot, 2007 for empirical evidence from France), to influence the location choices and the spatial distribution across municipalities especially for immigrants (see, Verdugo, 2016 and Schmutz and Verdugo, 2023), and of being not cost-effective (see, Olsen and Barton, 1983 for the US). It could also have significant adverse effects on tenants' mobility (see, Gobillon, 2001), thus, on the labor market as well. All these studies show that the policies' actual cost is likely higher than the figures in the finance laws. But, in front of the costs, we need to put some statistics about the benefits of the housing public policies and pencil out these policies' gains to reduce poverty and inequality. This study aims to provide a first pass at the most straightforward arithmetic exercise possible.

This paper departs from the country-specific approach by estimating and comparing the total impact of housing policies on inequality and poverty for all European countries using harmonized data. It also disentangles the effects of cash housing benefits on all beneficiaries, from the effects of in-kind housing benefits on renters at below-market rents. Furthermore, unlike most previous studies, we estimate these effects for all types of tenure status, which addressed either owners or social housing renters. The closest analysis to our own was performed by Verbist and Grabka (2017) on the effect of in-kind housing benefits (social housing) solely, on inequality and poverty for 17 EU countries, using the EU-SILC 2011 wave of data. They find that including such in-kind benefits in income greatly impacts inequality and poverty, mainly depending on the specific features of the housing market (high or low share of social renters). They also provide a detailed analysis

[6]See, Gibbons and Manning, 2006 and Brewer et al., 2019 for the United Kingdom, Fack, 2006 and Grislain-Letrémy and Trevien, 2014, 2022 for France, Susin, 2002, Eriksen and Ross, 2015 and Collinson and Ganong, 2018 for the US, Kangasharju, 2010, Viren, 2013, Eerola and Lyytikäinen, 2021 and Eerola et al., 2022 for Finland, Sayag and Zussman, 2020 for Israel, and Hyslop and Rea, 2019 for New Zealand.

for Germany using SOEP[7] data, looking at the effects of cash housing benefits, in-kind benefits from social housing, and a combination of both. They find that cash housing benefits are more effective in reducing poverty.

3 Methodology

In our method of assessing the effect of housing policies on inequality and poverty, we distinguish between different forms of tenure status: outright owner, owner paying mortgage (first-time owner), market-rent tenant, reduced-rent tenant and free-rent tenant. Outright owners do not have a mortgage left on their principal dwelling, while the second category of owners is still paying a mortgage on their principal dwelling. Market-rent tenants pay rent at the prevailing or market rate (even if the rent is wholly recovered from cash housing benefits). Reduced-rent tenants pay rent at a reduced rate (i.e., lower than the market price), including (a) renting social housing, (b) renting at a reduced rate from an employer, and (c) renting in accommodation at a legally-fixed rent. In the following, we use the terms *social housing* and *reduced-rent* housing interchangeably, as the EU-SILC dataset does not allow for a finer distinction (see, subsection 4.1 for a detailed development of the empirical implications). Finally, free-rent tenants benefit from accommodation granted rent-free by the employer or a private source. Since free-rent tenants should theoretically have zero housing expenses, they should not be impacted by housing policies, either in the form of cash housing benefits or reduced-rent subsidies. Therefore, we set their gain from housing policies to zero in the analysis.

The housing policies (HP) could be decomposed in two parts:

$$\text{HP} = \underbrace{\text{Housing allowances}}_{Cash\ housing\ benefit} + \underbrace{(\text{Imputed rent - Rent})}_{In-kind\ housing\ benefit} \tag{1}$$

Cash housing benefits. They correspond to the means-tested housing allowances paid by public authorities to help households meet the cost of housing (including tenants—temporarily or on a long-term basis—benefits to help with rent costs and owner-occupiers' benefits to help with paying their mortgages and/or interest)[8].

In-kind housing benefits. They represent the cash advantage from being in a reduced-rent dwelling, and can be considered as a proxy for the yearly benefits/gain of being a

[7] German socio-economic panel study.

[8] It excludes, social housing policy organised through the fiscal system (that is, tax benefits) and all capital transfers (in particular investment grants).

social housing tenant.

The first step is to estimate the cash advantages of each housing policy and to include them one by one in disposable income without housing benefits (i.e., the baseline *ceteris paribus*), to assess how they impact poverty and inequality by comparing them to this benchmark. More precisely, to measure the reduction in poverty and inequality attributable to the housing policies, we use equivalized disposable income[9] Therefore, we estimate four different income measures, including the combined or separate gains from housing policies , as follows: (i) the baseline income defined as total household cash income + cash transfers - cash housing benefits - taxes, (ii) income including both cash and in-kind housing benefits $\text{HP}_{cash+in\text{-}kind}$, i.e., the cash advantage from both current housing policies, (iii) income including only cash housing benefits HP_{cash}, i.e., a hypothetical situation where reduced-rent subsidies do not exist, and (iv) income including only in-kind housing benefits $\text{HP}_{in\text{-}kind}$, i.e., the cash advantage from social housing alone—a hypothetical situation where cash housing benefits do not exist.

The second step is to construct a variable measuring housing services, i.e., what the households would have to pay without any public intervention nor any advantages from being owner-occupiers (homeowners derive implicit rent from the housing service delivered to themselves, and thus do not deplete cash resources as tenants at market-rent do). For tenants in the private sector, this variable is the market rent. For homeowners and reduced-rent tenants, it is the estimated imputed rent.

The third step is to construct a variable measuring housing expenses: the actual amount paid by the households taking into account housing policies.

Then, using an econometric model, we estimate the net gain of each tenure status (outright owners, owners with mortgage, rental-market tenants, reduced-rent tenants and free-rent tenants), to identify the most advantageous. We consider public interventions and the imputed rents of owners and free-rent tenants, the latter being a special case.

Finally, we compare the distribution of housing services to the distributions of housing expenses and consumption expenditure (excluding housing-related expenditure), considering housing-specific subsidies (cash housing benefits and reduced rents). In principle, we should observe a less unequal distribution of housing services than that of housing expenses and non-housing consumption expenditure because housing policies reduce actual housing expenses burden for the less affluent households.

[9]Equivalized means that we take into account household composition: we use the OECD modified scale assigning 1 consumption unit (CU) to the first adult, 0.5 to other persons aged 14 or older, and 0.3 CU to children under 14. See, https://www.oecd.org/els/soc/OECD-Note-EquivalenceScales.pdf.

Inequality measurement. We measure inequality across countries using the Gini index and the Lorenz curve. The Gini coefficient allows us to easily quantify the possible reduction in inequality due to the different policies[10]. The Lorenz curve provides a robust inequality comparison of the distributions of the variables of interest among the various populations.

Poverty measurement. To estimate the share of poor households by country, we use the Foster–Greer–Thorbecke indices[11]. To compute the poverty threshold, we follow the recommendation from Eurostat[12], with a poverty line sets at 60% of the national median equivalized disposable income[13]. We estimate four different poverty lines, one for each income measure, and compare the share of households below the poverty line for the three alternative income measures taking into account housing policies to that of the baseline income measure.

3.1 Gain from housing policies

The cash advantages from the two housing policies (cash housing benefits and social housing) and the different types of tenure status are computed as follows.

[10] We could have enriched the analysis by adding other measures of inequality such as the mean logarithmic deviation. Compared to the Gini coefficient, it has the advantage of putting more weight on the bottom of the distribution. But since we also consider poverty indices, it would be partially redundant.

[11] $FGT_{\alpha c} = \frac{1}{N_c} \sum_{i=1}^{N_c} (\frac{z_c - y_{ic}}{z_c})^{\alpha} \mathbb{1}(y_{ic} \leq z_c)$, where $FGT_{\alpha c}$ corresponds to the FGT index of parameter α in country c, N_c to its population, y_{ic} to the equivalized disposable income of household i, and $\mathbb{1}(y_{ic} \leq z_c)$ is a dummy equal to 1 if the equivalized disposable income of household i is equal or below the poverty threshold z_c. The degree of the parameter α provides different poverty measures. The higher the value of α, the greater the weight given to the poorest individuals. The higher the FGT index, the more poverty there is in a country. FGT_0 corresponds to the headcount ratio (i.e., the fraction of households below the poverty line), FGT_1 to the poverty gap index (i.e., intensity of poverty) and FGT_2 to the severity or depth of poverty.

[12] https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:At-risk-of-poverty_rate.

[13] Thus, $z_c \equiv \text{Poverty line}_c = \text{Median income}_c \times 0.6$, where z_c corresponds to the at-risk-of-poverty threshold in country c, and median income to the median equivalized disposable income in country c.

Table 1: Cash advantages from housing policies by tenure status

Variable	**HP**$_{cash+in\text{-}kind}$	**HP**$_{cash}$	**HP**$_{in\text{-}kind}$
Tenure status	**Housing policies including cash housing benefits and reduced-rent**	**Housing policies with only cash housing benefits**	**Housing policies with only reduced-rent**
Owners	HB	HB	/
Market-rent tenants	HB	HB	/
Reduced-rent tenants	(IR - R) + HB	HB	IR - R
Free-rent tenants	/	/	/

Notes: HP = housing policies, IR = imputed rent, R = rent, HB = cash housing benefits.
Sources: Authors' chart.

Imputed rent IR is the equivalent market-rent that shall be paid for a similar dwelling as that occupied by households that do not report themselves as paying full rent, either because they are owner-occupiers or they live in accommodation rented at a lower price than the market price (i.e., reduced-rent tenants) or rent-free.

Rent R is the full rent payable to the landlord, as reported in EU-SILC. At this stage, we assume that it is invariant to the amount of cash housing benefits.

3.2 Housing services and expenses measurement

Housing services, expenses[14], and net gain by tenure status are computed as follows.

Table 2: Housing expenditure by tenure status

Variable	**R**	**IR**	**HS**	**HE**	**NG**
Tenure status	**Rent**	**Imputed rent**	**Housing services**	**Housing expenses**	**Net gain** HS - HE
Outright owners	.	X	IR + UC	UC - HB	IR + HB
Owners with mortgage	.	X	IR + UC	(UC + i.M) - HB	(IR - i.M) + HB
Market-rent tenants	X	.	R + UC	(UC + R) - HB	HB
Reduced-rent tenants	X	X	IR + UC	(UC + R) - HB	(IR - R) + HB
Free-rent tenants	.	X	IR + UC	UC	IR

Notes: IR = imputed rent, R = rent, UC = usage costs, i.M = mortgage interest repayments, HB = cash housing benefits.
Sources: Authors' chart.

Usage costs UC is the total housing costs[15] (except rent and mortgage interest + principal repayments) arising from a dwelling for all tenure status. It is computed as the sum of structural insurance, mandatory services and charges (sewage removal, refuse removal, etc.), regular maintenance and repairs, taxes (property and/or dwelling), and the cost of utilities (water, electricity, gas, and heating).

[14] In the following, we use the terms of housing expenses and housing expenditure or consumption interchangeably.

[15] EU-SILC gathers several expenses linked to the housing under the term housing cost. Therefore, we designate them as the usage costs, even though it remains quite far from the pure concept of user costs in asset pricing applied to housing tenure choice. See, appendix I for additional comments and references related to the user costs computation.

i.M is the mortgage interest repayments (before deducting any tax credit or tax allowance, and excluding any other mortgage payments such as mortgage protection insurance or mortgages for repairs and renovations).

Housing services HS could be seen as the counterfactual of housing expenses absent any public intervention in housing matters and no implicit advantages to owner-occupiers and free-rent tenants.

Housing expenses HE represents what the households actually and currently pay, taking into account cash and in-kind housing benefits.

Net gain NG is a proxy for the cash or financial advantages of the different tenure status choices, and corresponds to the difference between housing services and housing expenses[16]. It considers both housing policies and owners/free-rent tenants' advantages arising from the difference between imputed rent and dwelling-related housing costs[17].

3.3 Net gain by tenure status

To identify the advantages of being an outright owner, a first-time owner, a market tenant, a public housing tenant, or a free-rent tenant, taking into account public interventions in housing and the implicit advantage of the imputed rents from owning property or rent-free occupancy, we estimate the following regression using weighted least squares for each country separately.

$$\frac{\text{Net gain}_i}{\text{Net gain}_0} = \beta_0 + \sum_{k=1}^{4} \beta_k \times \mathbb{1}\{\text{Tenure status}\}_{ik} + X'\beta_2 + \epsilon_i \tag{2}$$

Net gain_i is the net gain of household i normalized by the average net gain of country c (Net gain_0), which enables the coefficients to be easily compared[18]. $\text{Tenure status}_{ik}$ is a categorical variable defining the tenure status k of the household i (i.e., outright owner, mortgage owner, market-rent tenant, reduced-rent tenant, or free-rent tenant). There are 4 dummies, the outright owner status being used as the baseline. X is a vector of household's characteristics such as marital status, age, age squared, composition, current activity, income, and dwelling's characteristics such as location, degree of urbanization of the location, amenities, dwelling type, number of rooms (see, Table A.2 for details)[19].

[16] For a matter or convenience, negative values of net gain, housing services and expenses are put to zero.

[17] Therefore, Net gain is different from the variables define above, which correspond to the cash advantages of the different housing policies only.

[18] See, Table 2 for the method of computing the variable Net gain. Net gain_i corresponds to the net gain/month.

[19] A first overview of the expected outcome is presented in Figure D.11 showing the mean housing services and housing expenses for each tenure status by country. Outright owners exhibit the largest difference between housing services and housing expenses in almost all countries. It should be noted

4 Data

We use two main datasets from Eurostat: (1) the European Union Statistics on Income and Living Conditions (EU-SILC), which provides information on households' income, labor, housing, and living conditions, and (2) the Household Budget Survey (HBS), which provides detailed information on households' consumption expenditure. Both datasets include most of the European countries and aim to provide harmonized data for each country. All the monetary data are inflation and purchasing power parity (EU-28 PPP) adjusted[20], and income, HS, HE and total non-housing consumption expenditure are also divided by the consumption units (OECD modified scale)[21] to take into account the household composition.

4.1 EU-SILC

EU-SILC provides harmonized data for each country of the European Union. The reference year of the survey is 2017[22]. The data most pertinent to our study are household characteristics (e.g., income, size, age, sex, type of household, citizenship, marital status, activity status, occupation)[23] and dwelling related data (e.g., current rent, imputed rent, housing benefits, tenure status, dwelling type, housing costs, mortgage principal repayments, and mortgage interest repayments). Dwelling data are estimated only for the main residence of the households, distinguishing between 5 types of tenure status: outright owner, owner paying mortgage, market-rent tenant, reduced-rent tenant, and free-rent tenant. In the EU-SILC dataset, reduced-rent tenants include (i) those renting social housing, (ii) those renting at a reduced rate from a third party (e.g., the employer or family), and (ii) those in accommodation where the rent is fixed by law, with no distinction among them possible on the basis of the data at hand. This could lead to an overestimation of the effect. Differences between the share of purely social tenants and the share of reduced-rent tenants are heterogeneous across countries and depend on the surveying/reporting made by the national statistical institutes, so that the share of social tenants can be regarded as a proxy depending on the country. Thus, the estimates of the effect of the in-kind housing policy (i.e., social housing) should be considered as an upper-bound. Furthermore, in some countries, there is no clear distinction between

that this estimation is only an accounting or static measure (i.e., usage costs comparison), and does not take into account households' lifetime spending (i.e., housing as an asset investment: real estate value + potential capital gain/loss).

[20] See, Appendix B for more details.

[21] OECD modified scale assigns 1 consumption unit (CU) to the first adult, 0.5 to other persons aged 14 or older, and 0.3 CU to children under 14.

[22] We do not use a more recent wave because from 2018, the UK, an important country in terms of housing policy and therefore for the comparison in our study, is no longer included in the SILC dataset.

[23] For a matter or convenience, negative values of incomes are put to zero.

market-rent and social-rent tenants, either because (almost) all households are considered as owning their home or live in social housing, or because there is no consensus on tenants classification among the official national statistical institutes for these countries[24]. In this case, all tenants are classified in EU-SILC as tenants at market rent. This is the case for Denmark, the Netherlands, and Sweden.

The most important data concern housing benefits and imputed rents. Housing benefits represent the cash benefit granted by public authorities to help households meet the cost of housing. This includes rent benefits and benefits to owner-occupiers (help with paying mortgages and/or interest) and excludes tax deductions and capital transfers. Imputed rents are computed by each national statistics institute, but according to different methods. Juntto and Reijo (2010) and Törmälehto and Sauli (2013) pointed out some imputed rents comparability issues in the 2007 EU-SILC wave due to the different methods used by countries. However, they conclude that the estimations made by the national statistics institutes are the most reliable indicators of the special features of their housing markets. Actually, there is no consensus on the best method of estimating imputed rents (see, Balcázar et al., 2017). For instance, non-hedonic models or methods (e.g., user costs or subjective assessment) are preferable when the share of tenants at market rent is low (which is especially the case in Eastern European countries). The EU-SILC dataset is also the only one to provide harmonized data for so many countries. Yet, for unknown reasons, while most national samples are complete, some imputed rents or market-rent tenants' rents are missing or set to zero. These missing values represent 2.3% of the total sample (i.e., all countries), ranging from 0% to 11.5% for the country-specific samples (see, Table C.2). To avoid a possible bias due to a change in the sample's weights and distribution when deleting observations with missing values, we use an imputation method to account for these missing observations (see, subsection 4.3).

We limit our panel to all EU countries before Brexit, excluding Romania for which there is no available data on imputed rents. (see, Table A.1 for a list of the countries and their abbreviation codes).

4.2 HBS

The main objective of the HBS survey is to calculate weights for the Consumer Price Index, taking as the survey reference year 2015. It contains harmonized data on household

[24]OECD data show tenure status proportions that are similar to Eurostat data (https://www1.compareyourcountry.org/housing), while the European Social Housing Observatory (CECODHAS) reports different reduced-rent tenants shares (https://www.housingeurope.eu/section-135/housing-observatory). In a situation where there is no clear distinction between a "prevailing-rent" rent sector and a "reduced-rent" sector, all renters would be classified as "tenant or subtenant paying rent at prevailing or market rate".

characteristics and desegregated data on household consumption expenditure. Thus, we are able to compute the total household consumption expenditure minus any housing-related expenditure (e.g., rents, water, electricity, gas, heating, maintenance and repair, and insurance), in order to compare it with housing expenditure.

Austria and Netherlands are not part of the HBS panel. We, therefore, have to impute the non-housing consumption expenditure variable for these countries before matching it to the EU-SILC dataset. To do so, we use the values of the closest countries in terms of housing market and standard of living: France, Germany, and Belgium.

4.3 Statistical matching and imputation of missing values

As mentioned above, consumption expenditures are not available in the EU-SILC dataset, and there are some unexplained missing imputed rents values or zero current rent values for market-rent tenants. To retrieve non-housing consumption expenditure and fill in the missing values, we apply a statistical matching/imputation method (Predictive Mean Matching) between the EU-SILC and the HBS datasets. The method and computation are detailed in Appendix C.

4.4 Stylized facts

Two main groups of countries can be distinguished according to differences in tenure status proportions. The first group comprises Western and Northern European countries, with a relatively high share of reduced-rent tenants. These are the United Kingdom, Finland, France, Ireland, Austria, Belgium, and Germany. Malta is a noteworthy exception among Southern countries. A second group with a very high home-ownership rate, especially outright owners (70%-90%), is composed mainly of Eastern European countries.

Measuring the spending under housing policies is difficult, especially the spending dedicated to social housing, as many different and heterogeneous aspects have to be taken into account in the total funding (e.g., land purchase, construction costs, refurbishment). Hence, we have chosen to take the gain of each reduced-rent tenant, as the actual cost of the policy for the society at large to provide social housing for this tenant[25]. This assumption is of course open to debate, but only an in-depth analysis country-by-country would be informative about how far this assumption is from the real world. In the sake of harmonization and comparison, we compute for each country our own measure by summing the total cash housing benefits paid to the households and the total difference between the imputed rent and the actual rent for reduced-rent tenants, over annual GDP.

[25]Unfortunately, data on spending split between social housing and cash housing benefits are not harmonized nor available for all the European countries.

This allows us to compute not only the total spending, but also the spending under cash and in-kind housing benefits separately. Regarding their spending as a percentage of GDP in 2017, the UK is the most generous country, devoting 0.96% of its GDP to public spending on housing. The second most generous countries are Finland and France, with around 0.8% of their GDP devoted to housing policies spending. The upper-middle group, with spending between 0.5% and 0.2% of their GDP, is composed of Denmark, the Netherlands, Germany, Sweden and Ireland. The two bottom groups, with spending between 0.2% and 0.1% and less than 0.1% of their GDP, are mainly made up of Southern and Eastern European countries.

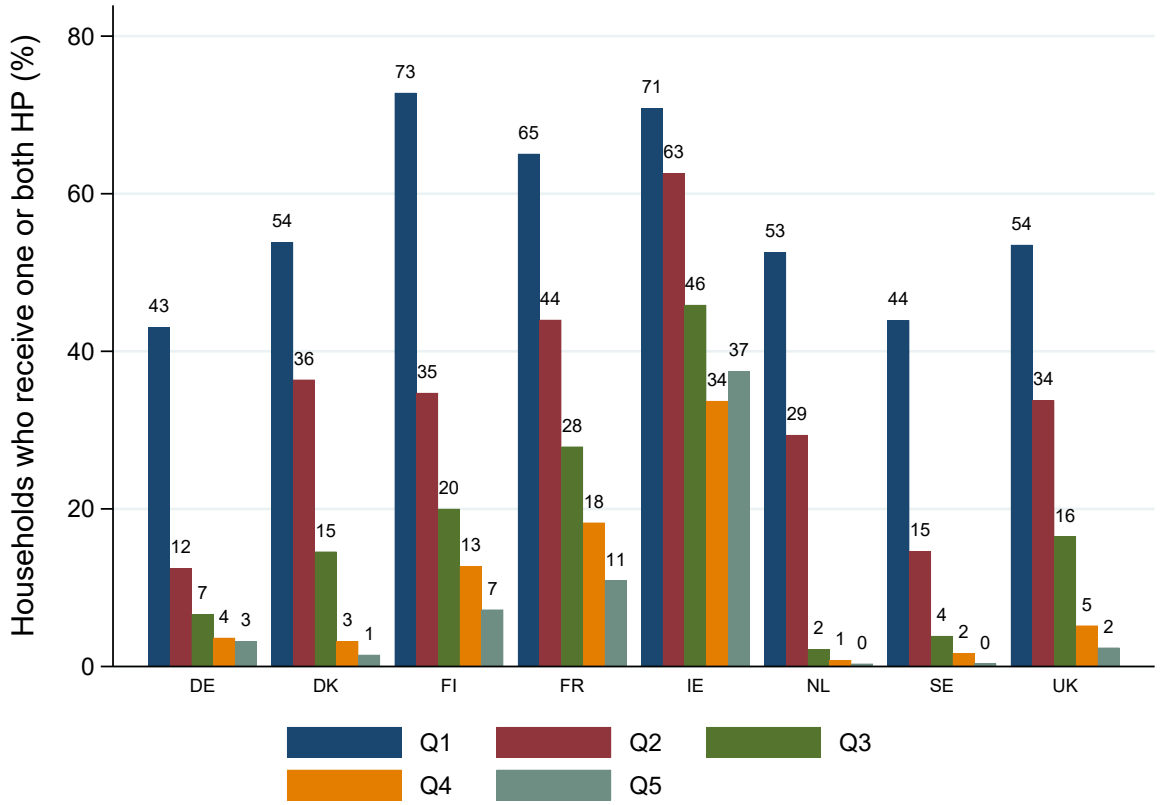
The total share of households receiving both housing policies largely mirrors the public spending as a percentage of GDP. Surprisingly, the country with the highest percentage of households benefiting from one or both housing policies (cash or in-kind housing benefits) is Ireland (50%). It can also be inferred that in France, for example, housing policies address a large part of the population (33%), as well as in Finland (30%), or the UK (22%); while in Germany housing policies seem to be more targeted and limited to a small part of the population (14%), just as in Luxembourg (14%), Austria (13%), or Sweden (13%). For the countries with the largest spending under housing policies, we can also observe a sharp decreasing share of recipients by quintile of equivalized disposable income, except for Ireland, and different degressivity levels among them (see, Figure 1).

We can also determine which of the policy (cash or in-kind housing benefits) is "favored" by countries regarding the share of households receiving housing support. For example, in Ireland, a large fraction of households receive cash housing benefits (43%), while the share of low-rent tenants is much lower (15%). In France, more households receive cash housing benefits than social housing (28% and 15% respectively). In contrast, Austria seems to apply a policy that favors social housing (10%), over cash housing benefits (4%). Germany, Finland, Malta, and the United Kingdom seem to apply both policies equally, with a similar proportion of households receiving housing benefits in cash or in-kind (i.e., being reduced-rent tenants).

In terms of mean gain as a percentage of disposable income of the recipients[26] from the two housing policies combined, the UK ranks the highest, with on average 60% of gain per recipient household, followed by Spain (52%) and Germany (51%), while Finland and France are ranked 8^{th} and 12^{th} with 35% and 25% respectively. Regarding mean gain from cash housing benefits alone, the UK and Germany also lead the way, with around 66% per household on average. It represents 53% for Germany, 26% for Finland, and 19% for France. Lithuania and Luxembourg have the highest mean gain from in-kind housing benefits (61% and 59% of the disposable income on average respectively). Therefore,

[26]Mean gain corresponds to the cash advantage from housing policies (see, Table 1).

Figure 1: Share of households receiving housing support among total population, by quintile of equivalized disposable income for selected countries



Notes: Income represents disposable income/CU/month without housing benefits. Housing Policies = cash or in-kind housing benefits.

Sources: EU-SILC 2017; authors' graphs.

we can conclude that, although these countries spend less or little on housing policies and probably grant housing benefits according to very selective and targeted criteria, the amount of housing benefits represents a substantial contribution for these households. In comparison, the mean gain from in-kind housing benefits represents 34% for Germany, 26% for Finland and 21% for France.

Detailed and additional stylized facts and graphs are provided in Appendix D.

5 Results

5.1 Inequality

In this subsection, we examine the effectiveness of the two housing benefits, separately and combined, in reducing inequality. To do so, we compare the Gini coefficient of baseline income to those obtained for the variant income measures.

Detailed results are presented in Table 3 and plotted in Figure 2. The graphs plot the Gini of baseline income in the X-axis, and the Gini of income after the housing policies in the Y-axis. Thus, below the 45-degree line lie the countries where inequalities have been reduced compared to the baseline income without housing benefits. It clearly shows countries with the most effective housing policies.

The most unequal countries in terms of baseline income are Italy, Spain, Portugal, the UK, Latvia, Bulgaria, and Lithuania, while the least unequal are Slovakia, Slovenia, Czechia, Slovenia, Belgium, Finland, and Austria.

On reduction of inequality, combining both policies (cash and in-kind housing benefits), the countries showing the most effective inequality reduction are obviously Western and Nordic countries: Finland (-9.02%), the UK (-7.24%), Ireland (-5.45%), France (-5.35%), Germany (-4.89%), the Netherlands (-4.19%), Denmark (-3.61%), Sweden (-3.54%), Belgium (-3.25%), and Malta (-2.51%). In contrast, the worst performers at reducing inequality are Eastern and Southern countries: Greece (-0.03%), Slovakia (-0.11%), Poland (-0.12%), Bulgaria (-0.15%), Italy (-0.32%), Croatia (-0.35%), Estonia (-0.36%), Hungary (-0.39%), and Cyprus (-0.59%). Between these extremes are countries whose policies yield a limited overall effect.

The inequality-reducing effect of cash housing benefits follows a similar distribution among European countries. At the top, we find Finland (-6.49%), the UK (-5.64%), the Netherlands (-4.19%), France (-4.09%), Denmark (-3.61%), Germany (-3.56%), and Sweden (-3.54%). At the bottom, Greece, Bulgaria, Slovakia, Italy, Portugal, Belgium, and Lithuania experience an inequality-reducing effect close to 0%.

Regarding the inequality-reducing effect of social housing only, Ireland is ranked first with -3.36%, followed by Belgium (-3.2%), Finland (-3.12%), the UK (-2.15%), and Malta

Table 3: Reduction in inequality after inclusion of housing benefits

				Gini			
Country	**Income (baseline)**	**Income** + $\text{HP}_{cash+in\text{-}kind}$	% △	**Income** + HP_{cash}	% △	**Income** + $\text{HP}_{in\text{-}kind}$	% △
Finland	0.28	0.26	-9.02***	0.27	-6.49***	0.28	-3.12***
United Kingdom	0.35	0.33	-7.24***	0.33	-5.64***	0.34	-2.15***
Ireland	0.33	0.31	-5.45***	0.32	-2.19***	0.32	-3.36***
France	0.3	0.29	-5.35***	0.29	-4.09***	0.3	-1.58***
Germany	0.32	0.3	-4.89***	0.31	-3.56***	0.31	-1.46***
Netherlands	0.29	0.28	-4.19***	0.28	-4.19***	0.29	0
Denmark	0.29	0.28	-3.61***	0.28	-3.61***	0.29	0
Sweden	0.29	0.28	-3.54***	0.28	-3.54***	0.29	0
Belgium	0.27	0.26	-3.25***	0.27	-0.07***	0.26	-3.2***
Malta	0.29	0.28	-2.51***	0.29	-0.5***	0.29	-2.05***
Czechia	0.26	0.25	-1.96***	0.25	-1.91***	0.26	-0.06***
Luxembourg	0.3	0.29	-1.2***	0.3	-0.17***	0.3	-1.03***
Slovenia	0.26	0.25	-1***	0.26	-0.27***	0.26	-0.77***
Spain	0.34	0.34	-0.99***	0.34	-0.33***	0.34	-0.66***
Austria	0.29	0.29	-0.93***	0.29	-0.56***	0.29	-0.39***
Portugal	0.34	0.34	-0.72***	0.34	-0.04***	0.34	-0.68***
Latvia	0.37	0.37	-0.71***	0.37	-0.47***	0.37	-0.24***
Lithuania	0.41	0.4	-0.69***	0.41	-0.08***	0.4	-0.6***
Cyprus	0.32	0.32	-0.59***	0.32	-0.5***	0.32	-0.09**
Hungary	0.29	0.29	-0.39***	0.29	-0.21***	0.29	-0.19***
Estonia	0.33	0.33	-0.36***	0.33	-0.24***	0.33	-0.13***
Croatia	0.32	0.32	-0.35***	0.32	-0.31***	0.32	-0.04***
Italy	0.33	0.33	-0.32***	0.33	-0.04***	0.33	-0.27***
Bulgaria	0.4	0.4	-0.15***	0.4	0	0.4	-0.15***
Poland	0.31	0.31	-0.12***	0.31	-0.1***	0.31	-0.02**
Slovakia	0.23	0.23	-0.11**	0.23	-0.03	0.23	-0.08*
Greece	0.33	0.33	-0.03	0.33	0	0.33	-0.03
EU-27	0.35	0.34	-2.86***	0.34	-2.21***	0.34	-0.83***

Notes: Income represents disposable income/CU/month without housing benefits. Countries are sorted from the most to the least reduction of inequality after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

(-2.05%). While France and Germany are among the countries with the highest share of reduced-rent tenants, the effectiveness of their policies is lower, with only -1.58% and -1.46% reduction of inequality, respectively.

Finally, the overall inequality-reducing effect of the two housing benefits combined in the EU-27 is quantified at -2.86%. Cash housing benefits appear to have the largest reducing effect, with -2.21% compared to -0.83% for in-kind housing benefits. It confirms the country-specific results, that cash housing benefits seem to be more efficient at reducing inequality than in-kind housing benefits.

Figure 3, which plots the percentage of reduction in inequality according to the spending under housing policies, shows another interesting feature. In spite of the fact that we can distinguish 3 groups of countries quite different in terms of their level of spending (low [0 ; 0.2[, medium [0.2 ; 0.5[, high [0.8 ; 1[), we detect a positive correlation between public expenditures on housing policies as a percentage of GDP and reduction in inequality. The countries above the regression line are more cost-effective than the average in reducing inequality accounting for their GDP share devoted to redistributive housing policies. Finland strongly leads the league, being 2 percentage points more efficient than its predicted reduction value. Other cost-effective countries in reducing housing inequality are Germany, Ireland, the Netherlands, Sweden, Belgian, and Malta, to cite only the most significant. On the opposite, the UK, which spends around 1% of its GDP on housing policies—17% more than Finland—achieves almost a similar inequality reduction to that country. France and Denmark belong to the set of countries less efficient per GDP point than the average European country.

Regarding the cost-effectiveness of each housing policy separately, we measure it by testing the difference between the coefficients of each linear regression. In order to compare them properly, we assume an equal yearly level of spending for both policy, *ceteris paribus*. Thus, we are scaling up the spending under in-kind housing benefits by 10 (see, legend of Figure 3). The difference is -1.75 (significantly different from zero at the 10% level), meaning that for each additional percentage point of public spending, cash housing benefits reduce inequality by 1.75%[27] more than in-kind housing benefits (see notes at the top of subfigures 3b and 3c).

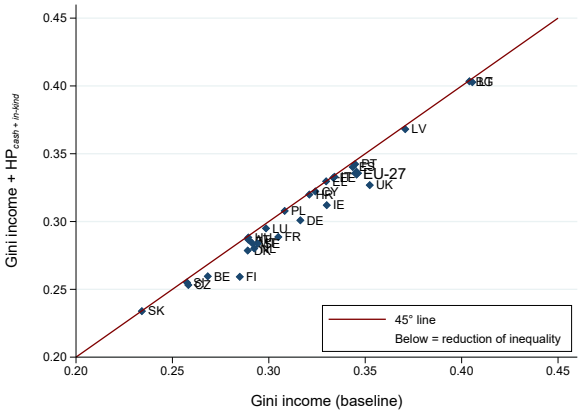
5.2 Poverty

We now look at the poverty-reducing effect of separate and combined housing benefits. To do so, we compare the fraction of households below the poverty line (60% of median

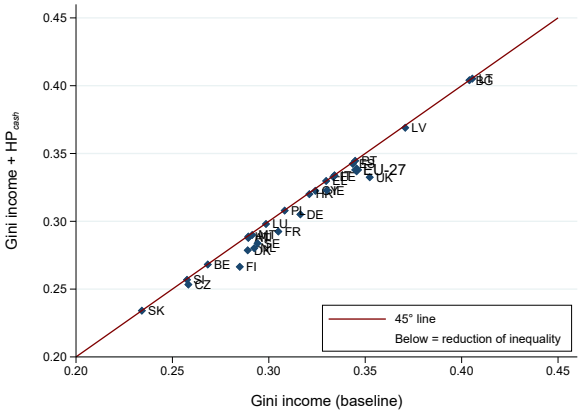
[27]As the dependant variable Y is expressed in percentage change (and not in proportion), we can interpret it as: a 1 percentage point of variation in X—the percentage of spending—changes Y—the percentage change of inequality (poverty)—by β percentage point, i.e., a variation of β% more in inequality (poverty).

Figure 2: Gini of baseline income compared to income including housing benefits

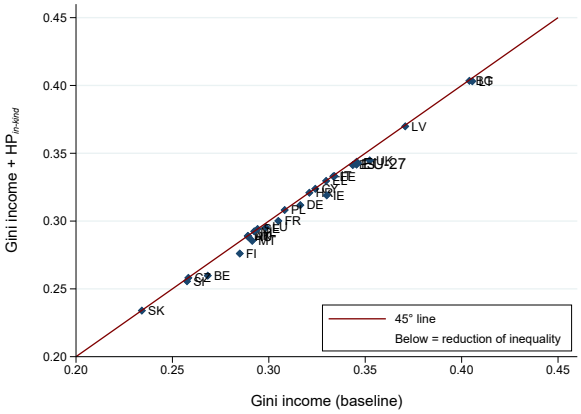
(a) Gini income + HP$_{cash+in\text{-}kind}$



(b) Gini income + HP$_{cash}$



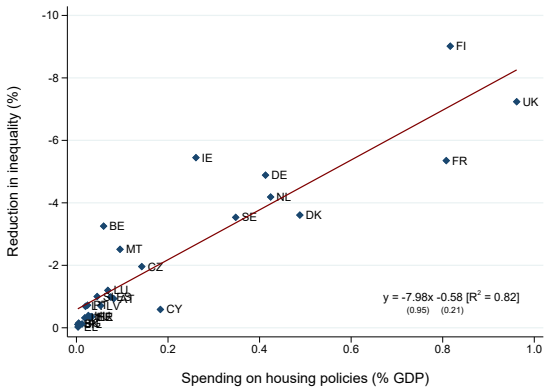
(c) Gini income + HP$_{in\text{-}kind}$



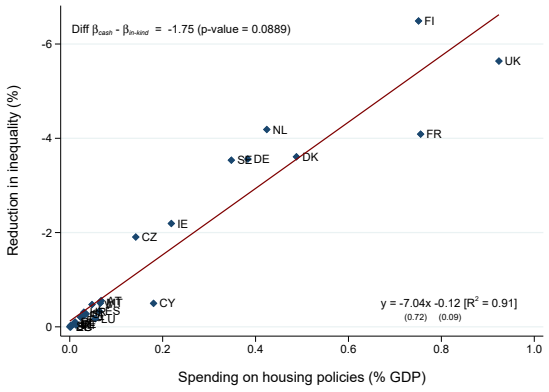
Notes: Income represents disposable income/CU/month without housing benefits.
Sources: EU-SILC 2017; authors' graphs.

Figure 3: Percentage of reduction in inequality according to the spending under housing policies in % of GDP

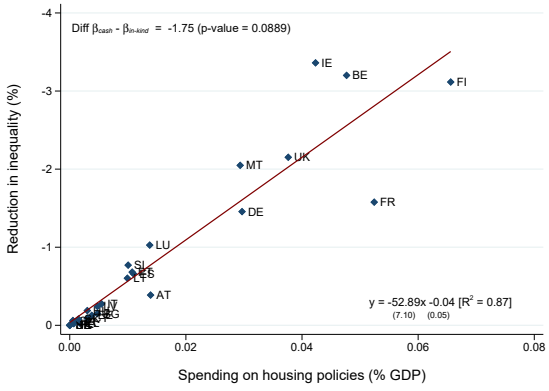
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits



Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

Sources: EU-SILC 2017; authors' graph.

income) with baseline income, to the fraction of households below the poverty line whose income includes either cash housing benefits, in-kind housing benefits, or both. This means we recalculate a poverty threshold for each income measure with and without housing benefits.

At baseline income, the countries with the highest share of households below the poverty line are Latvia, Estonia, Lithuania, Bulgaria, Croatia, and the United Kingdom, with poverty rates ranging from 24.79% to 21.06%, while the mean in the EU-27 is 18.4%. In contrast, the countries with the lowest poverty rate are Czechia, Slovakia, Belgium, Hungary, Denmark, and France, with poverty rates ranging between 9.35% and 14.78% (see, Table 4 for details).

Table 4: Reduction in poverty (FGT_0) after inclusion of housing benefits

Households below the poverty line (%) - FGT_0							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	17.4	11.71	-32.71***	12.36	-28.94***	15.95	-8.36***
Netherlands	16.67	12.04	-27.79***	12.04	-27.79***	16.67	0
Ireland	19.88	15.1	-24.05***	16.15	-18.75***	18.09	-8.97***
United Kingdom	21.06	16.54	-21.46***	17.33	-17.73***	19.83	-5.85***
Sweden	19.02	15.24	-19.88***	15.24	-19.88***	19.02	0
France	14.78	12.35	-16.42***	12.82	-13.23***	14.5	-1.85
Germany	19.42	17.61	-9.34***	18.29	-5.83***	19.02	-2.06***
Czechia	9.35	8.54	-8.73***	8.56	-8.5***	9.31	-0.52
Denmark	14.34	13.12	-8.5***	13.12	-8.5***	14.34	0
Belgium	13.24	12.23	-7.62***	13.18	-0.44	12.24	-7.56***
Malta	14.85	13.74	-7.47***	14.35	-3.37***	14.02	-5.61**
Hungary	14.3	13.84	-3.2***	14.19	-0.77**	14.01	-2.02***
Luxembourg	17.48	16.99	-2.79**	17.4	-0.42	17.22	-1.48
Austria	16.13	15.73	-2.49***	15.83	-1.82***	15.93	-1.23*
Slovenia	16.02	15.64	-2.35**	15.87	-0.9***	15.7	-1.94**
Cyprus	16.01	15.7	-1.95	15.7	-1.91	15.94	-0.43
Portugal	18.54	18.22	-1.74**	18.51	-0.16	18.17	-1.99***
Latvia	24.79	24.43	-1.44**	24.54	-1.03***	24.59	-0.79**
Spain	20.67	20.4	-1.32**	20.58	-0.43	20.53	-0.68
Lithuania	23.77	23.48	-1.21	23.75	-0.11	23.53	-1.02
Italy	20.84	20.62	-1.07***	20.8	-0.19	20.67	-0.83**
Croatia	21.55	21.43	-0.52**	21.43	-0.52**	21.51	-0.17
Poland	16.58	16.5	-0.5**	16.52	-0.38**	16.56	-0.12
Estonia	24.21	24.17	-0.2	24.1	-0.46*	24.23	0.07
Slovakia	11.07	11.06	-0.12	11.07	0	11.06	-0.12
Greece	19.4	19.39	-0.02	19.4	0	19.39	-0.02
Bulgaria	22.51	22.57	0.26	22.51	0	22.57	0.26
EU-27	18.4	16.61	-9.73***	17.01	-7.58***	18.01	-2.13***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.
Sources: EU-SILC 2017; authors' table.

The countries whose combined benefits policies are most effective in reducing poverty are, in decreasing order, Finland—with an impressive poverty reduction of almost one-third—the Netherlands, Ireland, the United Kingdom, Sweden, France, Germany, Czechia, Denmark, Belgium, and Malta, with a reduction of around -7%. We observe a poverty-reducing effect of housing policies for all countries except Bulgaria, where the poverty rate increases slightly after both housing benefits are included.

Regarding the poverty-reducing effect of cash housing benefits alone, we observe an almost similar ranking, with a slight drop in the poverty rate for the top countries from -28.94% (Finland) to -5.83% (Germany), and almost zero poverty reduction for the bottom countries.

The poverty-reducing effect of social housing alone is clearly weaker than that of cash housing benefits, ranging between -8.97% (Ireland) and -1.02% (Lithuania) for the most effective countries, and reducing the poverty rate between -1% and 0% for the remaining countries (mainly Eastern European countries).

The difference in poverty reduction between cash and in-kind housing benefits is exemplified in Figure 4, which plots the poverty rate with baseline income in the X-axis, and the poverty rate after inclusion of the gain under the different housing policies in the Y-axis. Below the 45-degree line, we observe similar patterns and distribution for both the poverty rate after cash plus in-kind housing benefits and the rate after cash housing benefits alone. On the other hand, almost all countries are close to the line after the inclusion of in-kind housing benefits solely.

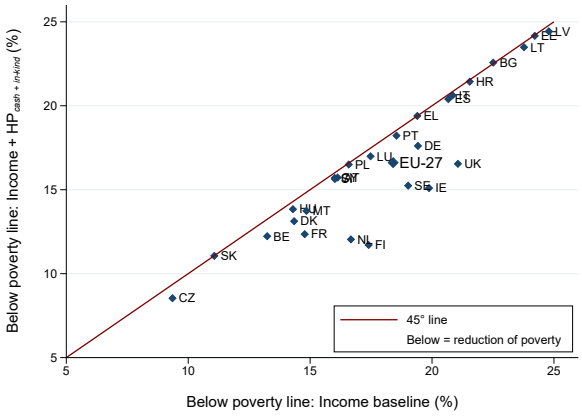
This graphical evidence is confirmed when the overall reduction effect is computed. On average in the EU-27, the two policies combined reduce poverty by 9.73%; the reduction is 7.58% with only cash housing benefits, and it drops to 2.13% with only in-kind housing benefits (see, Table 4).

Regarding the poverty-reducing cost-effectiveness of public spending under both housing policies, Finland ranks top, with an average poverty reduction of 32.71% for public spending of 0.82% of GDP. Next are the Netherlands and Ireland, with a poverty reduction of 27.79% and 24.05% respectively, for public spending of 0.42% and 0.26% of GDP. As in the case of inequality reduction, the UK performs "poorly" compared to top countries, with a reduction of the poverty rate comparable to that of Ireland, Sweden and France (around 20%) and much less than that of the Netherlands and Finland, although its public spending on housing is between 1.2 and 3.7 times as high (see, Figure 5). It should be noted that again France and Denmark, and this time Germany, belong to the group of least efficient countries.

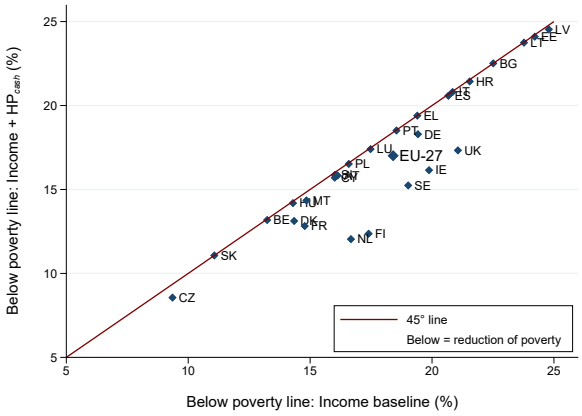
Regarding the cost-effectiveness of each housing policy separately, we apply the same comparison by testing the difference between the coefficients of each linear regression. The

Figure 4: Poverty rate (FGT_0) with baseline income compared to income including housing benefits

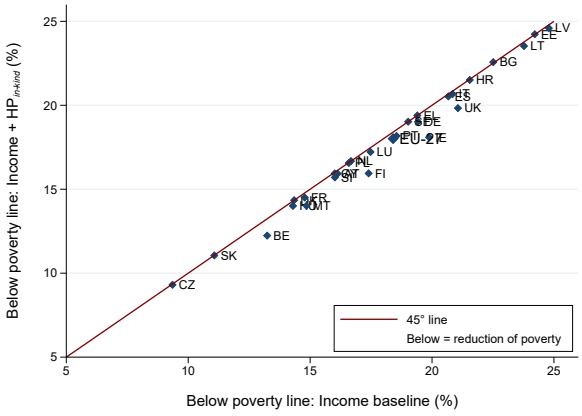
(a) Below poverty line: income + $\text{HP}_{cash+in\text{-}kind}$



(b) Below poverty line: income + HP_{cash}



(c) Below poverty line: income + $\text{HP}_{in\text{-}kind}$



Notes: Poverty rate represents the share of households below the poverty line. Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing benefits. Income represents disposable income/CU/month without housing benefits.

Sources: EU-SILC 2017; authors' graphs.

difference is -14.10 (significantly different from zero at the 5% level), meaning that for each additional percentage point of public spending, cash housing benefits reduce poverty by 14.10% more than in-kind housing benefits (see notes at the top of subfigures 5b and 5c). The difference in cost-effectiveness is much greater for poverty than for inequality.

Regarding the results using FGT_1 and FGT_2, which examine the intensity and severity of poverty, we observe nearly similar results in terms of rankings, with the exception of Ireland and the Netherlands, which swap ranks with France and Germany, and Czechia now in the top group. Finland, the UK, France, Germany, and Czechia now lead in terms of poverty reduction, with an even greater magnitude for FGT_1 and FGT_2 than for FGT_0 (see, Tables E.1 and E.2). This confirms that these countries have (effective) housing policies focused on the poorest. In terms of the poverty-reducing effectiveness of public spending under housing policies, we again find that the UK, France and Denmark perform far worse than most Western and Nordic countries, while Germany seems to perform better for the poorest than for the whole population (see, Figures E.1 and E.2).

5.3 Non-housing consumption expenditure, housing services and housing expenses comparison

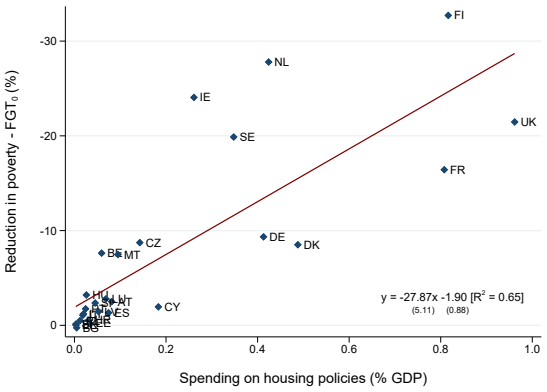
Additional evidence of the inequality-reducing effect of housing policies is provided by comparing households' total consumption expenditure (less any expenses concerning the dwelling) with expenditure on housing services (i.e., what households would have to pay for their dwelling in the absence of cash and in-kind housing benefits) and housing expenses (i.e., what households currently and actually pay for their dwelling). We examine the difference between households' distribution of total non-housing consumption expenditure and of housing services (HS) and expenses (HE).

In theory, we should observe that expenditure on housing services is more equally distributed than total non-housing consumption expenditure, which in turn is more equally distributed than housing consumption. Indeed, if the housing benefits target poor people, their housing expenses should decrease compared to their housing services, so that housing expenses become more unevenly distributed across the population with the poorest paying less than the most affluent.

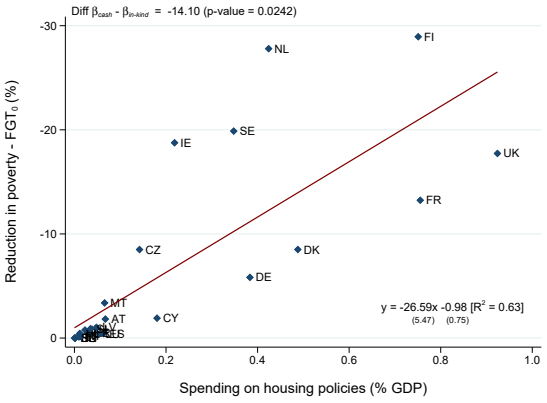
Figures F.1, F.2, F.3, and F.4 show the Lorenz curves of the three variables. It can be seen that housing services are clearly more evenly distributed than the other two expenditures (i.e., their Lorenz curves are above) in all countries except Czechia, Denmark, Hungary, Lithuania, Luxembourg, the Netherlands, Poland and Slovakia where two or all three curves overlap or intersect. Table 5 summarizes the Lorenz dominance relations at the country level. Housing services distributions strictly dominate the two other distributions for 19 out of 27 countries and are never dominated. Results are more

Figure 5: Percentage of reduction in poverty (FGT_0) according to the spending under housing policies in % of GDP

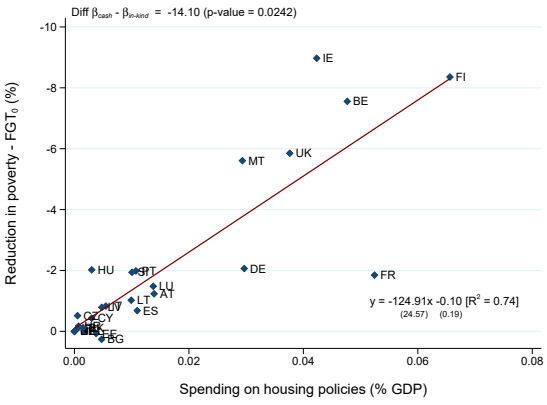
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits



Notes: The subgraphs' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

Sources: EU-SILC 2017; authors' graph.

ambiguous for the comparison between non-housing consumption expenditure vs housing expenditure. The latter dominates the former for 10 countries. There are also 17 countries for which we cannot rank both curves because they overlap or intersect.

Table 5: Number of country-pairwise Lorenz-domination: Housing service, Housing expenses, Non-housing consumption expenditure

		Lorenz dominance		
	Variable	**Housing services (HS)**	**Housing expenses (HE)**	**Consumption expenditure**
Lorenz dominated	**Housing services (HS)**	/	0	0
	Housing expenses (HE)	19	/	0
	Consumption expenditure	19	10	/

Notes: For details, see Figures F.1, F.2, F.3, and F.4. The totals are different from the total number of countries (i.e., 27), because some Lorenz curves overlap or intersect, so it is impossible to rank them. Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses corresponds to housing expenditure/CU/month including housing policies (cash + in-kind benefits).
Sources: Authors' table.

The difference is even clearer in Figure 6, which plots the Gini coefficients of non-housing consumption expenditure on the horizontal axis and the Gini coefficients of housing services and expenses on the vertical axis. Most of the Gini coefficients of the housing expenses are close to the 45-degree line (i.e., close to the distribution of the total non-housing consumption expenditure), while most of the Gini coefficients of housing services are below this line, and more importantly, below those of housing expenses when looking at each country intra-comparison. In the EU-27, the Gini coefficient is 10 points lower on average for housing services than for housing expenses[28]. The figure reveals that the inequality of housing services is also considerably lower than that of consumption of other goods and services in almost countries, with a Gini drop of also about 10 points in the EU-27 on average[29]. It is also worth to note that Belgium appears here as the European country with the lowest inequality in housing services, with an impressive Gini below 0.18.

Thus, we can conclude that cash housing benefits and social housing actually reduce households' housing expenses by reducing their housing expenses burden, preferentially for the poor, thus contributing to making housing inequality similar to consumption inequality.

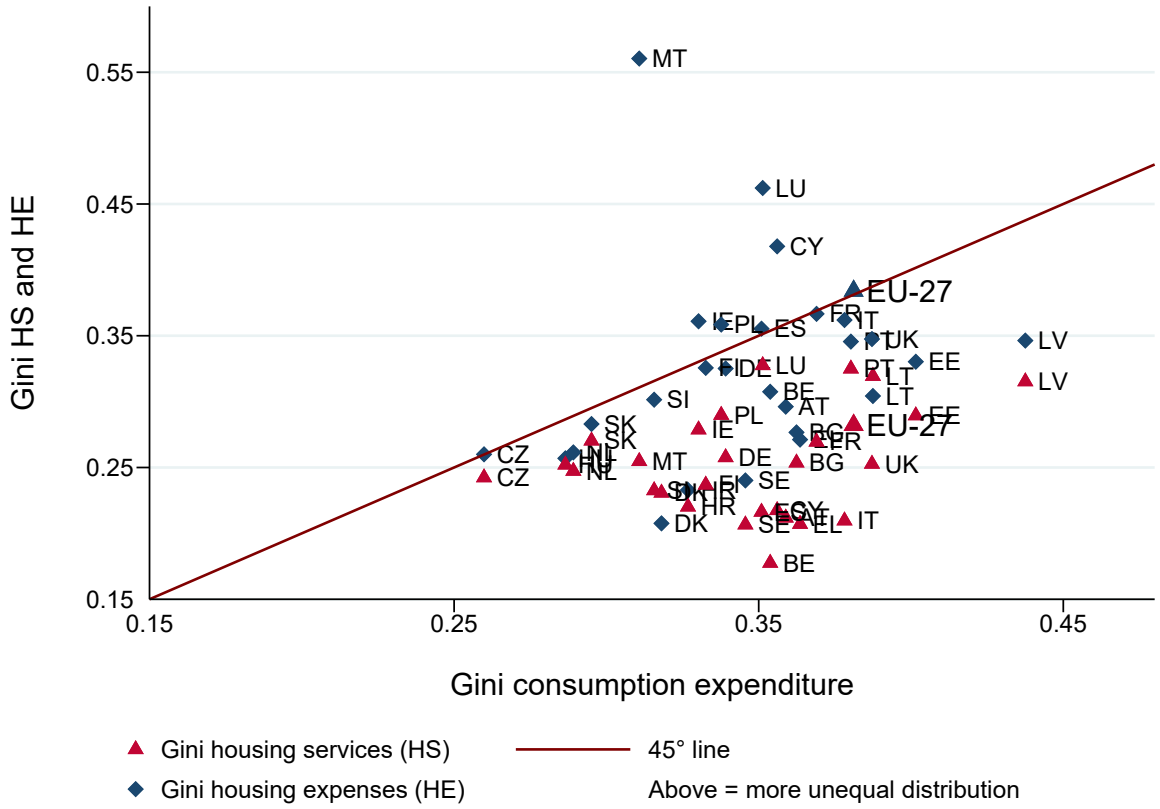
5.4 Net gain associated with tenure status

We now turn to estimating the mean gain according to the different types of tenure status, taking into account both housing policies and the advantage of being owners and free-rent tenants (see, Table 2). Obviously, this is a static or instantaneous comparison of the net gain by tenure status and does not cover owners' lifetime spending.

[28] In the EU-27, the Gini of HS is equal to 0.282 and the Gini of HE is equal to 0.384. Thus, a difference of 0.102 (p-value = 0.000).

[29] In the EU-27, the Gini of HS is equal to 0.282 and the Gini of non-housing consumption expenditure is equal to 0.381. Thus, a difference of 0.099 (p-value = 0.000).

Figure 6: Gini of non-housing consumption expenditure compared to Gini of housing services (HS) and expenses (HE)

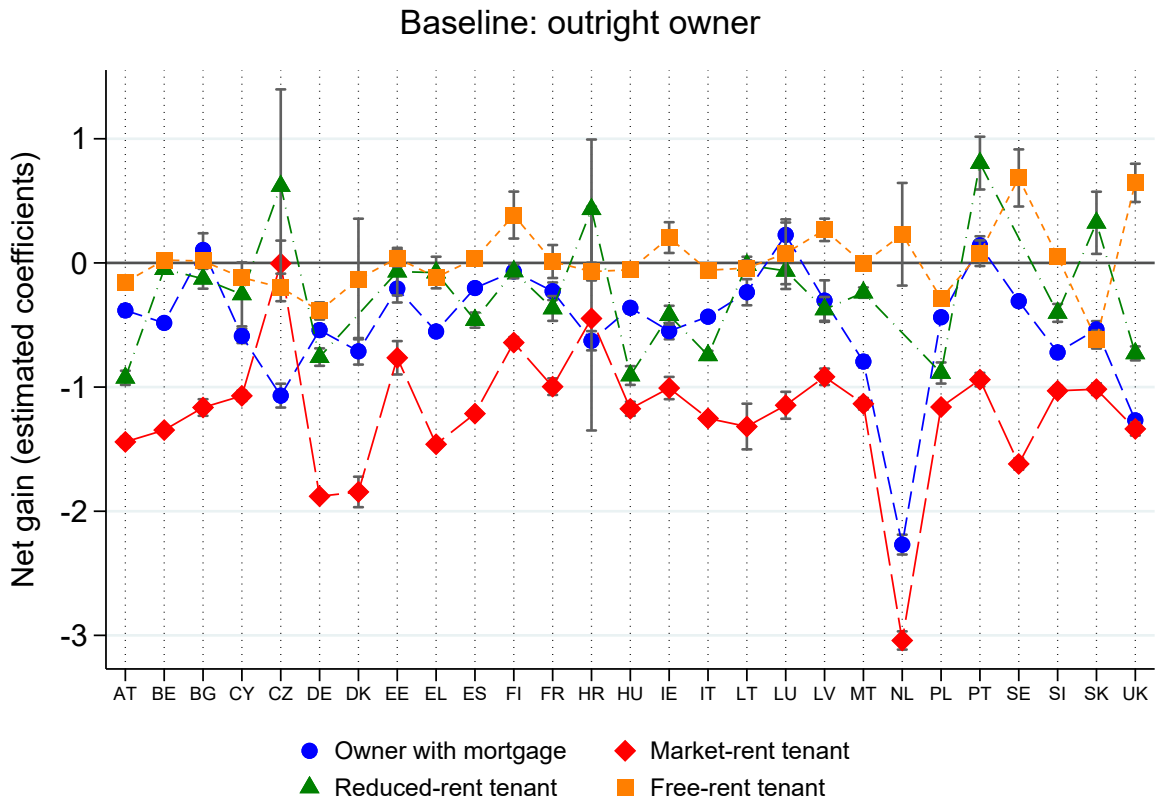


Notes: Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses corresponds to housing expenditure/CU/month including housing policies (cash + in-kind benefits).

Sources: HBS 2015 and EU-SILC 2017; authors' graph.

Figure 7 provides the estimates using weighted least squares with robust standard errors from equation 2 for each country, with their 95% confidence intervals. Outright owners are considered the baseline for comparison. Coefficients provide the deviation in net gain between each tenure status and the baseline tenure status computed at the mean. The dependent variable (Net gain) is normalized by dividing it by the country's mean net gain. The coefficients can be interpreted as by how many times at the mean the net gain of a tenure status differs from that of an outright owner".

Figure 7: Regression estimates: Net Gain by tenure status



Notes: Estimates of equation 2 using weighted least squares with robust standard errors and 95% confidence intervals (CIs). CIs that are not visible are behind the symbols.
Sources: EU-SILC 2017; authors' graph.

First of all, for owners with mortgages, we observe almost everywhere lower net gain, as opposed to being an outright owner. This is obviously due to the mortgage interest repayments. The magnitude of the differences is between 0 and -1, except for the Netherlands, where the net gain of an owner with mortgage is almost 2 times lower at the mean than that of an outright owner.

Surprisingly, the differences for reduced-rent tenants are also negative or close to zero for most of the countries, ranging from 0 and -1, except for Portugal and Slovakia, where

the differences are positive and statistically different from zero. Thus, on average, reduced-rent tenants are worse off than outright owners even after the redistributive effect of housing benefits, with a net gain about half lower. Interestingly, we observe no correlation between the share of reduced-rent tenants and the mean gain from in-kind housing benefits, meaning that neither the reduced-rent tenants nor the governments seem to trade-off the two dimensions (see, Figures D.12 and D.13).

The case of market-rent tenants is even worse. In all countries, the difference in mean net gain between being an outright owner and a market-rent tenant is negative, except for Czechia where it is zero, ranging roughly between 1 and 2 times lower, except for the Netherlands again, where the net gain is 3 times lower.

Finally, the net gain for free-rent tenants is not statistically different from zero or slightly positive for almost every country, meaning that there is no difference between being a free-rent tenant as opposed to being an outright owner.

To conclude, the best tenure status taking into account the housing policies remains that of the outright owner as well as free-rent tenant, followed by owner with mortgage and reduced-rent tenant, which alternate between countries, and that of market-rent tenant last.

6 Capture of the cash housing benefits

Previous literature has highlighted the fact that landlords can capture a sizable share of cash housing benefits by raising rents. By how much the benefit is reflected in the rent is known as the pass-through rate. This pass-through is linked to the public knowledge of the amount perceived by the tenant and the relative magnitude of supply elasticity with respect to demand elasticity. Such behavior would obviously prevent the housing policy from being fully efficient in reducing inequality and poverty, as only part of the statutory amount of the subsidy would effectively benefit the targeted low-income households.

In order to test the possible impact on our estimates, we simulate a counterfactual situation, taking into account this possible partial capture and pass-through in rents of the cash housing benefits. We proceed in two stages. First, we re-estimate the incomes used in the inequality and poverty analysis by applying to the cash housing benefits a hypothetical partial capture. Based on the previous literature results, which estimate a range of pass-through rate of [20 ; 80][30], we apply a mean value of 50% to our simulations for all countries. In detail, we change the values in Table 1, by cutting by half the actual amount of the subsidy for market-rent tenants receiving cash housing benefits, before adding it to the households' income when measuring the cash advantages from housing

[30] See, Section 2 for the literature review.

policies. Second, we also change the rent values in Table 2. Since we now assume that the rents reflect the inflating effect of the capture by landlord, we subtract from the value of the rent of market-rent household j benefiting from the subsidy, the capture rate times the benefit: $\text{Rent}_j - \text{Cash housing benefits}_j \times 0.5$. We do not apply this correction to all rents (i.e., market-rent tenants not benefiting from the subsidy and reduced-rent tenants), because we stick to the view of the literature that the estimated pass-through reflects a short-term or partial equilibrium effect.

Rental incomes of landlords[31] and imputed rents would also be affected[32], but we cannot precisely know how they would be one by one. To circumvent this issue, we apply to all imputed rents and rental incomes of landlords[33] a correction equals to $R_i(1-\eta_c)$, with R_i the imputed rent or rental income of household i, $\eta_c = 0.5 \times \frac{\sum_{j=1}^{S} \text{Cash housing benefits}_j}{\sum_{k=1}^{N} \text{Rent}_k}$ the average pass-through rate for country c, S the number of beneficiaries of cash housing benefits among market-rent tenants, and N the number of market-rent tenants.

Simulations' results with the capture of 50% by landlords show a slight increase in inequality and poverty, especially for the Northern and Western European countries, while ranking is maintained and reducing effects are smaller overall, compared to the main results. Disentangling the effect of the housing policies confirmed our major finding: even with a half capture of the cash housing benefits by landlord, they remain more effective than in-kind housing benefits at reducing households' inequality and poverty (see, Figures 8 and 9). Doing the same exercise as before—comparing the cost-effectiveness of the two policies—we observe that the result vanishes for inequality (the coefficient is no more different from zero at the 10% level), whereas it remains for poverty (-8.27, significantly different from zero at the 10% level) (see notes at the top of subfigures G.1b, G.1c, G.2b and G.2c).

We can conclude that the pass-through rate of cash housing benefits should be at least larger than half to observe a possible reversal in the relative efficiency of cash housing benefits compared to in-kind housing policy, and in cost-effectiveness at least for poverty reduction measured by FGT_0.

Detailed results presenting the inequality and poverty reduction of the income after inclusion of housing benefits and partial capture by the landlords are reported in Tables G.1, G.2, G.3 and G.4, and Figures G.1, G.2, G.3 and G.4.

Results on non-housing consumption expenditure compared to housing services and expenses, and net gain estimates show almost no differences compared to the main results

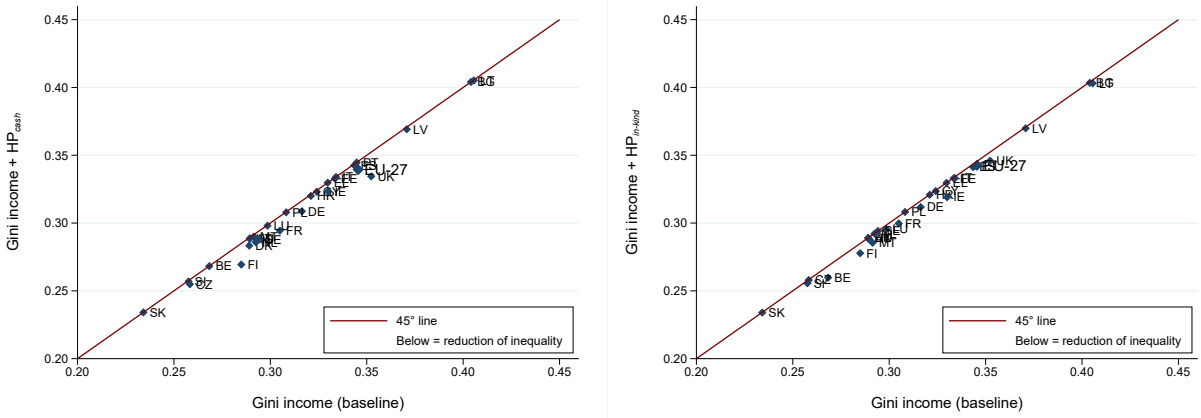
[31] Landlords are identified in EU-SILC as the households with "Income from the rental of a property or land", but we don't know whether the tenant benefits from the subsidy.

[32] Given that the imputed rents are computed mainly using regression methods on market-rents, we can assume that the inflating effect also applies to these estimates.

[33] Regardless their tenure status or whether they benefit from the subsidy.

Figure 8: Gini of baseline income compared to income including housing benefits, with partial capture of cash housing benefits by landlords

(a) Gini income + HP$_{cash}$ (b) Gini income + HP$_{in\text{-}kind}$

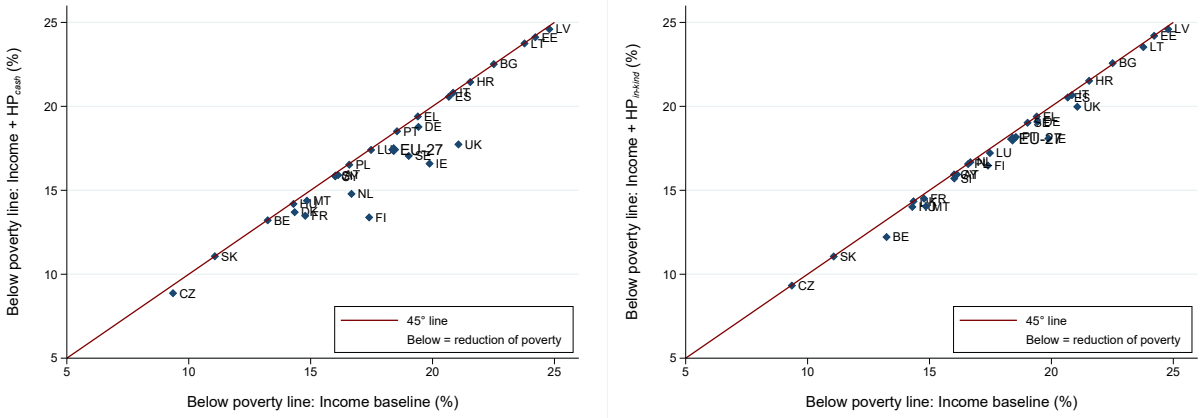


Notes: Income represents disposable income/CU/month without housing benefits. Partial capture rate of the cash housing benefits by landlords of 50%.

Sources: EU-SILC 2017; authors' graphs.

Figure 9: Poverty rate (FGT_0) with baseline income compared to income including housing benefits, with partial capture of cash housing benefits by landlords

(a) Below poverty line: income + HP$_{cash}$ (b) Below poverty line: income + HP$_{in\text{-}kind}$



Notes: Poverty rate represents the share of households below the poverty line. Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing benefits. Income represents disposable income/CU/month without housing benefits. Partial capture rate of the cash housing benefits by landlords of 50%.

Sources: EU-SILC 2017; authors' graphs.

overall (see, Figures G.6 and G.5). As for the possible effect of social housing or on its privatization on market-rents, we leave aside this interesting issue due the lack of literature on this impact, and consider our paper as a first step.

7 Robustness check: imputed rents using Heckman regression

The main concern that our study could raise is the computation of imputed rents. Indeed, we use harmonized data from the EU-SILC, but different calculation methods are applied as indicated in the data section, depending on each country's specificity. In order to test the robustness of our main results on the magnitude of reduction in inequality and poverty and ranking of the European countries, we compute our own imputed rents for the owners, free-rent and reduced-rent tenants. To do so, we reproduce the method developed in Verbist and Grabka (2017). We did not choose this method for our main estimations, first of all, because of the lack of depth in the data available in the EU-SILC, especially on the dwelling characteristics. It is impossible to obtain an exhaustive hedonic regression, and to perform a stratification method, depending for example on the exact type of dwelling, housing price, or precise location, as most of the national statistical institutes have done. Moreover, in some countries, the share of market-rent tenants is low (particularly in Eastern European countries), so they could be less representative of the country's housing market (e.g., between owners who live mainly in houses, and tenants who live mainly in apartment blocks).

The method is an objective measure of the imputed rents: a regression approach (with Heckman correction) with an additional error correction term in order to maintain the distribution of the rents. Indeed, it could be argued that imputation works well to estimate the first moment of a subgroup, or the conditional expectation (i.e., the mean), but it's really hard to know how it approaches second moments (i.e., the variance). This computation is done in three steps for each country separately. (1) We applied a Heckman procedure on the population of tenants[34], by regressing the logarithm of the actual rent of the market-rent tenants on covariates of the characteristics and location of the dwelling, amenities, and household's characteristics. To avoid possible selection bias in the tenure choice, we applied a Heckman selection correction. The variables used in the selection equation are assumed to be correlated with the tenure choice of the household, especially the eligibility criteria of the social housing tenants. These variables are household income, the capacity to face unexpected financial expenses, size of the household, the marital status of the reference person, age, whether or not the reference person is a lone parent,

[34]Market-rent + reduced-rent tenants.

possible chronic illness, status (if unemployed, disabled or retired), and whether or not the reference person has a migration background and a permanent contract (see, Table H.1 for the detail). If there is no convergence of the maximum likelihood estimator, then we run an OLS instead of, using the same variables[35]. (2) We use the estimated coefficients to predict the imputed rents for owners, reduced-rent and free-rent tenants[36]. (3) We add the error correction term to the predicted rents. This *ad hoc* error component is randomly chosen from a normal distribution with a zero mean and a variance equal to the difference between the standard deviation of the actual rent variable and the standard deviation of the predicted rent variable for market-rent tenants.

Detailed results on poverty and inequality are presented in Tables H.2, H.3. We see that most of the countries' rankings are maintained (e.g., Finland, the UK, Germany, France, the Netherlands, Ireland, Sweden, Denmark, Czechia, and Belgium are still in the lead) as compared to the main results using EU-SILC's imputed rents. The magnitudes change only marginally[37]. Ranking and magnitudes are also mostly maintained regarding FGT_1 and FGT_2 (see, Tables H.4 and H.5).

The preserved ranking in general, and the overall increase in inequality and poverty reduction for the Western countries are more vivid in Figures H.3, H.4, H.5 and H.6 which plot the percentage of reduction in inequality and poverty according to the spending under housing policies in % of GDP. Compared to the main results, we see that the position of most of the countries is unchanged. Thus, our results that the cash housing benefits performed better than in-kind housing benefits (i.e., social housing) are confirmed (see, Figures H.1 and H.2).

On the cost-effectiveness of the two policies, we observe that the result vanishes for inequality (the coefficient is not different from zero at the 10% level), whereas it remains for poverty (-15.70, significantly different from zero at the 5% level) (see notes at the top of subfigures H.3b, H.3c, H.4b and H.4c).

Regarding the comparison with non-housing consumption expenditure and the advantages by tenure status (see, Figures H.8 and H.7), estimates are also comparable and even clearer to that using the EU-SILC's imputed rents, in terms of rankings, magnitudes, and interpretations.

[35]This is the case for Denmark, Estonia, Greece, Hungary, Lithuania, Malta, the Netherlands, Poland, Sweden, and Slovakia.

[36]We set the negative values of imputed rents to zero, after imputation. We also winsorized (or censored) the top extreme abnormal values, by replacing the values higher than the 0.1 percentile value with the top 0.1 percentile value.

[37]For instance, regarding the main results for inequality reductions including both housing benefits: the UK increases from -7.24% to -8.57%, France from -5.35% to -5.47%, Finland decreases from -9.02% to -8.47%, Germany from -4.89% to -4.13%; for poverty reductions: the UK increases from -21.06% to -23.17%, France from -16.42% to -17.29%, Finland decreases from -32.71% to -31.08%, Germany from -9.34% to -7.03%.

We can conclude that our main results are robust to the choice of the imputed rent estimation method.

8 Conclusion

This study proposes a detailed comparison of the impacts of housing policies on housing inequality and poverty rates in 27 European countries, using the EU-SILC and HBS datasets, disentangling the inequality- and poverty-reducing effects of governments' two main housing policies (cash housing benefits and social housing). The method we propose to calculate households' housing services (what they would have to pay in the absence of housing benefits) and housing expenses (what they currently and actually pay) is specific to our study. We take into account total housing costs (or usage costs) and income advantages derived from housing for different types of tenure status: owner-occupiers, reduced-rent tenants, and free-rent tenants (i.e., imputed rents).

Our results show that cash housing benefits seem more cost-effective than in-kind housing benefits (social housing) and more effective in reducing poverty than inequality, even after taking into account a partial capture of half of cash housing benefits by landlords (at least for poverty). We also find a positive correlation between this reducing effect and the level of public spending on housing. However, some countries, like Finland, Sweden, the Netherlands or Ireland, achieve better or similar results in reducing inequality and poverty while spending as much as France or Germany and much less than the UK. The performance of Finland is particularly outstanding, the opposite of Denmark's one, which is not particularly cost-effective, just like France and the UK.

Moreover, using a statistical matching method on the basis of EU-SILC and HBS datasets, we retrieve the households' total non-housing consumption expenditure and compare it to housing services and expenses. The analysis confirms that housing policies reduce housing costs burden for the poorest households, and therefore housing inequality between households, which becomes comparable to non-housing consumption inequality. Housing policy is often attacked by pointing out inefficiencies. They exist and should not be minimized. But at the same time, inequalities in housing services are much less salient than inequalities in consumption of other goods and services, and this was undoubtedly one of the major objectives of public policy on housing as it was conceived in the interwar period. It can be said that this objective has been largely achieved in Europe, considered as a single country.

Finally, an econometric estimate shows that in almost all countries, without taking into account lifetime spending, the most advantageous tenure status after including cash and in-kind housing benefits is outright ownership.

One direction for further research could be to extend the present analysis by looking backward at the evolution of poverty, inequality, and consumption over time (EU-SILC data are available for almost all countries from 2004 to 2022). Another direction would be to estimate precisely the true costs of the social housing policy, which may be different

from the estimation through the user's gain approach adopted here, and to use precise data on the purely social housing tenants. It requires an in-depth analysis that can only be performed at the country level using national-based detailed datasets.

References

Albers, Thilo N H, Charlotte Bartels, and Moritz Schularick, "The Distribution of Wealth in Germany," *CESifo Working Paper*, 2022, *9739.*

Albouy, David and Mike Zabek, "Housing Inequality," *NBER Working paper series*, 2016, *21916.*

Balcázar, Carlos Felipe, Lidia Ceriani, Sergio Olivieri, and Marco Ranzani, "Rent-Imputation for Welfare Measurement: A Review of Methodologies and Empirical Findings," *Review of Income and Wealth*, 2017, *63* (4), 881–898.

Brewer, Mike, James Browne, Carl Emmerson, Andrew Hood, and Robert Joyce, "The curious incidence of rent subsidies: Evidence of heterogeneity from administrative data," *Journal of Urban Economics*, 2019, *114*, 103–198.

Collinson, Robert and Peter Ganong, "How Do Changes in Housing Voucher Design Affect Rent and Neighborhood Quality?," *American Economic Journal: Economic Policy*, 2018, *10* (2), 62–89.

Dewilde, Caroline and Bram Lancee, "Income Inequality and Access to Housing in Europe," *European Sociological Review*, 2013, *29* (6), 1189–1200.

D'Orazio, Marcello, Marco Di Zio, and Mauro Scanu, *Statistical Matching: Theory and Practice*, John Wiley & Sons, 2006.

Droste, Christiane and Thomas Knorr-Siedow, "Social Housing in Germany," in "Social Housing in Europe," John Wiley & Sons, 2014, pp. 183–202.

Dustmann, Christian, Bernd Fitzenberger, and Markus Zimmermann, "Housing Expenditure and Income Inequality," *The Economic Journal*, 2022, *132* (645), 1709–1736.

Díaz, Antonia and María José Luengo-Prado, "On the user cost and homeownership," *Review of Economic Dynamics*, 2008, *11* (3), 584–613.

Eerola, Essi and Teemu Lyytikäinen, "Housing Allowance and Rents: Evidence from a Stepwise Subsidy Scheme," *The Scandinavian Journal of Economics*, 2021, *123* (1), 84–109.

_ , _ , Tuukka Saarimaa, and Tuuli Vanhapelto, "The Incidence of Housing Allowances: Quasi-Experimental Evidence," *VATT Working papers*, 2022, *149.*

Eriksen, Michael D. and Amanda Ross, "Housing Vouchers and the Price of Rental Housing," *American Economic Journal: Economic Policy*, 2015, *7* (3), 154–176.

Fack, Gabrielle, "Are housing benefit an effective way to redistribute income? Evidence from a natural experiment in France," *Labour Economics*, 2006, *13* (6), 747–771.

Fessler, Pirmin, Miriam Rehm, and Lukas Tockner, "The impact of housing non-cash income on the household income distribution in Austria," *Urban Studies*, 2016, *53* (13), 2849–2866.

Figari, Francesco, Alari Paulus, Holly Sutherland, Panos Tsakloglou, Gerlinde Verbist, and Francesca Zantomio, "Removing Homeownership Bias in Taxation: The Distributional Effects of Including Net Imputed Rent in Taxable Income: Removing homeownership bias in taxation," *Fiscal Studies*, 2017, *38* (4), 525–557.

_ , Katarina Hollan, Manos Matsaganis, and Eszter Zolyomi, "Recent changes in housing policies and their distributional impact across Europe," *EUROMOD working paper series*, 2019, *12* (19).

Frick, Joachim R. and Markus M. Grabka, "Imputed Rent and Income Inequality: A Decomposition Analysis for Great Britain, West Germany and the U.S.," *Review of Income and Wealth*, 2003, *49* (4), 513–537.

_ , _ , Timothy M. Smeeding, and Panos Tsakloglou, "Distributional effects of imputed rents in five European countries," *Journal of Housing Economics*, 2010, *19* (3), 167–179.

Gibbons, Stephen and Alan Manning, "The incidence of UK housing benefit: Evidence from the 1990s reforms," *Journal of Public Economics*, 2006, *90* (4), 799–822.

Gibbs, Ian and Peter Kemp, "Tenure Differences in Income and Housing Benefit in Later Life," *Social Policy & Administration*, 1993, *27* (4), 341–353.

Gobillon, Laurent, "Emploi, logement et mobilité résidentielle," *Economie et statistique*, 2001, *349* (1), 77–98.

Goedemé, Tim, Karel Van den Bosch, Lina Salanauskaite, and Gerlinde Verbist, "Testing the Statistical Significance of Microsimulation Results: A Plea," *International Journal of Microsimulation*, 2013, *6* (3), 50–77.

Goux, Dominique and Eric Maurin, "The effect of overcrowded housing on children's performance at school," *Journal of Public Economics*, 2005, *89* (5), 797–819.

Grislain-Letrémy, Céline and Corentin Trevien, "The Impact of Housing Subsidies on the Rental Sector: the French Example," *Working paper INSEE*, 2014, *08*.

_ **and** _ , "The Long-Term Impact of Housing Subsidies on the Rental Sector: the French Example," *Working paper Banque de France*, 2022, *886.*

Heylen, Kristof, "The distributional impact of housing subsidies in Flanders," *International Journal of Housing Policy*, 2013, *13* (1), 45–65.

Hyslop, Dean R. and David Rea, "Do housing allowances increase rents? Evidence from a discrete policy change," *Journal of Housing Economics*, 2019, *46*, 101–657.

Jacquot, Alain, "L'occupation du parc HLM : un éclairage à partir des enquêtes Logement de l'INSEE," *INSEE Working papers*, 2007, *F0708.*

Juntto, Anneli and Marie Reijo, *The comparability of imputed rent*, Luxembourg: Statistical Office of the European Union, 2010.

Kadi, Justin, "Recommodifying Housing in Formerly "Red" Vienna?," *Housing, Theory and Society*, 2015, *32* (3), 247–265.

Kangasharju, Aki, "Housing Allowance and the Rent of Low-income Households: Housing allowance and the rent of low-income households," *Scandinavian Journal of Economics*, 2010, *112* (3), 595–617.

Krieger, James and Donna L. Higgins, "Housing and Health: Time Again for Public Health Action," *American Journal of Public Health*, 2002, *92* (5), 758–768.

Lerman, Donald L. and Robert I. Lerman, "Imputed Income from Owner-Occupied Housing and Income Inequality," *Urban Studies*, 1986, *23* (4), 323–331.

Leulescu, Aura and Mihaela Agafiţei, *Statistical matching: a model based approach for data integration : 2013 edition*, Luxembourg: Statistical Office of the European Union, 2013.

List, Emanuel, "Housing and Income Inequality in Europe: Distributional Effects of Non-Cash Income From Imputed Rents," *Review of Income and Wealth*, 2022, *0 eprint* (0).

Little, Roderick J A, "Missing-Data Adjustments in Large Surveys," *Journal of Business & Economic Statistics*, 1988, *6* (3), 287–296.

Maestri, Virginia, "Imputed rent and income re-ranking. Evidence from EU-SILC data," *Gini discussion paper*, 2012, *29.*

_ , "Imputed rent and distributional effects of housing-related policies in Estonia, Italy and the United Kingdom," *Baltic Journal of Economics*, 2013, *13* (2), 37–60.

_ , "A Measure of Income Poverty Including Housing: Benefits and Limitations for Policy Making," *Social Indicators Research*, 2015, *121* (3), 675–696.

Matznetter, Walter, "Social Housing Policy in a Conservative Welfare State: Austria as an Example," *Urban Studies*, 2002, *39* (2), 265–282.

Mundt, Alexis, "Privileged but Challenged: The State of Social Housing in Austria in 2018," *Critical Housing Analysis*, 2018, *5* (1), 12–25.

Olsen, Edgar O., "Housing programs for low-income households," *NBER Working paper series*, 2001, *8208.*

_ **and David M. Barton**, "The benefits and costs of public housing in New York City," *Journal of Public Economics*, 1983, *20* (3), 299–332.

Poterba, James M., "Tax Subsidies to Owner-Occupied Housing: An Asset-Market Approach," *The Quarterly Journal of Economics*, 1984, *99* (4), 729–752.

_ , "Taxation and Housing: Old Questions, New Answers," *American Economic Review*, 1992, *82* (2), 237–242.

Reinprecht, Christoph, "Social Housing in Austria," in "Social Housing in Europe," John Wiley & Sons, Ltd, 2014, pp. 61–73.

Rubin, Donald B., "Statistical Matching Using File Concatenation with Adjusted Weights and Multiple Imputations," *Journal of Business & Economic Statistics*, 1986, *4* (1), 87–94.

Sayag, Doron and Noam Zussman, "Who benefits from rental assistance? Evidence from a natural experiment," *Regional Science and Urban Economics*, 2020, *80*, 103395.

Schmutz, Benoît and Gregory Verdugo, "Do elections affect immigration? Evidence from French municipalities," *Journal of Public Economics*, 2023, *218*, 104803.

Smeeding, Timothy M., "Poverty, Inequality, and Family Living Standards Impacts across Seven Nations: The Effect of Noncash Subsidies for Health, Education and Housing," *Review of Income and Wealth*, 1993, *39* (3), 229–256.

Susin, Scott, "Rent vouchers and the price of low-income housing," *Journal of Public Economics*, 2002, *83* (1), 109–152.

Tobin, James, "On Limiting the Domain of Inequality," *The Journal of Law & Economics*, 1970, *13* (2), 263–277.

Tonkin, Richard and Paola Serafino, *Statistical matching of European Union statistics on income and living conditions (EU-SILC) and the household budget survey 2017 edition*, Luxembourg: Statistical Office of the European Union, 2017.

Trevien, Corentin, "Habiter en HLM : quel avantage monétaire et quel impact sur les conditions de logement ?," *Economie et statistique*, 2014, *471* (1), 33–64.

Törmälehto, Veli-Matti and Hannele Sauli, *The distributional impact of imputed rent in EU-SILC 2007-2010*, Luxembourg: Statistical Office of the European Union, 2013.

Verbist, Gerlinde and Markus M. Grabka, "Distributive and poverty-reducing effects of in-kind housing benefits in Europe: with a case study for Germany," *Journal of Housing and the Built Environment*, 2017, *32* (2), 289–312.

Verdugo, Gregory, "Public housing magnets: public housing supply and immigrants' location choices," *Journal of Economic Geography*, 2016, *16* (1), 237–265.

Viren, Matti, "Is the housing allowance shifted to rental prices?," *Empirical Economics*, 2013, *44* (3), 1497–1518.

Webber, Dominic and Richard Tonkin, *Statistical matching of EU-SILC and the household budget survey to compare poverty estimates using income, expenditures and material deprivation*, Luxembourg: Statistical Office of the European Union, 2013.

Whitehead, Christine M. E. and Kathleen Scanlon, *Social housing in Europe*, London: LSE London, London School of Economics and Political Science, 2007.

Appendices

A Tables

Table A.1: List of countries included in the sample and their abbreviations

Country	**Abbreviation**
Austria	AT
Belgium	BE
Bulgaria	BG
Croatia	HR
Cyprus	CY
Czechia	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	EL
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV
Lithuania	LT
Luxembourg	LU
Malta	MT
Netherlands	NL
Poland	PL
Portugal	PT
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
United Kingdom	UK

Sources: Eurostat 2020; authors' table.

Table A.2: Variables used for Net gain regression and the imputation of missing imputed rents and rents values

Variable	Details	EU-SILC
Imputed rent	Imputed rent	HY030g
Rent	Current rent (including housing benefits)	HH060
Tenure status	• Outright owner • Owner paying mortgage • Market-rent tenant • Reduced-rent tenant • Free-rent tenant	HH021
Dwelling type	• Detached house • Semi-detached house • Apartment/flat in building with < 10 dwellings • Apartment/flat in building with ≥ 10 dwellings • Other	HH010
Number of rooms	Number of available rooms in the dwelling	HH030
Bath	Bath or shower in dwelling	HH081
Toilet	Indoor flushing toilet for sole use of household	HH091
Moisture	Leaking roof, damp walls/floors/foundation, or rot in window frames or floor	HH040
Warm	Ability to keep home adequately warm	HH050
Dark	Problems with the dwelling: too dark, not enough light	HS160
Noise	Noise from neighbors or from the street	HS170
Pollution	Pollution, grime or other environment problems	HS180
Crime	Crime, violence or vandalism in the area	HS190
Degree of urbanization	• Densely populated • Intermediate area • Thinly-populated area	DB100
Region	NUTS 1	DB040
Year	Year of contract or purchasing or installation	HH031
Income	Total disposable household income	HY020
Income squared	Income # income	/
Household size	Number of people in household	HX040
Unexpected expenses	Capacity to face unexpected financial expenses	HS060
Lone parent	Single parent household, one or more dependent children	HX060
Marital status of reference person	• Never married • Married • Widowed • Divorced	PB190
Illness	Suffer from any chronic illness or condition	PH020
Status	• Unemployed • Disabled • Retired	PL031
Stranger	Country of birth (other than EU)	PB210
Permanent contract	Permanent job/work contract of unlimited duration	PL140
Age of reference person	Age (0 - 99)	PX020
Age squared	Age # age	/

Sources: EU-SILC 2017; authors' table.

B Variables adjusted for inflation and difference in standard of living

Inflation-adjusted. HBS data are available for the year 2015, while the EU-SILC data are available for the year 2017. Thus, to avoid a possible bias due to the price difference, all monetary variables are adjusted for inflation. We divide these variables by the Deflator_{2017}, which is calculated as follows: $\text{Deflator}_{2017} = \text{HICP}_{2015} \backslash \text{HICP}_{2017}$, where HICP corresponds to the harmonized index of consumer prices from the Eurostat database[38] for each country.

Currency- and purchasing-power-parity adjusted. Comparing incomes, rents or cash transfers from different countries raises the issue of currencies and purchasing powers. Not all the countries we analyze are part of the Eurozone, and some have very different standards of living (e.g., Western Europe versus Eastern Europe). Therefore, to make the estimates comparable, we convert all the variables (from EU-SILC and HBS) into euros and derive common Purchasing Power Parity (PPP), by dividing them by each country's EU-28 PPP. We use the EU-28 PPP of Eurostat[39] specific to the EU-SILC dataset[40] as a reference base, which means that the variables are expressed in euros according to the average 2017 PPP of the EU-28 household final consumption expenditure.

[38] https://ec.europa.eu/eurostat/web/hicp.
[39] https://ec.europa.eu/eurostat/web/purchasing-power-parities.
[40] https://circabc.europa.eu/w/browse/2657d26b-9780-4ca0-bde1-9f21559b964a.

C Statistical matching

Predictive mean matching method. In order to perform statistical matching between the EU-SILC and the HBS datasets, and to recover some missing values, we implement a matching/imputation method. We select the most recommended method: a mixed approach between the regression method (parametric) and the hotdeck method (non-parametric). Thus, we implement a predictive mean matching (PMM) method with bootstrap estimates of the model parameters, proposed first by Rubin (1986) and Little (1988). The PMM method involves three steps. First, we fit an econometric model to the data to estimate a predicted value for the variable to be matched/imputed. This is performed on both the donor dataset (HBS) and the recipient dataset (EU-SILC) for statistical matching, or on both the missing observations and the complete observations (i.e., to be used as imputation) in the case of the imputation of the missing rents. Second, a distance function based on the absolute difference between the predicted value for the missing value and that of the complete values is computed. Third, the matched/imputed values are drawn from the donor dataset or complete values using a nearest-neighbors method: the missing value is randomly replaced by an observed value from the donor or complete observations, depending on the number of closest observations specified. To avoid a possible bias from correlation among multiple imputations (i.e., the same value is used multiple times for tied households), we set to 5 the number of nearest neighbors from which the non-missing value is randomly selected, and perform this PMM method several times before selecting one of these imputed values.

Statistical matching. As detailed in D'Orazio et al. (2006), before implementing a statistical matching, the following procedure must be applied: (i) harmonization of the definition of units, (ii) harmonization of reference periods, (iii) completion of population, (iv) harmonization of variables, (v) harmonization of classifications, (vi) adjustment for measurement errors (accuracy), (vii) adjustment for missing data, (viii) derivation of variables.

For the statistical matching between HBS and EU-SILC datasets, we follow the procedures for harmonization of units, classifications, and choice of variables proposed by Eurostat in Webber and Tonkin (2013), Leulescu and Agafiţei (2013) and Tonkin and Serafino (2017). The first step log-level regression model used to perform the statistical matching between HBS and EU-SILC is:

$$\log(\text{Expenditure}_i) = \beta_0 + X'\beta_1 + \epsilon_i \tag{3}$$

where Expenditure_i is the total consumption expenditure (without housing expenditure)

of households i, from the HBS dataset. We use the logarithm of expenditure, as it is highly positively skewed. X is a vector of variables common to the HBS and EU-SILC datasets that are correlated to the level of expenditure, such as household's characteristics, characteristics of the reference person, current activity status, hours worked, type of contract, income, current rent, tenure status, and degree of urbanization (see, Table C.1 for a detail of the variables). Finally, ϵ_i is the error term. We estimate this model using weighted least squares for each country.

To check the accuracy of the statistical matching, we look at the distribution of density and mean total non-housing consumption expenditure by decile of equivalized household expenditure between EU-SILC (recipient dataset) and HBS (donor dataset). In Figure C.1, we can see that the densities of both EU-SILC and HBS follow similar patterns for all countries. The mean households' non-housing consumption expenditure also shows a similar pattern by decile of equivalized household expenditure between datasets (see, Figure C.2). Thus, the statistical matching can be considered accurate: and based on households' characteristics, the non-housing consumption expenditure values appear to be matched without bias.

Imputing missing values. The first step used to perform the imputation of missing imputed rents or rents[41] relies upon the following regression model:

$$\text{Rent}_i = \beta_0 + X'\beta_1 + \epsilon_i \tag{4}$$

where Rent_i[42] represents the (non-missing) current imputed rents, or actual rents[43] for the market-rent tenants, of households i. X is a vector of variables that are significant in explaining the level of rents of the households. These variables are the same as for the regression 2: household's characteristics, the dwelling's characteristics and location, degree of urbanization, and tenure status (see, Table A.2 for a detail of the variables). Finally, ε_i is the error term. We estimate this model using weighted least squares for each country.

[41] We also impute 500 missing or zero rent values for market-rent tenants at the same time.

[42] We use the absolute value of the imputed rents variable, rather than the logarithm, because it performs better when comparing the imputation. We also set the negative values to zero, after imputation.

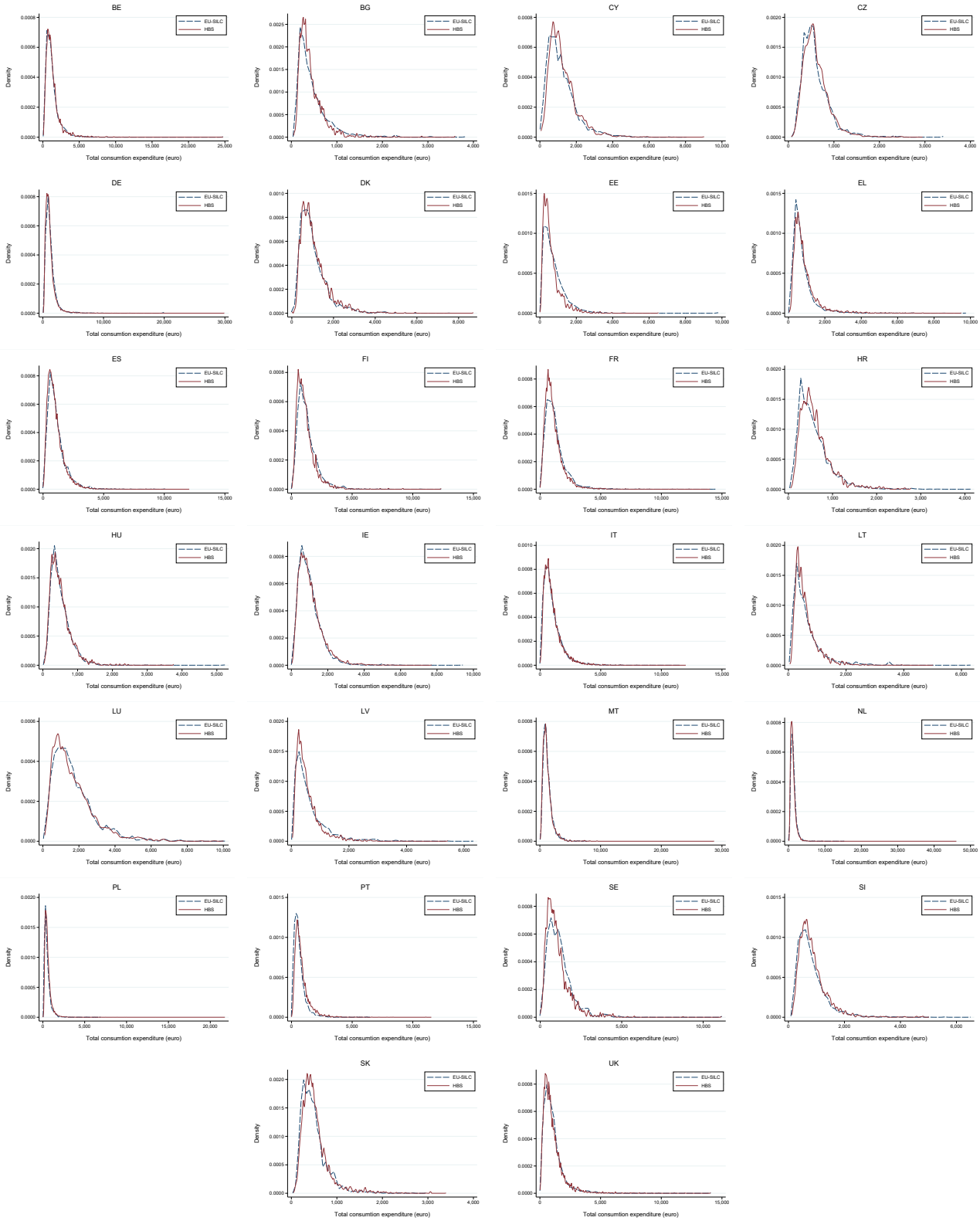
[43] Including housing benefits. See, subsection 3.2 for the exact definition of imputed rents and rents variables.

Table C.1: Variables uses for the statistical matching between HBS and EU-SILC

Variable	Details	EU-SILC	HBS
log(expenditure)	Total consumption expenditure without rents and housing-related expenditure	/	EUR_HE00 - EUR_HE041
Household size	Number of people in household	HX040	HB05
Household type	Composition of the household	HX060	HB074
Sex of reference person	Male or female	RB090	MB02
Age of reference person	Age (5 year-range classes)	PX020	MB03_Recoded_5YearsClasses
Marital status of reference person	• Never married • Married • Widowed • Divorced	PB190	MB04_Recoded_3Categ
Consensual union of reference person	• Person living in consensual union • Person not living in consensual union • Not specified	PB200	MB042
Current activity status	• At work • Unemployed • Retired • Inactive	RB210	ME01
Hours worked	• Full time • Part time • Not applicable • Not specified	PL031	ME02
Type of contract	• Permanent job/work contract of unlimited duration • Temporary job/work contract of limited duration	PL140	ME03
Income	Total household disposable income	HY020	EUR_HH095
Current rent	Total monthly rent paid on main residence	HH060	EUR_HE041
Tenure status	• Owner • Tenant	HH021	Deduced from EUR_HE0421 Deduced from EUR_HE0411
Degree of urbanization	• Densely populated • Intermediate area • Thinly-populated area	DB100	HA09
Region	Nuts 1	DB040	NUTS1
Country of birth	Loc EU Other	PB210	MB01
Citizenship	Loc EU Other	PB220a	MB011
Occupation	ISCO-08 - 1 digit	PL051	ME0908_Recoded

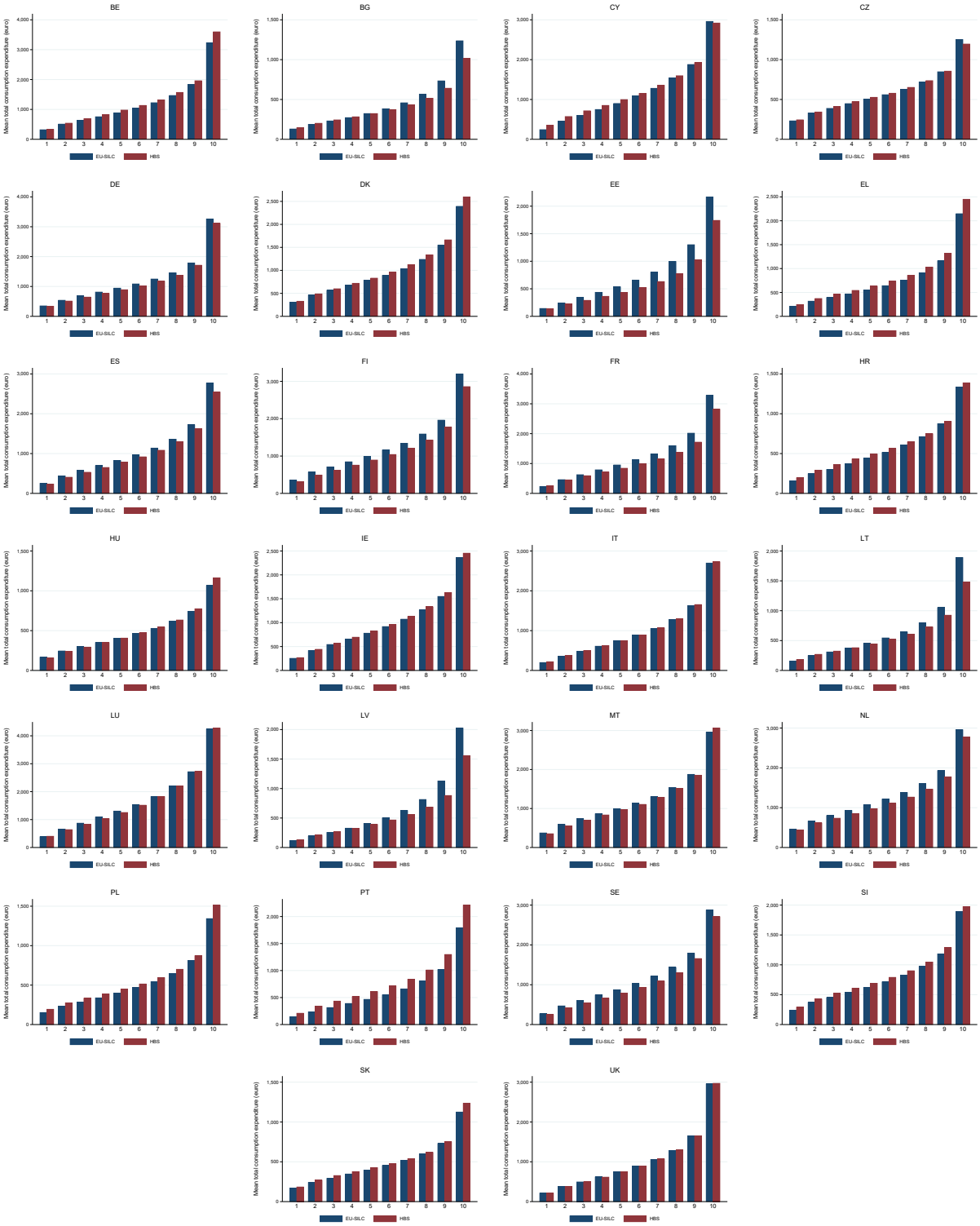
Sources: HBS 2015 and EU-SILC 2017; authors' table.

Figure C.1: Distribution of density of total expenditure for EU-SILC and HBS



Notes: Graphs represent the weighted densities.
Sources: HBS 2015 and EU-SILC 2017; authors' graphs.

Figure C.2: Distribution of mean household non-housing consumption expenditure, by decile of equivalized household expenditure for EU-SILC and HBS



Notes: Graphs represent the weighted means and deciles of households' total consumption expenditure (without rents and housing-related expenditure)/CU/month, in euro PPP-28.
Sources: HBS 2015 and EU-SILC 2017; authors' graphs.

Table C.2: Percentage of missing values on imputed rents or rents

Country	**Missing imputed rents or rents (%)**
Austria	0.2
Belgium	0.3
Bulgaria	0
Cyprus	0.5
Czechia	0.8
Germany	6.2
Denmark	2.6
Estonia	2.7
Greece	0
Spain	0.5
Finland	5.2
France	6.5
Croatia	0.1
Hungary	0
Ireland	1.2
Italy	0.9
Lithuania	0
Luxembourg	0.1
Latvia	0.6
Malta	0.3
Netherlands	1.4
Poland	1.4
Portugal	7
Sweden	0.1
Slovenia	1
Slovakia	1
United Kingdom	11.5

Notes: Percentages correspond to the unweighted share of missing observations among the total. Missing observations correspond to missing imputed rent values for owners, reduced-rent and free-rent tenants, or missing and zero current rent values for market-rent tenants.
Sources: EU-SILC 2017; authors' table.

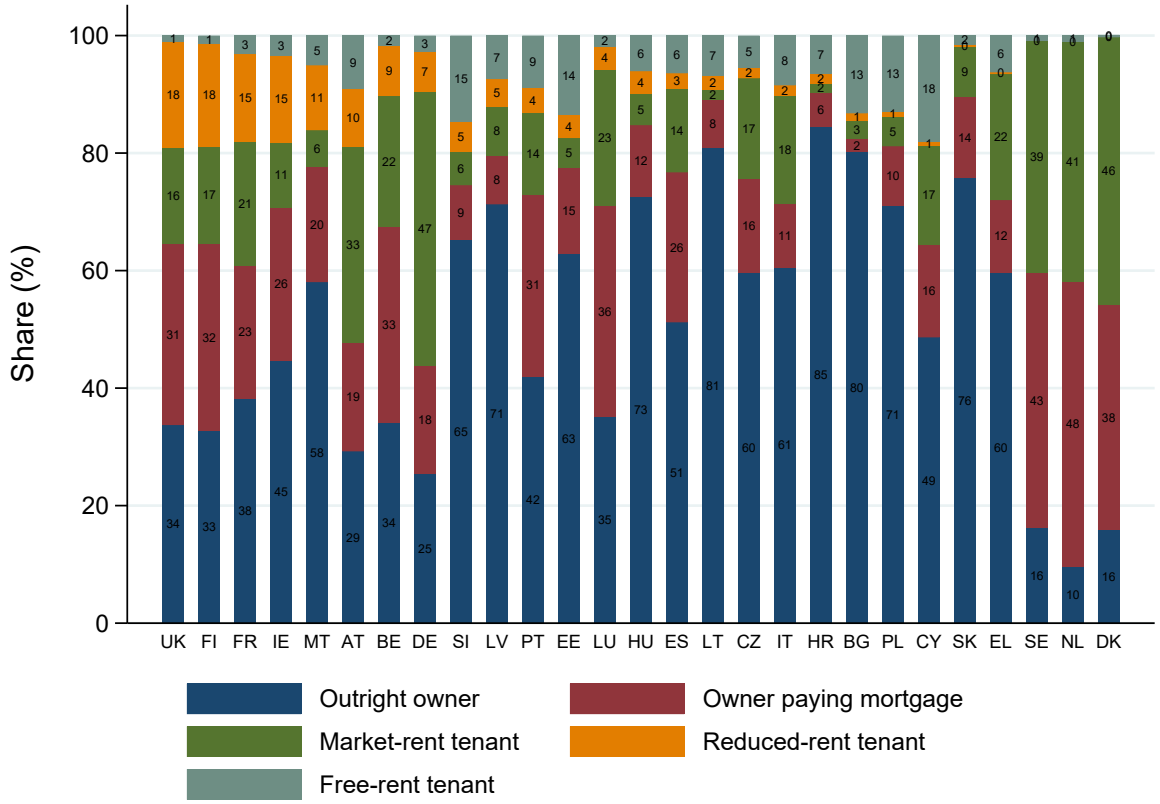
D Stylized facts

Tenure status. At this stage, we would like to warn that our conclusions depend on conventions on the chosen classification of housing as social housing by Eurostat. Of course, we benefit from harmonized conventions throughout Europe, but they may represent a too-straight jacket for some specific countries. These conventions are about the degree of effective rent subsidization to be elicited as social housing. Take the example of Austria, a country in a unique position of having maintained the importance of social housing in the overall distribution of tenures. Historically, public intervention in the housing market has been a major element of Austrian housing policy since the early 20^{th} century (see, Reinprecht, 2014, Matznetter, 2002, Kadi, 2015, and Mundt, 2018). More than 60% of Vienna residents live in 440,000 social dwellings, of which about half are owned directly by the municipal government, and the rest by state-subsidized not-for-profit cooperatives. For the quoted Austrian experts, 24% of the housing sector should be considered as social housing. It is formed by two segments of administratively allocated rental dwellings with below-market prices. First, the limited-profit housing associations owned and managed 16% of all main residences. Second, 8% of all main residences are managed by the municipalities (mainly Vienna). According to the EU-SILC, the reduced-rent housing stock only represents one-tenth of the total stock. Apparently, statisticians from Eurostat only retained the fraction owned by municipalities as social housing. We understand that between purely private housing and purely public housing, there is a gray zone that Eurostat merges with private housing. In Austria, housing production was and is strongly influenced by public supply-side subsidies, distributed mainly to special limited-profit providers to supply affordable, long-term rental housing. Nowadays, these housing associations construct around 15,000 units per year, between a quarter and a third of all new housing construction in Austria[44]. Our concern is not limited to Austria, and is about other Northern European countries as well as the Netherlands, Sweden, Denmark, and likely Germany, with the *de jure* and *de facto* distinction in social housing. Two main groups of countries can be distinguished according to differences in tenure status proportions. The first group comprises Western and Northern European countries, with a relatively high share of reduced-rent tenants. These are the United Kingdom, Finland, France, Ireland, Austria, Belgium, and Germany. Malta is a noteworthy exception among Southern countries, with 11% of reduced-rent tenants, the third highest share. Even within this group, there are differences. For example, while in the UK, Finland, France, and Ireland the share of reduced-rents tenants varies from 18% to 15%, it is only 9% and 7% respectively for Belgium and Germany (see, Figure D.1). In map D.2, the distinction

[44] http://iibw.at/documents/2017%20IIBW.%20Wien.%20Berichtstandard%20WBF.pdf.

between countries with a high share of reduced-rent tenants and others is even clearer.

Figure D.1: Distribution of tenure status



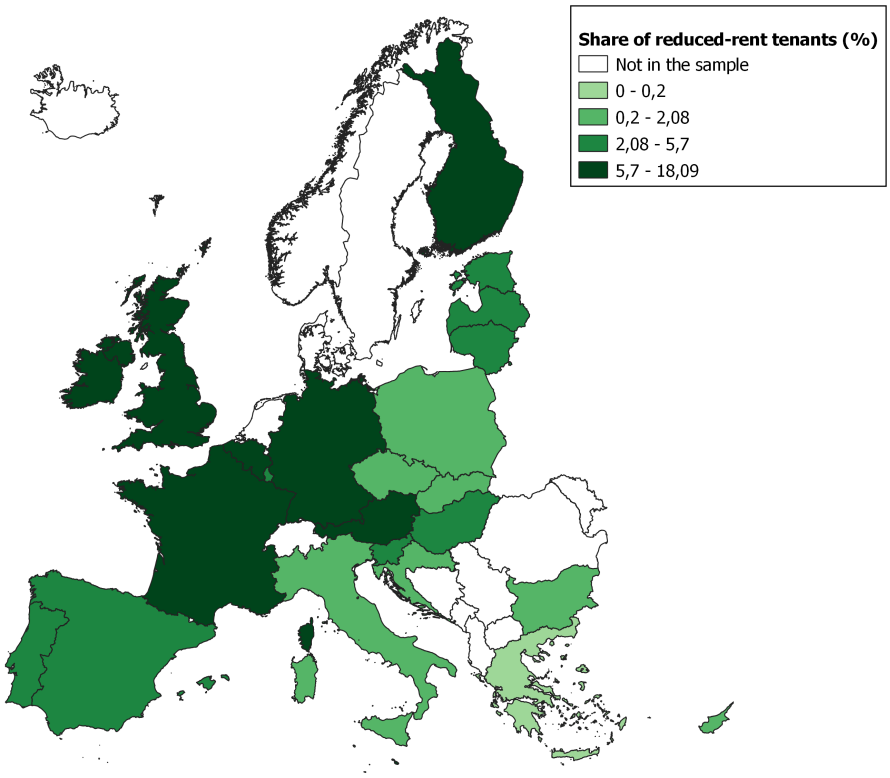
Notes: Countries are sorted from high to low share of reduced-rent tenants.
Sources: EU-SILC 2017; authors' graph.

A second group with a very high home-ownership rate, especially outright owners (70%-90%), is composed mainly of Eastern European countries (see, Figure D.3) for historical reasons: dwellings were privatized following the end of Communism, and households could buy their homes for a relatively cheap price.

Between these two groups lie the Southern European countries (Spain, Italy, Portugal, Malta, and Greece), with a large share of owners ranging from 72% to 78%. The share of market-rent tenants is the highest in the Nordic countries (Denmark, Netherlands, Sweden[45], Germany, and Austria). Finally, the share of free-rent tenants is the highest in Cyprus, Austria, Portugal, and the Eastern European countries, ranging between around 5% to 18%.

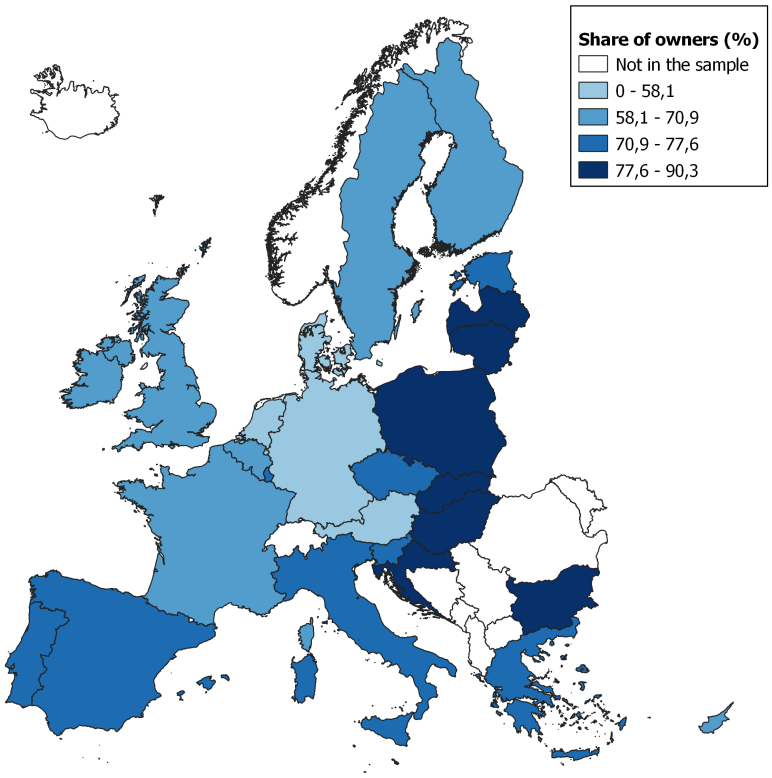
[45]As previously explained, the Netherlands, Denmark, and Sweden are a particular case regarding reduced-rent tenants.

Figure D.2: Share of reduced-rent tenants



Notes: Share of reduced-rent tenants among total households.
Sources: EU-SILC 2017; authors' drawing.

Figure D.3: Share of owners

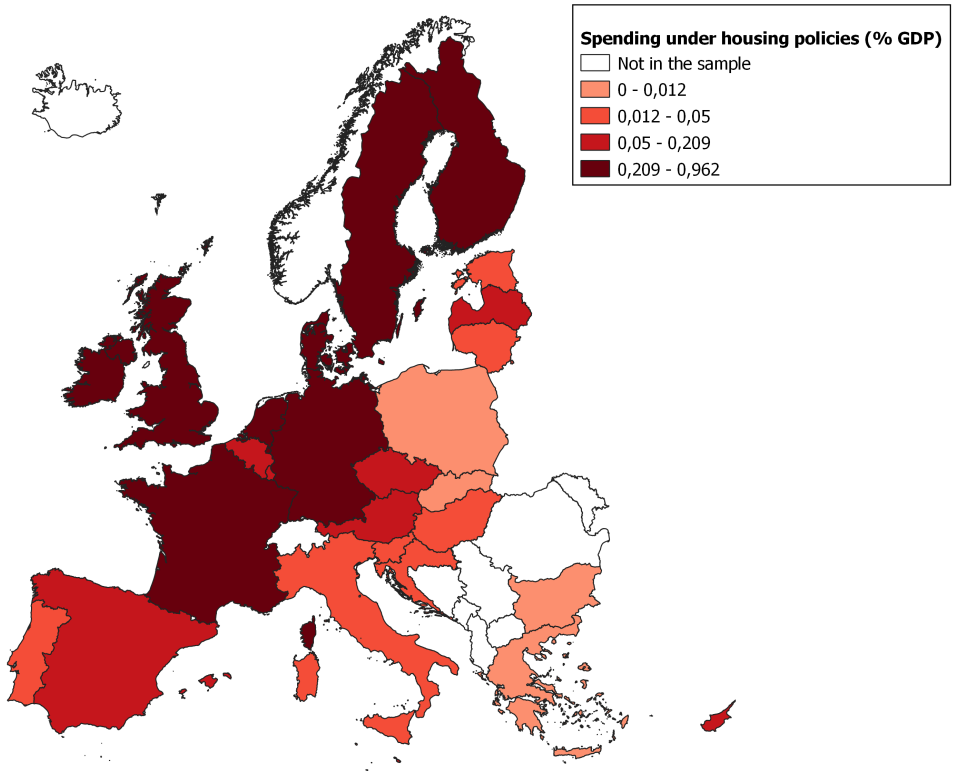


Notes: Share of owners among total households. Owners = outright owners + owners with mortgage.
Sources: EU-SILC 2017; authors' drawing.

Public spending on housing policies. Measuring the spending under housing policies is difficult, especially the spending dedicated to social housing, as many different and heterogeneous aspects have to be taken into account in the total funding (e.g., land purchase, construction costs, refurbishment). Thus, in the sake of harmonization and comparison, we have chosen to take the gain of each reduced-rent tenant, as the actual cost of the policy for the society at large to provide social housing for this tenant[46]. This assumption is of course open to debate, but only an in-depth analysis country-by-country would be informative about how far this assumption is from the real world. For each country, we compute our own measure by summing the total cash housing benefits paid to the households and the total difference between the imputed rent and the actual rent for reduced-rent tenants, over annual GDP. This allows us to compute not only the total spending, but also the spending under cash and in-kind housing benefits separately.

When comparing Figures D.2 and D.4, we observe a positive correlation between the countries that spend the most on housing policies and the share of reduced-rent tenants.

Figure D.4: Spending under housing policies in % of GDP

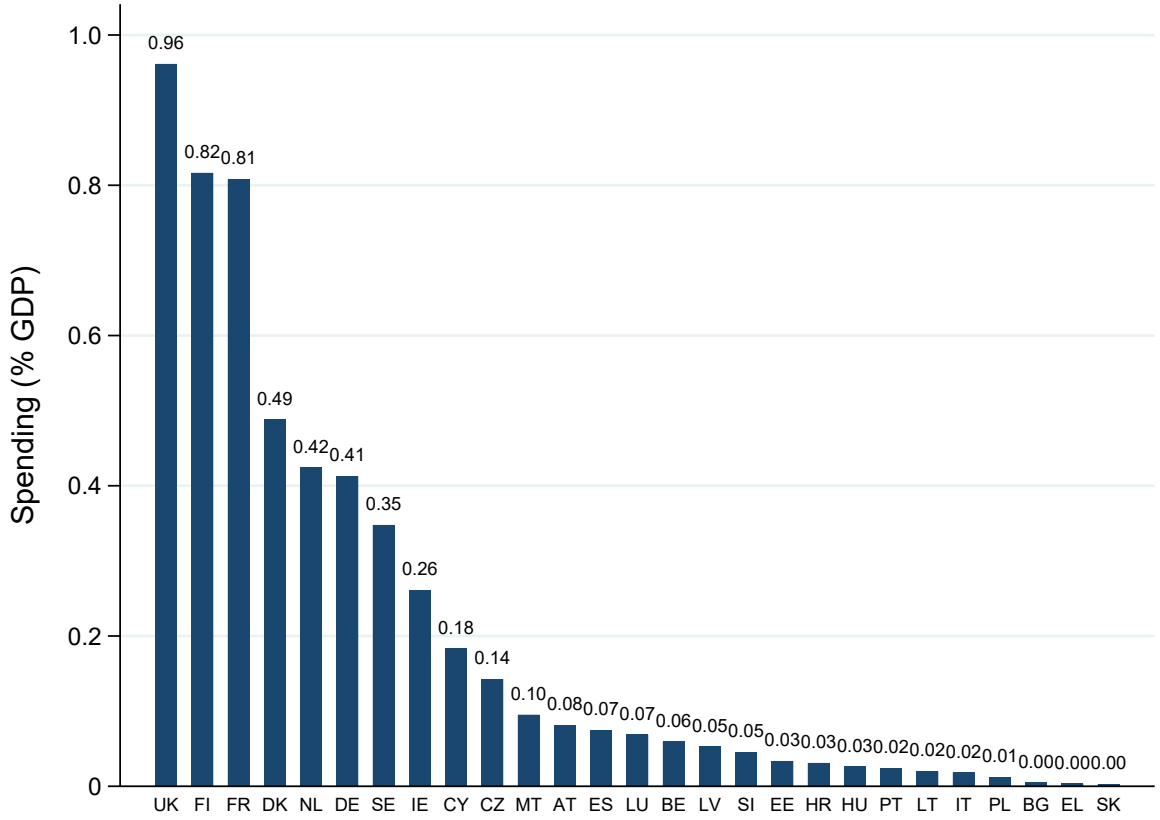


Sources: EU-SILC 2017; authors' drawing.

[46]Unfortunately, data on spending split between social housing and cash housing benefits are not harmonized nor available for all the European countries.

Based on their spending as a percentage of GDP in 2017, European countries can be divided into four groups (see, Figure D.5) as follows. (i) A top group of countries spending between 1% and 0.8%, composed of the UK, Finland and France, (ii) an upper-middle group with countries spending between 0.5% and 0.2%, (iii) a lower-middle group of countries spending between 0.2% and 0.1%, and (iv) a bottom group of countries spending less than 0.1% of their GDP. Most countries in the top two groups are Western and Nordic. The UK is the most generous country, devoting 0.96% of its GDP to public spending on housing. The second most generous countries are Finland and France, with 0.8% of their GDP devoted to housing policies spending. The two bottom groups are mainly made up of Southern and Eastern European countries.

Figure D.5: Spending under housing policies in % of GDP



Notes: Countries are sorted from high to low spending in % of GDP.
Sources: EU-SILC 2017; authors' graph.

Overview of the housing policies. A first synthesis of the results can be seen in Figures D.6, which presents the share of households that benefit from housing policies. Surprisingly, the country with the highest percentage of households benefiting from one or both housing policies (cash or in-kind housing benefits) is Ireland (50%). The total

share of households receiving both housing policies largely mirrors the public spending as a percentage of GDP. A notable exception is Malta, which spends less than one percent of its GDP on housing policies, while almost 21% of its population benefits from either cash or in-kind housing benefits. It can also be inferred that in France, for example, housing policies address a large part of the population (33%), as well as in Finland (30%), or the UK (22%); while in Germany housing policies seem to be more targeted and limited to a small part of the population (14%), just as in Luxembourg (14%), Austria (13%), or Sweden (13%). We can also observe different degressivity levels by quintile of equivalized disposable income among the countries (see, Figures D.7, D.8 and D.9)

We can also determine which of the policy (cash or in-kind housing benefits) is "favored" by countries regarding the share of households receiving housing support[47]. For example, in Ireland, a large fraction of households receive cash housing benefits (43%), while the share of low-rent tenants is much lower (15%). In France, more households receive cash housing benefits than social housing (28% and 15% respectively). In contrast, Austria seems to apply a policy that favors social housing (10%), over cash housing benefits (4%). Germany, Finland, Malta, and the United Kingdom seem to apply both policies equally, with a similar proportion of households receiving housing benefits in cash or in-kind (i.e., being reduced-rent tenant).

In terms of mean gain[48] from the two housing policies as a percentage of disposable income, the UK ranks the highest, with on average 60% of gain per recipient household, followed by Spain (52%) and Germany (51%), while Finland and France are ranked 8^{th} and 12^{th} with 35% and 25% respectively. Greece, Portugal, Poland, Austria and Hungary are ranked last, with a mean gain of around 10%.

On mean gain from cash housing benefits alone, the UK and Germany also lead the way, with around 66% per household on average, followed by Czechia (53%), Germany (53%), Spain (36%), Croatia (31%) and Finland (26%). The last one is Bulgaria, with 0% on average per household.

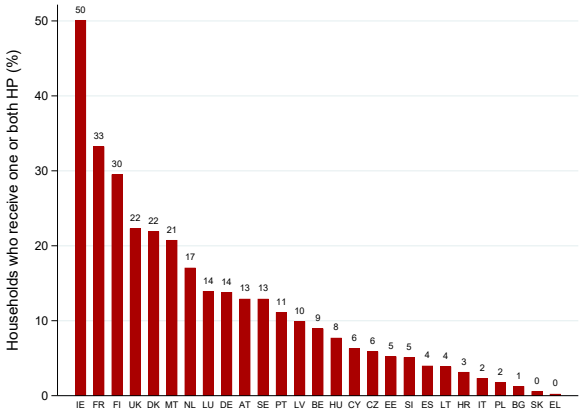
Lithuania and Luxembourg have the highest mean gain from in-kind housing benefits (61% and 59% of the disposable income on average respectively). Therefore, we can conclude that, although these countries spend less or little on housing policies and probably grant housing benefits according to very selective and targeted criteria, the amount of housing benefits represents a substantial contribution for these households. In comparison, the mean gain from in-kind housing benefits represents 34% for Germany, 26% for Finland and 21% for France. At the bottom of the distribution, the mean gain as a

[47]Here, we are not talking about the share of spending in each housing policy.

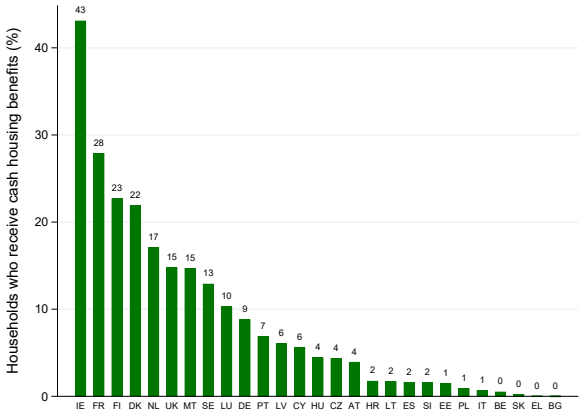
[48]Mean gain corresponds to the cash advantage from housing policies (see, Table 1). We winsorized (or censored) the top extreme abnormal values, by replacing the values higher than the 0.1 percentile value with the top 0.1 percentile value.

Figure D.6: Share of households receiving housing support among total population

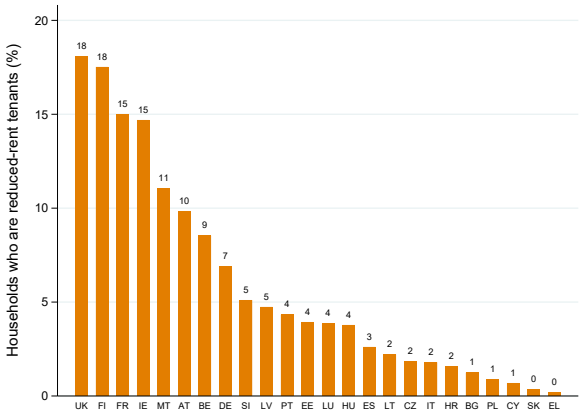
(a) Share of households receiving one or both housing benefits



(b) Share of households receiving cash housing benefits



(c) Share of households receiving in-kind housing benefits

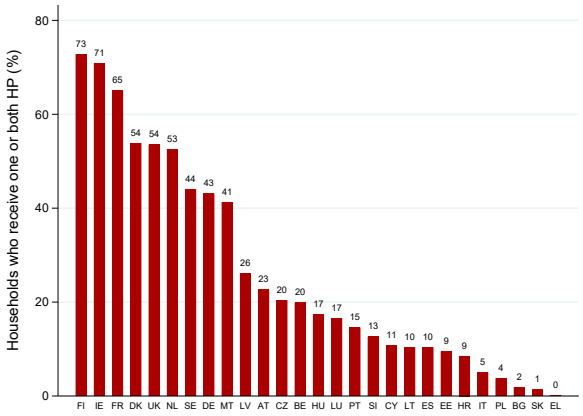


Notes: Housing Policies = cash or in-kind housing benefits. Countries are sorted from high to low percentage.

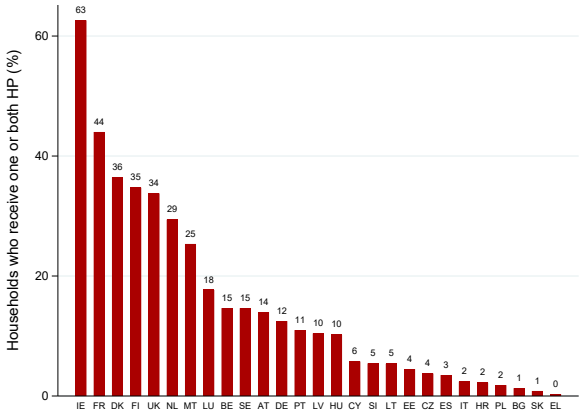
Sources: EU-SILC 2017; authors' graphs.

Figure D.7: Share of households receiving one or both housing benefits among total population, by quintile of equivalized disposable income

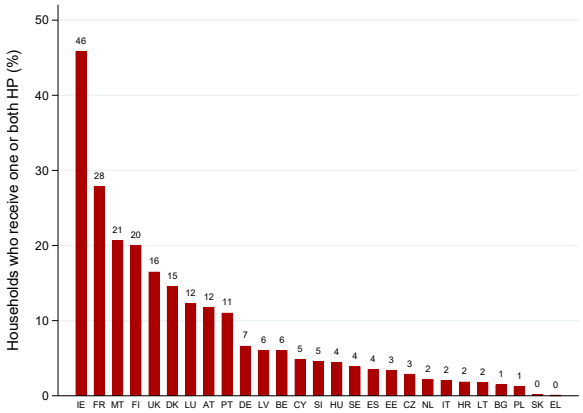
(a) Quintile 1



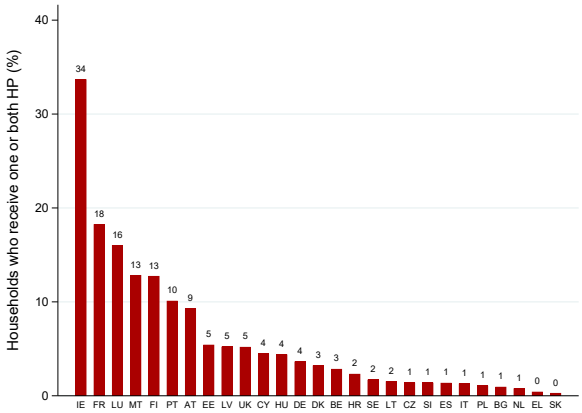
(b) Quintile 2



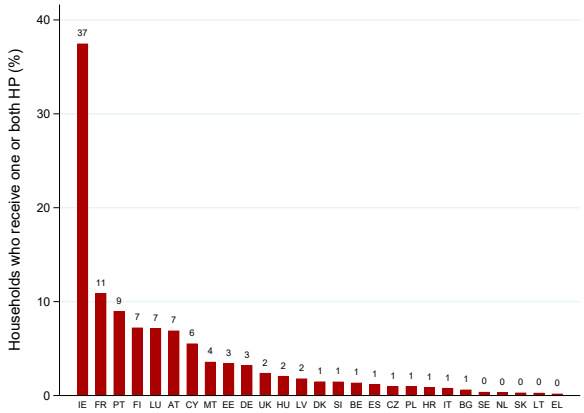
(c) Quintile 3



(d) Quintile 4



(e) Quintile 5

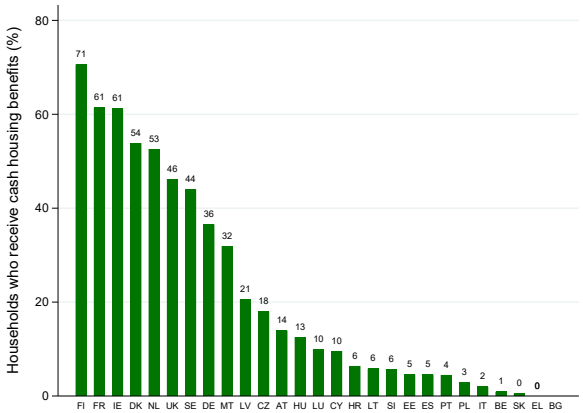


Notes: Income represents disposable income/CU/month without housing benefits. Housing Policies = cash or in-kind housing benefits. Countries are sorted from high to low percentage.

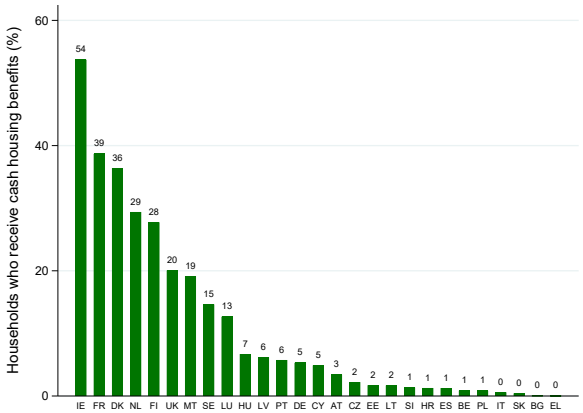
Sources: EU-SILC 2017; authors' graphs.

Figure D.8: Share of households receiving cash housing benefits among total population, by quintile of equivalized disposable income

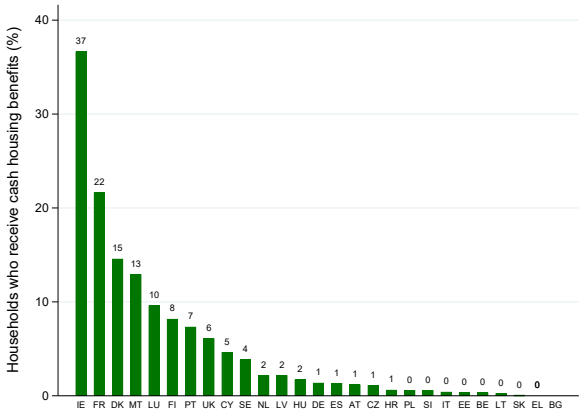
(a) Quintile 1



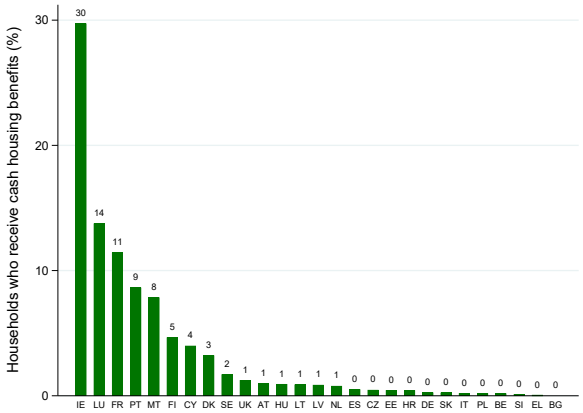
(b) Quintile 2



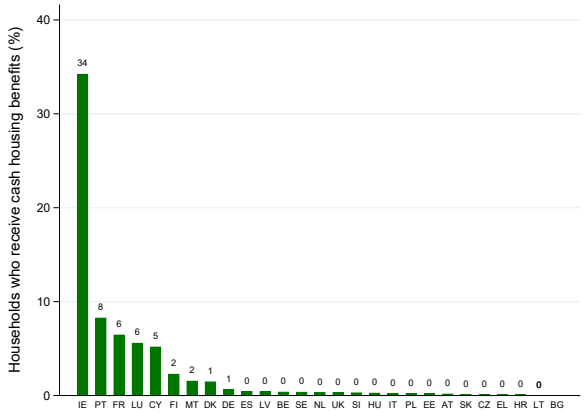
(c) Quintile 3



(d) Quintile 4



(e) Quintile 5

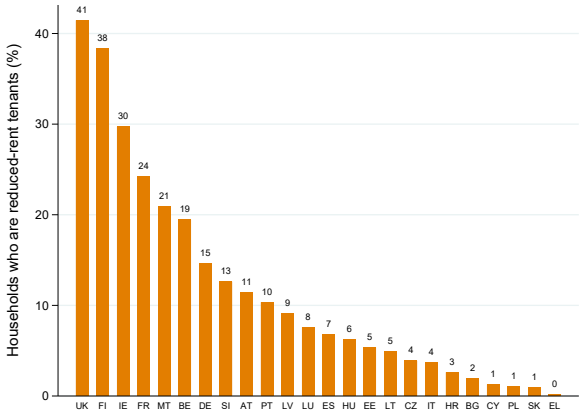


Notes: Income represents disposable income/CU/month without housing benefits. Housing Policies = cash or in-kind housing benefits. Countries are sorted from high to low percentage.

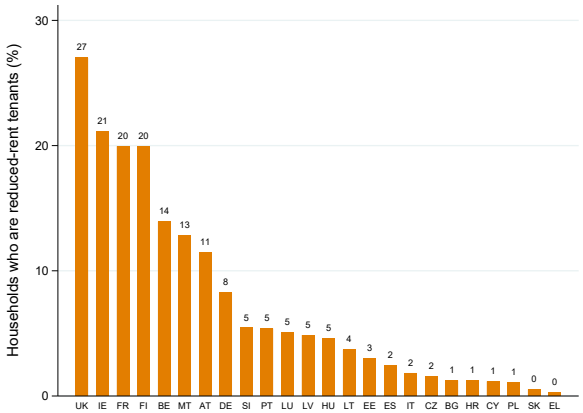
Sources: EU-SILC 2017; authors' graphs.

Figure D.9: Share of households receiving in-kind housing benefits among total population, by quintile of equivalized disposable income

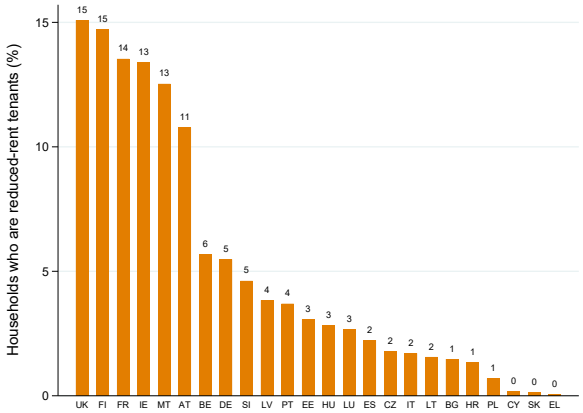
(a) Quintile 1



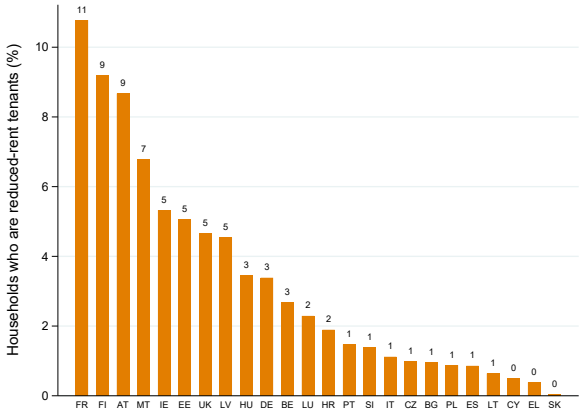
(b) Quintile 2



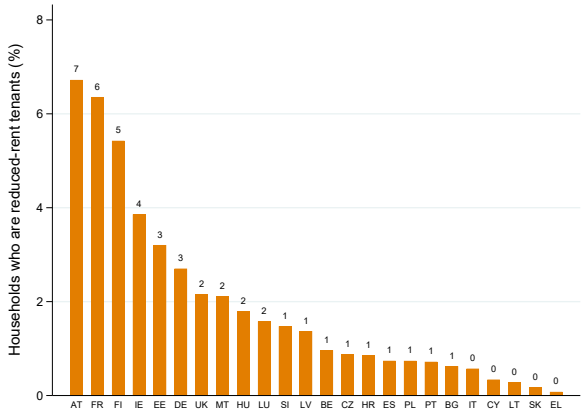
(c) Quintile 3



(d) Quintile 4



(e) Quintile 5



Notes: Income represents disposable income/CU/month without housing benefits. Housing Policies = cash or in-kind housing benefits. Countries are sorted from high to low percentage.

Sources: EU-SILC 2017; authors' graphs.

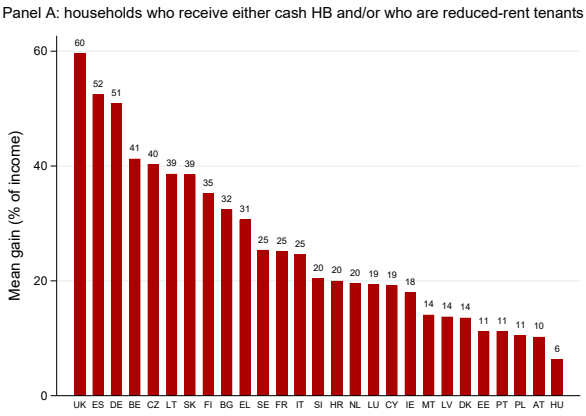
percentage of the income from social housing ranges only between 8% to 2% in Austria, Hungary, Greece, Poland, Croatia and Czechia (see, Figure D.10).

Historical background. It is fascinating how diverse housing policies are in Europe. It is a chance from a statistical viewpoint to confront diverse experiences and doctrines to see how effective they are. First of all, the great divide between Eastern and Western Europe has left permanent marks on housing policies. When the Berlin wall fell, the grand majority of the housing stock was public on the iron curtain's other side. Massive privatization took place, and the homeownership rate is among the highest in these countries. People became the owner of the public apartment they rent until then. If decent housing is given for free, the very case for additional housing policy in Tobin's perspective disappears. In that case, it is understandable that the public funds devoted to housing policy are tiny. The Mediterranean countries share a limited appetite for public housing policy with Eastern Europe. Family help is generally considered a substitute for public social assistance, as two, and sometimes three generations liver under one roof, particularly in rural areas. Finally, the remaining group, Western and Nordic European countries, appear as countries that apply at a different degree the recipes of a policy helping the poor to have better decent living conditions, through in-kind or cash housing benefits. According to Whitehead and Scanlon (2007), large social housing programs developed primarily in Scotland, the Netherlands, and Austria, and the medium-sized social housing sector were also present in England, France, Denmark, and Sweden. To this list, one can also add West Germany, up to the fall of the Berlin wall. If the inspiration was the same for all these countries, the U-Turn following the liberalization generated by Thatcherism and Reaganism has affected European countries to varying degrees. Some countries have offered a stronger resistance than others to the new political wind. Austria more than Germany, Scotland more than England, and France more than the Netherlands. The equilibrium between social forces, intellectual and doctrinal traditions, and proximity with the Anglo-sphere, plays a role. From a common matrix forged in the aftermath of WW2, the bloc of the Western and Nordic countries now appears as dislocated with the idiosyncratic national housing social policies' ups and downs.

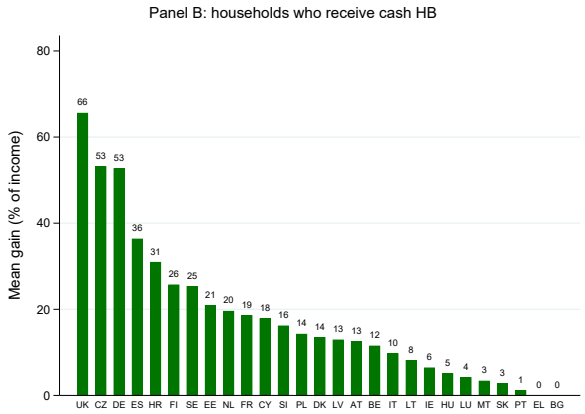
German affordable housing policy appears as one of the most cost-effective in Europe. The actual German housing policy (see, Droste and Knorr-Siedow, 2014) emerges as a specific case due partly to historic conditions. The Weimar republic initiated garden cities, and modernist estates with a social dimension. After the destruction of WW2, Western Germany launched a massive program of social housing (5 million built). In 2012, only 1.5 million are still currently classified as social housing. The decline comes after a 30-year lock-in period under which the owner should respect some stringent leasing

Figure D.10: Mean gain from housing policies in proportion of income (%)

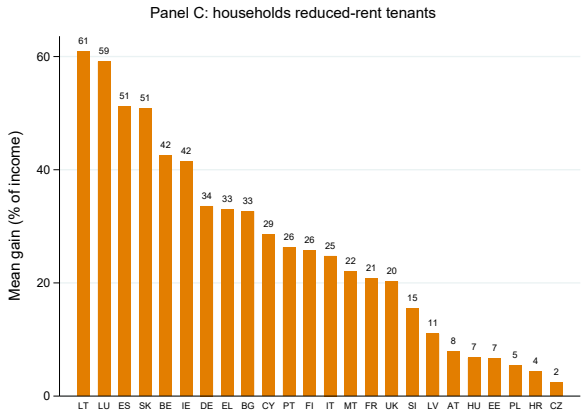
(a) Mean gain from both housing policies ($\text{HP}_{cash+in\text{-}kind}$)



(b) Mean gain from cash housing benefits (HP_{cash})



(c) Mean gain from in-kind housing benefits ($\text{HP}_{in\text{-}kind}$)



Notes: Income = disposable income/CU/month (without housing benefits) in euro PPP EU-28. Countries are sorted from high to low gain from housing policies. Mean gain corresponds to the cash advantage from housing policies (see, Table 1).

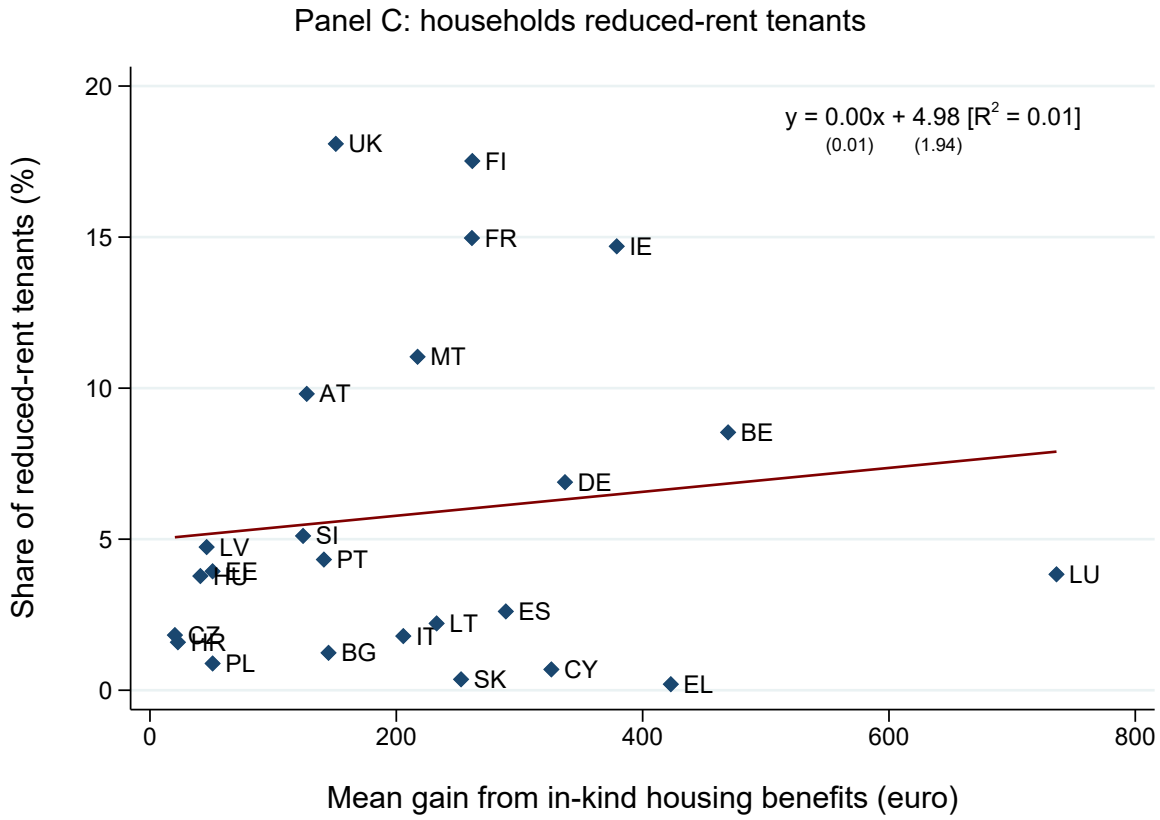
Sources: EU-SILC 2017; authors' graphs.

rules. In essence, there is a cap on the maximum rent, and access is limited to lower-income households. These rules are the price to pay for receiving subsidies from public entities (Federal Government, Landers, municipalities) to build and manage the housing facilities. Over the lock-in period, the housing can be rented or sold on the private market. From 1990 onward, the wave of liberalization in vogue in the 1980s and 1990s contributed to making social housing less fashionable. The number of newly built social housing units reached a fairly low threshold of 20,000 to 30,000 per year, while the end of the lock-in was gradually reaching the social housing park built before 1990, with an outflow of about 100,000 social housing units per year. This historical evolution makes the actual German social housing stock very concentrated on those who need it most.

Figure D.11: Mean housing services (HS) and housing expenses (HE) by tenure status

Notes: Graphs represent the weighted means. Housing services and housing expenses are expressed per consumption units (CU) per month, in euro PPP-28.
Sources: EU-SILC 2017; authors' graphs.

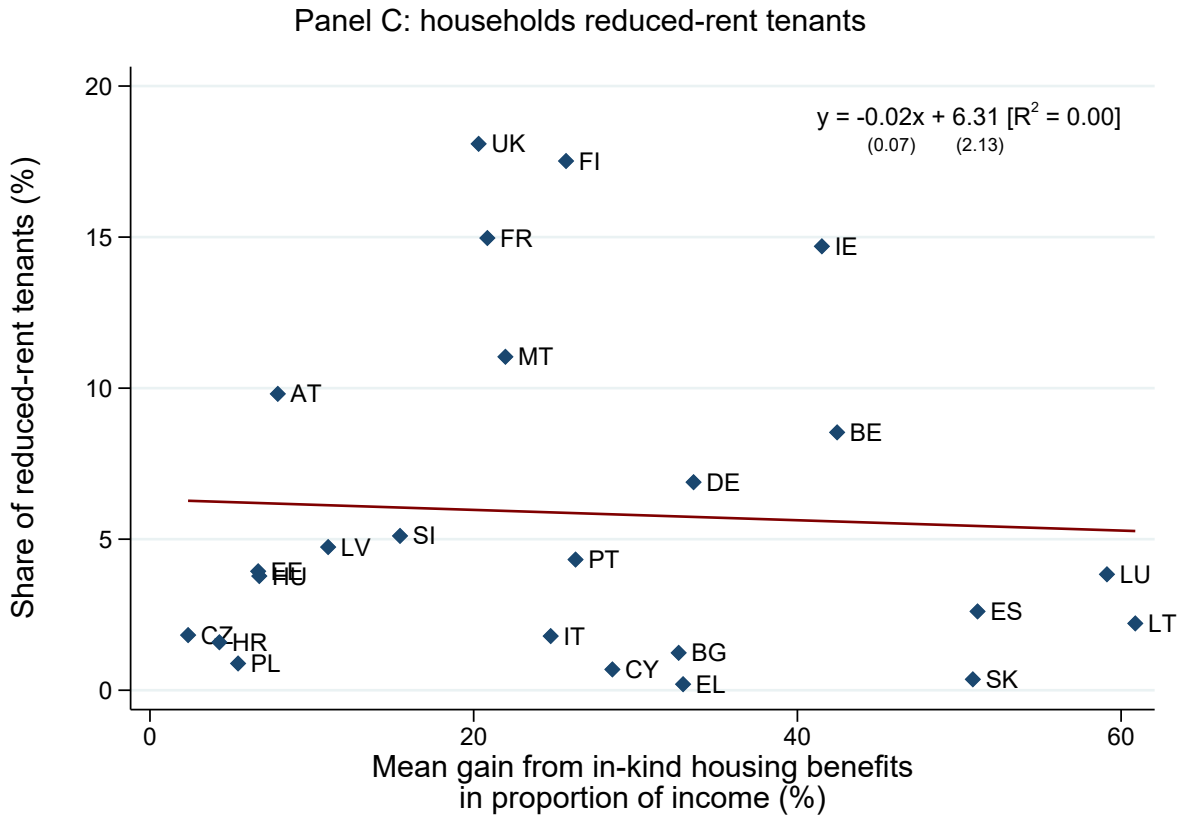
Figure D.12: Share of reduced-rent tenants according to the mean gain from in-kind housing benefits (euro)



Notes: Income represents disposable income/CU/month without housing benefits, in euro PPP-28. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses).

Sources: EU-SILC 2017; authors' graph.

Figure D.13: Share of reduced-rent tenants according to the mean gain from in-kind housing benefits in proportion of income (%)



Notes: Income represents disposable income/CU/month without housing benefits, in euro PPP-28. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses).

Sources: EU-SILC 2017; authors' graph.

E Inequality and poverty results

Table E.1: Reduction in poverty (FGT_1) after inclusion of housing benefits

Households below the poverty line (%) - FGT_1							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	4.62	2.46	-46.88***	2.69	-41.79***	4	-13.56***
United Kingdom	6.69	4.56	-31.89***	4.83	-27.8***	6	-10.24***
France	4.01	2.8	-30.23***	2.91	-27.51***	3.79	-5.6***
Germany	6.77	4.85	-28.31***	5.16	-23.81***	6.35	-6.12***
Czechia	2.43	1.82	-25.07***	1.83	-24.64***	2.42	-0.47*
Ireland	4.37	3.32	-23.88***	3.73	-14.53***	3.86	-11.68***
Sweden	5.81	4.49	-22.76***	4.49	-22.76***	5.81	0
Netherlands	4.61	3.71	-19.53***	3.71	-19.53***	4.61	0
Malta	3.11	2.84	-8.67***	2.99	-4***	2.92	-6.15***
Belgium	3.07	2.82	-8.08***	3.05	-0.4**	2.82	-7.89***
Denmark	4.2	3.9	-7.07***	3.9	-7.07***	4.2	0
Luxembourg	5.56	5.27	-5.1***	5.54	-0.34*	5.32	-4.35***
Austria	5.09	4.85	-4.89***	4.92	-3.51***	5.03	-1.33***
Latvia	7.63	7.3	-4.33***	7.38	-3.36***	7.54	-1.23***
Spain	8.26	7.93	-4***	8.13	-1.51***	8.04	-2.58***
Cyprus	3.3	3.17	-3.94***	3.17	-3.98***	3.29	-0.53*
Slovenia	3.87	3.72	-3.91***	3.8	-1.75***	3.77	-2.44***
Lithuania	8.05	7.78	-3.3***	7.99	-0.74***	7.84	-2.58***
Portugal	5.58	5.41	-3.09***	5.57	-0.18	5.41	-3.1***
Croatia	7.2	7.04	-2.22***	7.06	-2.01***	7.19	-0.23***
Hungary	4.83	4.73	-2.08***	4.76	-1.39***	4.79	-0.74***
Estonia	6.2	6.08	-1.96***	6.08	-1.87***	6.17	-0.38
Italy	8.01	7.9	-1.27***	7.98	-0.29***	7.93	-1***
Poland	5	4.96	-0.81***	4.96	-0.73***	4.99	-0.09**
Slovakia	4.16	4.13	-0.62*	4.15	-0.2	4.14	-0.41
Greece	7.12	7.12	-0.08	7.12	0	7.12	-0.08
Bulgaria	7.01	7.02	0.02	7.01	0	7.02	0.02
EU-27	6.08	5.08	-16.42***	5.24	-13.83***	5.83	-4.21***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

Table E.2: Reduction in poverty (FGT_2) after inclusion of housing benefits

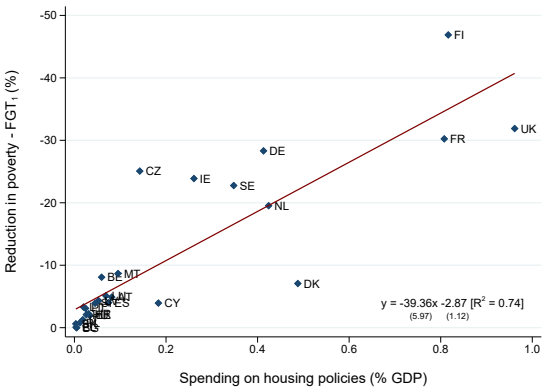
Households below the poverty line (%) - FGT_2							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	1.99	1.01	-49.36***	1.13	-43.5***	1.68	-15.84***
Czechia	1.14	0.72	-36.45***	0.73	-35.87***	1.13	-0.88
Germany	3.64	2.32	-36.09***	2.47	-32.05***	3.35	-7.81***
United Kingdom	3.48	2.23	-35.94***	2.37	-31.83***	3.04	-12.78***
France	1.79	1.15	-35.76***	1.2	-32.87***	1.66	-7.58***
Ireland	1.85	1.47	-20.78***	1.64	-11.34***	1.64	-11.29***
Sweden	2.98	2.45	-17.63***	2.45	-17.63***	2.98	0
Netherlands	2.37	2.03	-14.51***	2.03	-14.51***	2.37	0
Belgium	1.4	1.3	-7.43***	1.4	-0.43	1.3	-7.14***
Malta	1.23	1.14	-7.32***	1.19	-3.48***	1.17	-5.08**
Luxembourg	3.08	2.86	-7.01***	3.07	-0.31	2.88	-6.49***
Denmark	2.13	1.99	-6.47***	1.99	-6.47***	2.13	0
Spain	4.98	4.68	-6.14***	4.87	-2.23***	4.78	-4.07***
Latvia	4.12	3.88	-5.98***	3.93	-4.64***	4.05	-1.73***
Austria	2.72	2.6	-4.75***	2.65	-2.63***	2.67	-2.09**
Portugal	2.64	2.52	-4.62***	2.63	-0.4	2.52	-4.54***
Lithuania	4.49	4.31	-3.96***	4.45	-0.92***	4.35	-3.06**
Croatia	3.71	3.57	-3.9***	3.58	-3.62***	3.7	-0.31***
Estonia	3.17	3.06	-3.64***	3.07	-3.38***	3.16	-0.56
Slovenia	1.44	1.38	-3.6***	1.41	-1.86***	1.4	-2.28***
Cyprus	1.17	1.13	-2.9**	1.13	-3.04**	1.16	-0.37
Italy	5.12	5.05	-1.41***	5.1	-0.37***	5.06	-1.06***
Hungary	3.23	3.18	-1.34***	3.19	-1.02***	3.22	-0.36***
Slovakia	2.79	2.76	-1.33**	2.78	-0.29	2.76	-1.04*
Poland	2.47	2.44	-1.16***	2.44	-1.1***	2.46	-0.06*
Bulgaria	3.55	3.54	-0.39	3.55	0	3.54	-0.39
Greece	4.12	4.12	-0.17	4.12	0	4.12	-0.17
EU-27	3.32	2.71	-18.29***	2.8	-15.61***	3.15	-5.15***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

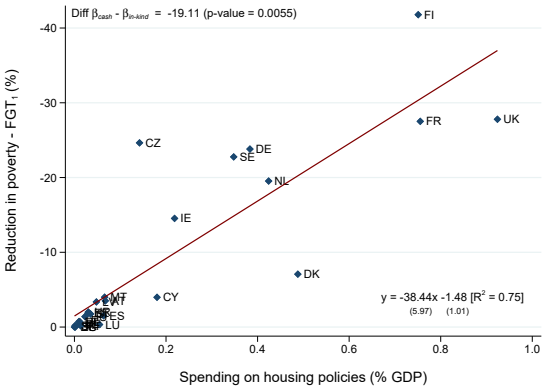
Sources: EU-SILC 2017; authors' table.

Figure E.1: Percentage of reduction in poverty (FGT_1) according to the spending under housing policies in % of GDP

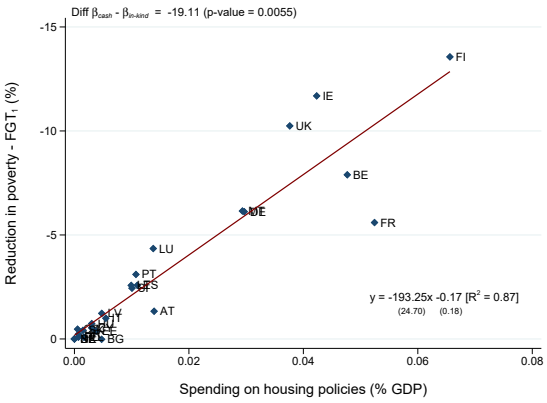
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

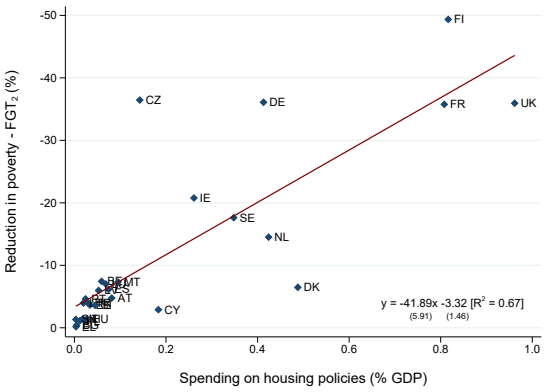


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

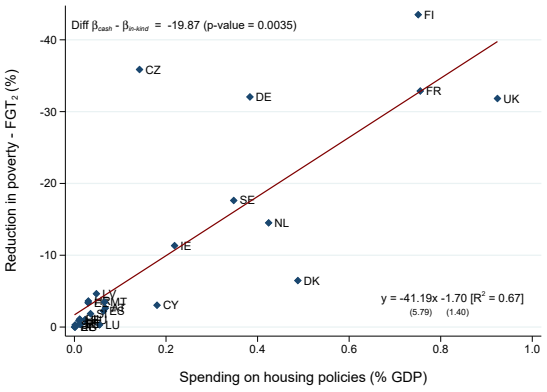
Sources: EU-SILC 2017; authors' graph.

Figure E.2: Percentage of reduction in poverty (FGT_2) according to the spending under housing policies in % of GDP

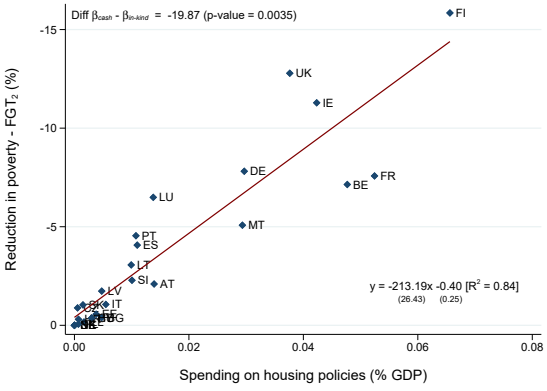
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

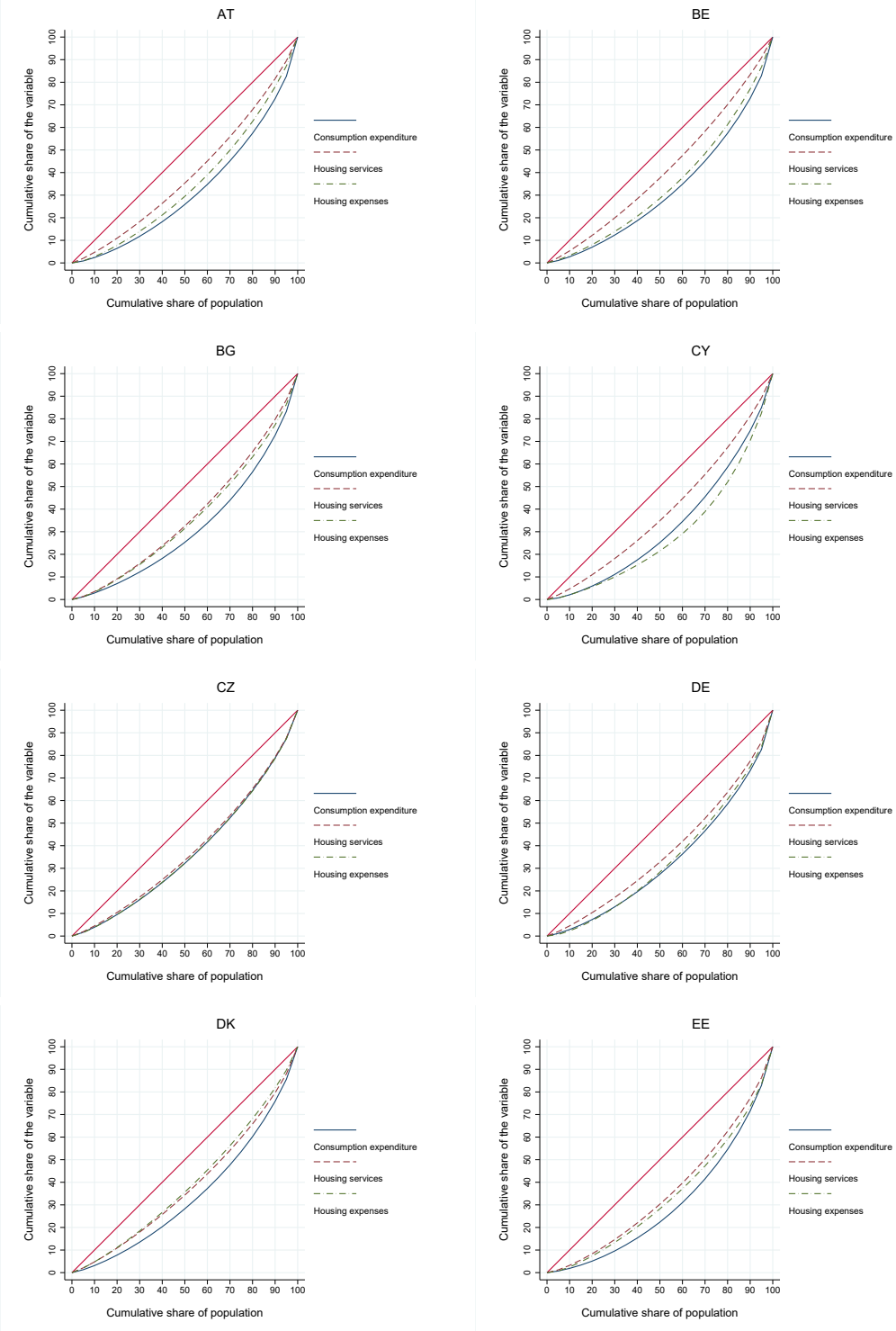


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

Sources: EU-SILC 2017; authors' graph.

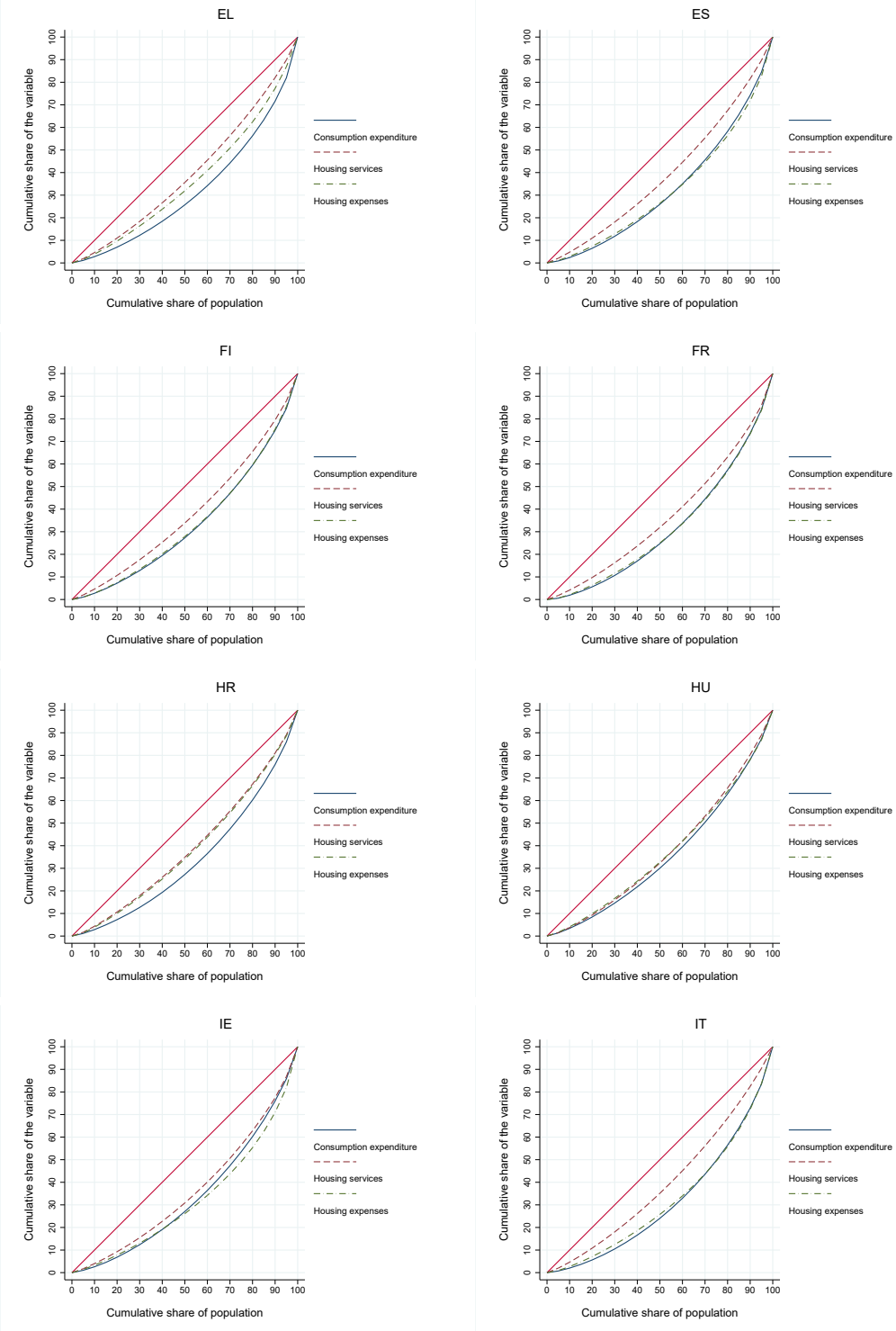
F Lorenz curves

Figure F.1: Comparisons of households' non-housing consumption expenditure, housing services and housing expenses 1/4



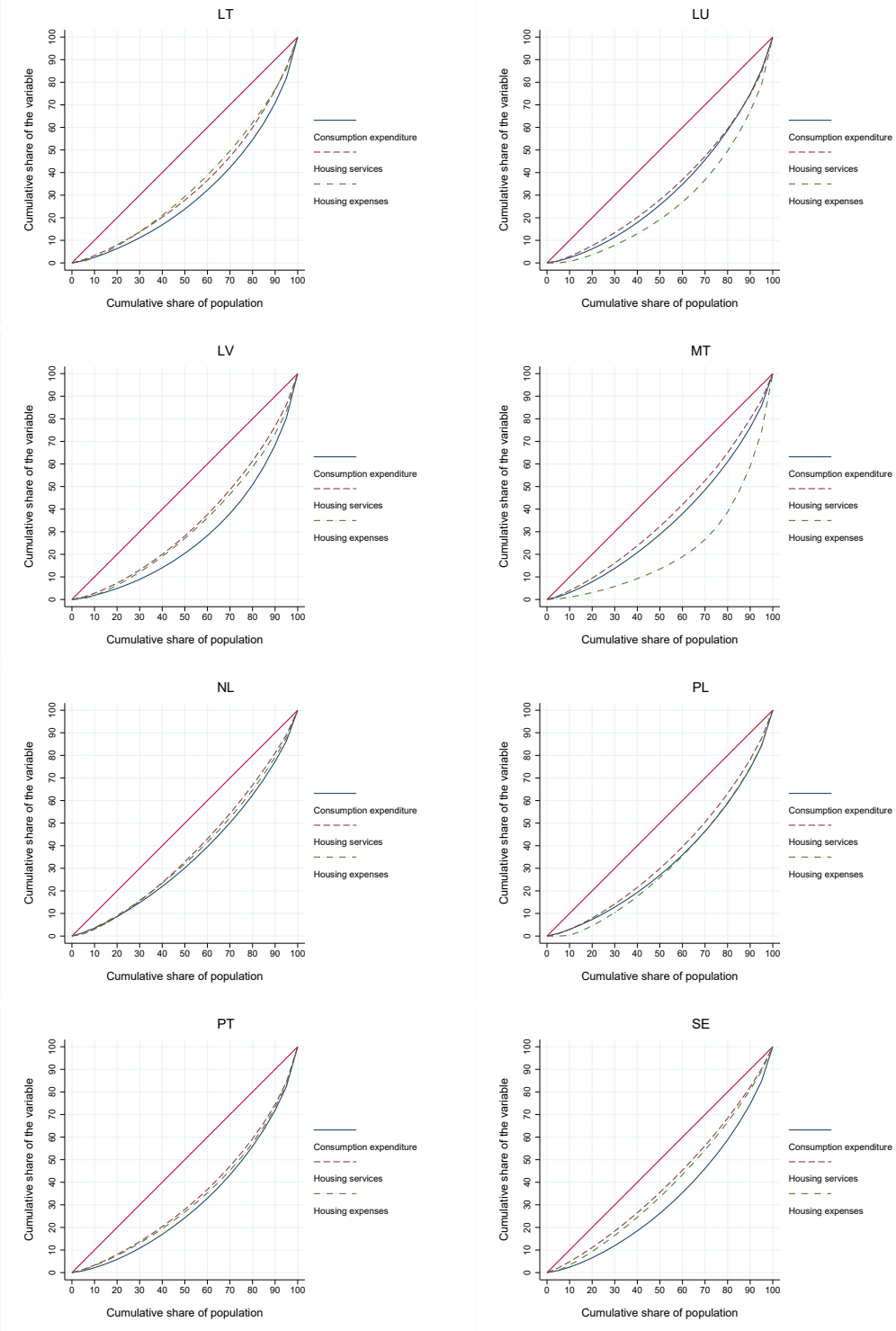
Notes: Graphs represent the weighted Lorenz curves. Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses corresponds to housing expenditure/CU/month including housing policies (cash + in-kind benefits).
Sources: HBS 2015 and EU-SILC 2017; authors' graphs.

Figure F.2: Comparisons of households' non-housing consumption expenditure, housing services and housing expenses 2/4



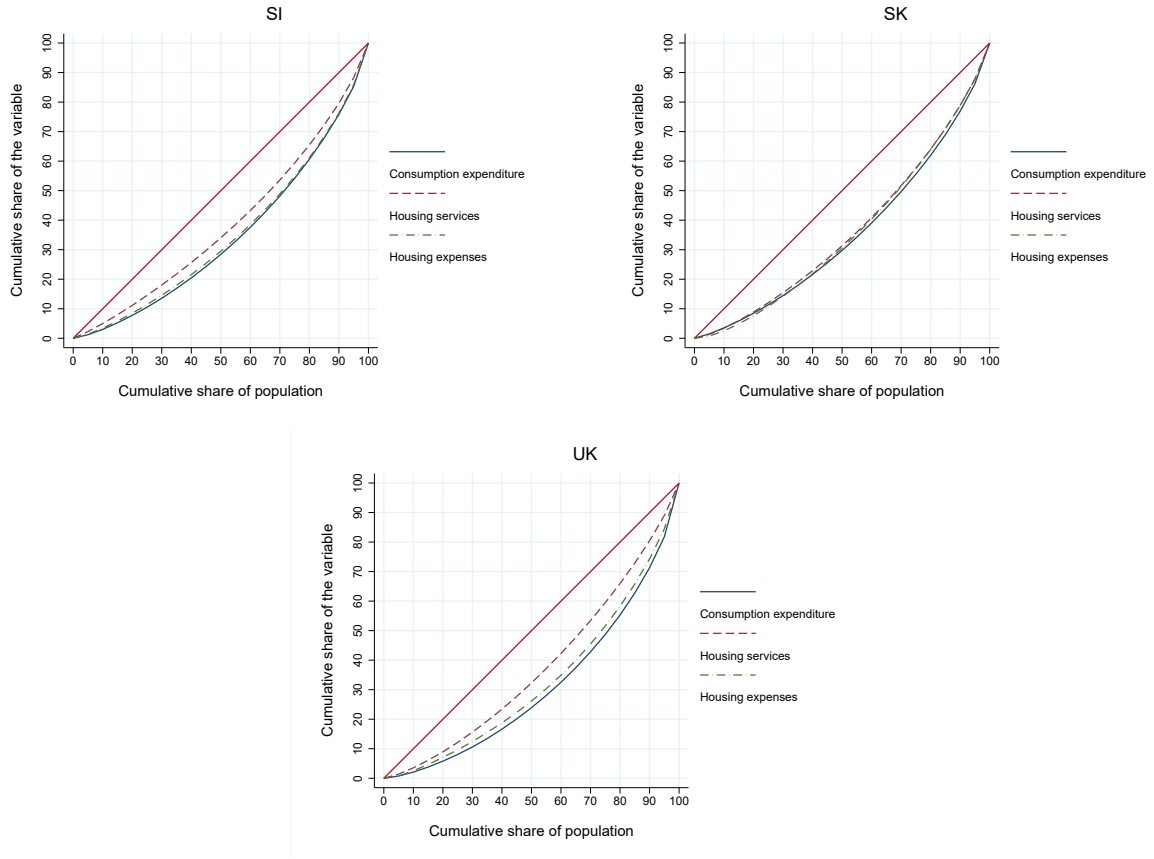
Notes: Graphs represent the weighted Lorenz curves. Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses corresponds to housing expenditure/CU/month including housing policies (cash + in-kind benefits).
Sources: HBS 2015 and EU-SILC 2017; authors' graphs.

Figure F.3: Comparisons of households' non-housing consumption expenditure, housing services and housing expenses 3/4



Notes: Graphs represent the weighted Lorenz curves. Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses corresponds to housing expenditure/CU/month including housing policies (cash + in-kind benefits).
Sources: HBS 2015 and EU-SILC 2017; authors' graphs.

Figure F.4: Comparisons of households' non-housing consumption expenditure, housing services and housing expenses 4/4



Notes: Graphs represent the weighted Lorenz curves. Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses corresponds to housing expenditure/CU/month including housing policies (cash + in-kind benefits).

Sources: HBS 2015 and EU-SILC 2017; authors' graphs.

G Capture of the cash housing benefits

Table G.1: Reduction in inequality after inclusion of housing benefits and partial capture by landlords

				Gini			
Country	**Income (baseline)**	**Income** + $HP_{cash+in\text{-}kind}$	% △	**Income** + HP_{cash}	% △	**Income** + $HP_{in\text{-}kind}$	% △
Finland	0.28	0.26	-7.28***	0.27	-5.46***	0.28	-2.53***
United Kingdom	0.35	0.33	-6.25***	0.33	-5.08***	0.35	-1.81***
Ireland	0.33	0.31	-5.09***	0.32	-2.02***	0.32	-3.32***
France	0.3	0.29	-4.36***	0.29	-3.46***	0.3	-1.7***
Germany	0.32	0.3	-3.65***	0.31	-2.42***	0.31	-1.44***
Belgium	0.27	0.26	-3.23***	0.27	-0.05***	0.26	-3.2***
Malta	0.29	0.28	-2.45***	0.29	-0.49***	0.29	-2.03***
Netherlands	0.29	0.29	-2.25***	0.29	-2.25***	0.29	-0.07***
Sweden	0.29	0.29	-2.17***	0.29	-2.17***	0.29	0**
Denmark	0.29	0.28	-1.98***	0.28	-1.98***	0.29	0
Czechia	0.26	0.25	-1.36***	0.25	-1.32***	0.26	-0.13***
Luxembourg	0.3	0.29	-1.19***	0.3	-0.17***	0.3	-1.03***
Slovenia	0.26	0.25	-1***	0.26	-0.27***	0.26	-0.77***
Spain	0.34	0.34	-0.91***	0.34	-0.27***	0.34	-0.66***
Austria	0.29	0.29	-0.73***	0.29	-0.37***	0.29	-0.4***
Portugal	0.34	0.34	-0.72***	0.34	-0.04***	0.34	-0.68***
Lithuania	0.41	0.4	-0.69***	0.41	-0.08***	0.4	-0.6***
Latvia	0.37	0.37	-0.66***	0.37	-0.43***	0.37	-0.24***
Cyprus	0.32	0.32	-0.4***	0.32	-0.32***	0.32	-0.16***
Hungary	0.29	0.29	-0.39***	0.29	-0.21***	0.29	-0.18***
Estonia	0.33	0.33	-0.34***	0.33	-0.22***	0.33	-0.13***
Croatia	0.32	0.32	-0.34***	0.32	-0.31***	0.32	-0.05***
Italy	0.33	0.33	-0.31***	0.33	-0.03***	0.33	-0.28***
Bulgaria	0.4	0.4	-0.15***	0.4	0	0.4	-0.15***
Poland	0.31	0.31	-0.11***	0.31	-0.09***	0.31	-0.02**
Slovakia	0.23	0.23	-0.11**	0.23	-0.03	0.23	-0.08*
Greece	0.33	0.33	-0.03	0.33	0	0.33	-0.03
EU-27	0.35	0.34	-2.35***	0.34	-1.78***	0.34	-0.85***

Notes: Income represents disposable income/CU/month without housing benefits. Partial capture rate of the cash housing benefits by landlords of 50%. Countries are sorted from the most to the least reduction of inequality after including both housing policies (Income + $HP_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

Table G.2: Reduction in poverty (FGT_0) after inclusion of housing benefits and partial capture by landlords

Households below the poverty line (%) - FGT_0							
Country	**Income (baseline)**	**Income + HP$_{cash+in\text{-}kind}$**	**% △**	**Income + HP$_{cash}$**	**% △**	**Income + HP$_{in\text{-}kind}$**	**% △**
Finland	17.4	12.91	-25.78***	13.39	-23.07***	16.47	-5.32***
Ireland	19.88	15.59	-21.58***	16.59	-16.54***	18.09	-9***
United Kingdom	21.06	17.2	-18.34***	17.73	-15.81***	19.97	-5.16***
Netherlands	16.67	14.78	-11.33***	14.78	-11.33***	16.67	-0.01
France	14.78	13.13	-11.18***	13.48	-8.76***	14.5	-1.85
Sweden	19.02	17.05	-10.38***	17.05	-10.38***	19.02	0
Malta	14.85	13.66	-7.97***	14.38	-3.14***	14.04	-5.45**
Belgium	13.24	12.21	-7.76***	13.21	-0.2	12.22	-7.72***
Germany	19.42	18.11	-6.77***	18.78	-3.33***	19.07	-1.81***
Czechia	9.35	8.83	-5.59***	8.87	-5.2***	9.32	-0.32
Denmark	14.34	13.7	-4.52***	13.7	-4.52***	14.34	0
Hungary	14.3	13.84	-3.18***	14.19	-0.77**	14.01	-2***
Luxembourg	17.48	16.99	-2.79**	17.4	-0.42	17.22	-1.48
Slovenia	16.02	15.64	-2.35**	15.87	-0.9***	15.7	-1.94**
Austria	16.13	15.77	-2.23***	15.91	-1.37***	15.94	-1.14*
Portugal	18.54	18.19	-1.89***	18.51	-0.15	18.17	-1.99***
Lithuania	23.77	23.48	-1.21	23.75	-0.11	23.53	-1.02
Spain	20.67	20.43	-1.16*	20.57	-0.48	20.53	-0.68
Latvia	24.79	24.51	-1.14**	24.6	-0.78**	24.59	-0.79**
Italy	20.84	20.63	-1***	20.81	-0.16	20.67	-0.83**
Cyprus	16.01	15.91	-0.64	15.83	-1.11	15.94	-0.43
Poland	16.58	16.5	-0.5**	16.52	-0.38**	16.56	-0.12
Croatia	21.55	21.45	-0.47**	21.45	-0.47**	21.52	-0.12
Estonia	24.21	24.13	-0.33	24.12	-0.41*	24.2	-0.05
Slovakia	11.07	11.06	-0.12	11.07	0	11.06	-0.12
Greece	19.4	19.39	-0.02	19.4	0	19.39	-0.02
Bulgaria	22.51	22.57	0.26	22.51	0	22.57	0.26
EU-27	18.4	17.08	-7.18***	17.42	-5.33***	18.05	-1.93***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Partial capture rate of the cash housing benefits by landlords of 50%. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

Table G.3: Reduction in poverty (FGT_1) after inclusion of housing benefits and partial capture by landlords

Households below the poverty line (%) - FGT_1							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	4.62	2.85	-38.42***	3.04	-34.15***	4.15	-10.29***
United Kingdom	6.69	4.81	-28.08***	5.02	-25.01***	6.11	-8.59***
France	4.01	3.12	-22.35***	3.2	-20.31***	3.82	-4.77***
Ireland	4.37	3.42	-21.74***	3.81	-12.81***	3.84	-11.95***
Germany	6.77	5.41	-19.99***	5.68	-16.02***	6.38	-5.65***
Czechia	2.43	2.03	-16.63***	2.04	-16.35***	2.42	-0.42**
Sweden	5.81	4.95	-14.78***	4.95	-14.78***	5.81	0
Netherlands	4.61	4.04	-12.19***	4.04	-12.19***	4.61	0.08
Malta	3.11	2.85	-8.46***	3	-3.72***	2.93	-5.9***
Belgium	3.07	2.82	-8.06***	3.06	-0.27**	2.82	-7.91***
Luxembourg	5.56	5.28	-5.03***	5.54	-0.27	5.32	-4.34***
Denmark	4.2	4.01	-4.39***	4.01	-4.39***	4.2	0.01
Latvia	7.63	7.34	-3.91***	7.4	-3.02***	7.54	-1.19***
Slovenia	3.87	3.72	-3.91***	3.8	-1.75***	3.77	-2.44***
Spain	8.26	7.96	-3.58***	8.17	-1.11***	8.04	-2.57***
Austria	5.09	4.91	-3.56***	4.98	-2.31***	5.03	-1.31***
Lithuania	8.05	7.78	-3.3***	7.99	-0.74***	7.84	-2.58***
Portugal	5.58	5.41	-3.09***	5.57	-0.18**	5.41	-3.09***
Cyprus	3.3	3.21	-2.8***	3.2	-3.07***	3.29	-0.43
Croatia	7.2	7.06	-2.02***	7.07	-1.83***	7.19	-0.17***
Estonia	6.2	6.07	-2.01***	6.09	-1.69***	6.17	-0.49**
Hungary	4.83	4.73	-2***	4.76	-1.34***	4.79	-0.71***
Italy	8.01	7.91	-1.17***	7.99	-0.2***	7.93	-0.98***
Poland	5	4.96	-0.76***	4.96	-0.68***	4.99	-0.08**
Slovakia	4.16	4.13	-0.61*	4.15	-0.2	4.14	-0.41
Greece	7.12	7.12	-0.08	7.12	0	7.12	-0.08
Bulgaria	7.01	7.02	0.02	7.01	0	7.02	0.02
EU-27	6.08	5.31	-12.71***	5.45	-10.46***	5.85	-3.76***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Partial capture rate of the cash housing benefits by landlords of 50%. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

Table G.4: Reduction in poverty (FGT_2) after inclusion of housing benefits and partial capture by landlords

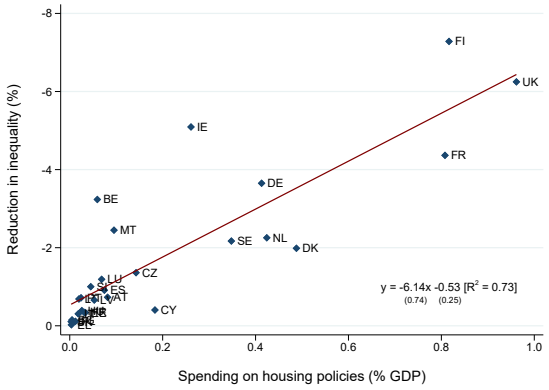
Households below the poverty line (%) - FGT_2							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	1.99	1.17	-41.12***	1.27	-36.16***	1.75	-12.4***
United Kingdom	3.48	2.37	-31.97***	2.48	-28.82***	3.11	-10.72***
Czechia	1.14	0.83	-26.99***	0.83	-26.59***	1.13	-0.74
France	1.79	1.31	-26.89***	1.35	-24.78***	1.68	-6.34***
Germany	3.64	2.67	-26.73***	2.79	-23.22***	3.37	-7.29***
Ireland	1.85	1.5	-18.93***	1.67	-9.95***	1.64	-11.31***
Sweden	2.98	2.61	-12.45***	2.61	-12.45***	2.98	0
Netherlands	2.37	2.16	-8.87***	2.16	-8.87***	2.37	0.16*
Belgium	1.4	1.3	-7.35***	1.4	-0.28*	1.3	-7.15***
Malta	1.23	1.14	-7.18***	1.19	-3.3***	1.17	-4.88**
Luxembourg	3.08	2.87	-6.92***	3.07	-0.23	2.88	-6.48***
Spain	4.98	4.71	-5.57***	4.9	-1.69***	4.78	-4.04***
Latvia	4.12	3.89	-5.54***	3.95	-4.28***	4.05	-1.69***
Portugal	2.64	2.52	-4.61***	2.63	-0.39*	2.52	-4.53***
Lithuania	4.49	4.31	-3.96***	4.45	-0.92***	4.35	-3.06**
Denmark	2.13	2.04	-3.93***	2.04	-3.93***	2.13	0.01
Austria	2.72	2.62	-3.8***	2.68	-1.83***	2.67	-2.04**
Croatia	3.71	3.58	-3.66***	3.59	-3.42***	3.71	-0.23***
Estonia	3.17	3.06	-3.65***	3.07	-3.24***	3.15	-0.63
Slovenia	1.44	1.38	-3.6***	1.41	-1.86***	1.4	-2.28***
Cyprus	1.17	1.14	-2.57***	1.13	-2.92***	1.16	-0.31
Slovakia	2.79	2.76	-1.33**	2.78	-0.29	2.76	-1.04*
Hungary	3.23	3.19	-1.3***	3.2	-1***	3.22	-0.33***
Italy	5.12	5.05	-1.28***	5.1	-0.25***	5.06	-1.05***
Poland	2.47	2.44	-1.1***	2.44	-1.04***	2.46	-0.06**
Bulgaria	3.55	3.54	-0.39	3.55	0	3.54	-0.39
Greece	4.12	4.12	-0.17	4.12	0	4.12	-0.17
EU-27	3.32	2.84	-14.57***	2.91	-12.21***	3.17	-4.63***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Partial capture rate of the cash housing benefits by landlords of 50%. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

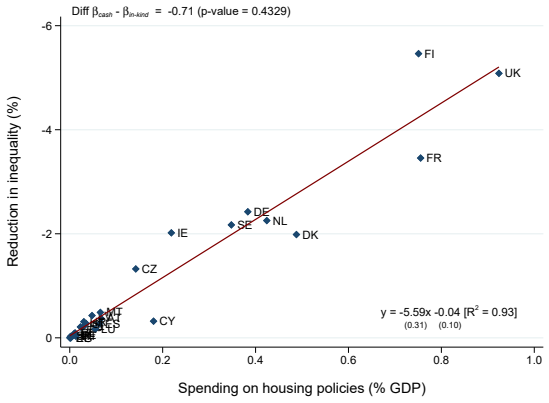
Sources: EU-SILC 2017; authors' table.

Figure G.1: Percentage of reduction in inequality according to the spending under housing policies in % of GDP, with partial capture of cash housing benefits by landlords

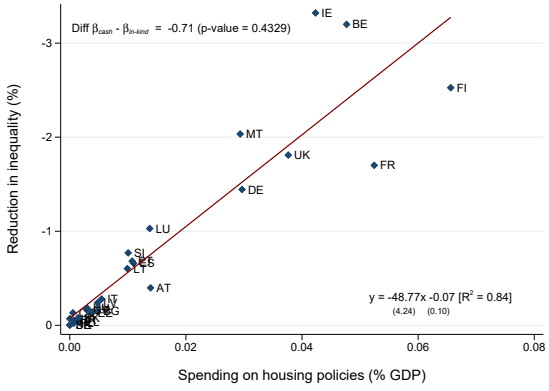
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

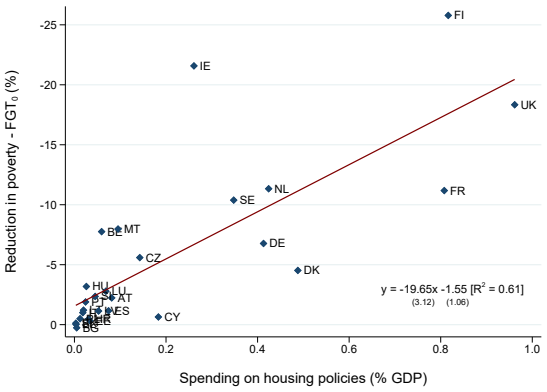


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable. Partial capture rate of the cash housing benefits by landlords of 50%.

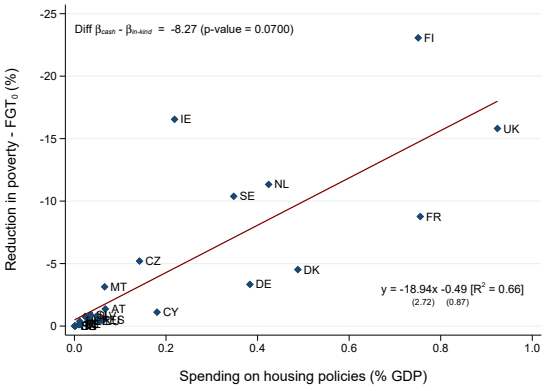
Sources: EU-SILC 2017; authors' graph.

Figure G.2: Percentage of reduction in poverty (FGT_0) according to the spending under housing policies in % of GDP, with partial capture of cash housing benefits by landlords

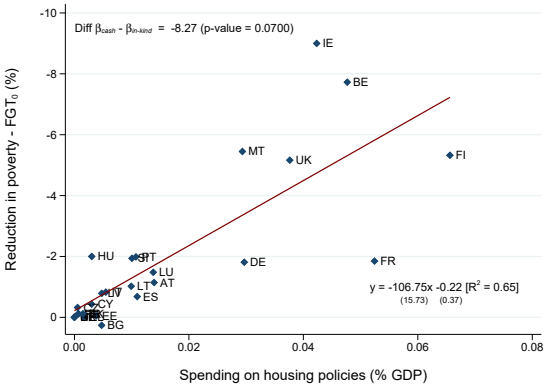
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

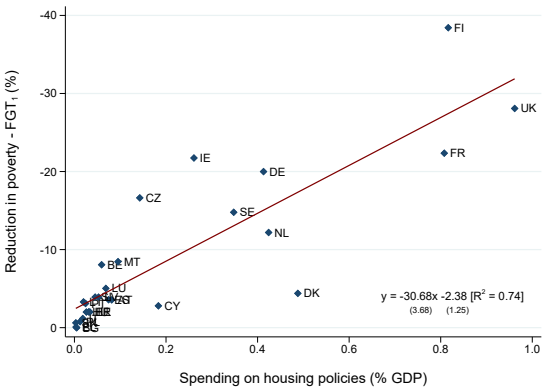


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable. Partial capture rate of the cash housing benefits by landlords of 50%.

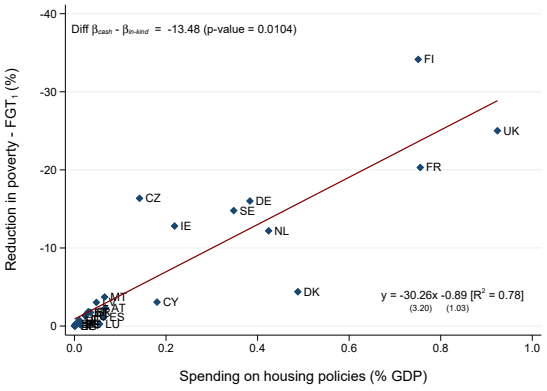
Sources: EU-SILC 2017; authors' graph.

Figure G.3: Percentage of reduction in poverty (FGT_1) according to the spending under housing policies in % of GDP, with partial capture of cash housing benefits by landlords

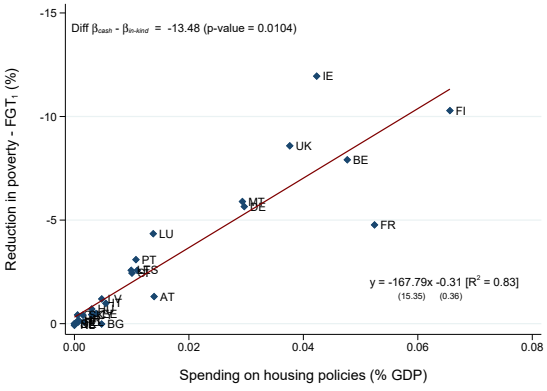
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

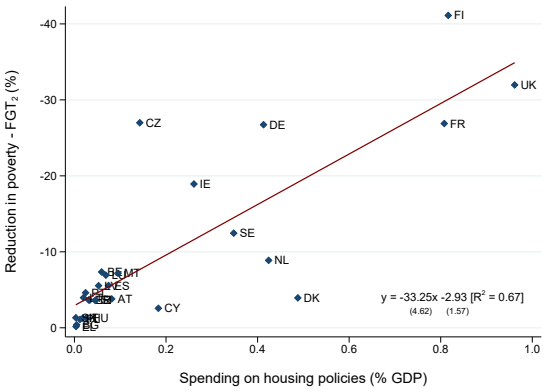


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable. Partial capture rate of the cash housing benefits by landlords of 50%.

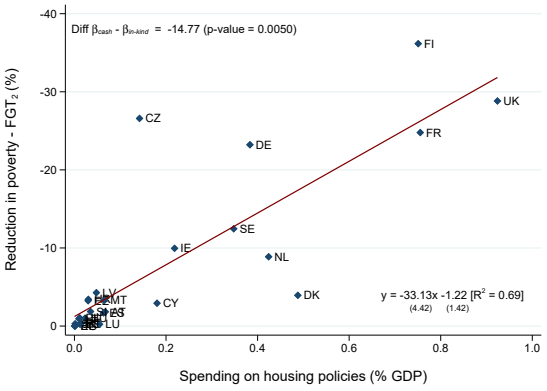
Sources: EU-SILC 2017; authors' graph.

Figure G.4: Percentage of reduction in poverty (FGT_2) according to the spending under housing policies in % of GDP, with partial capture of cash housing benefits by landlords

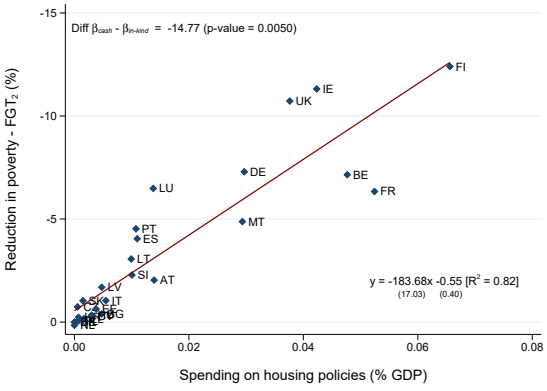
(a) Total spending



(b) Spending under cash housing benefits



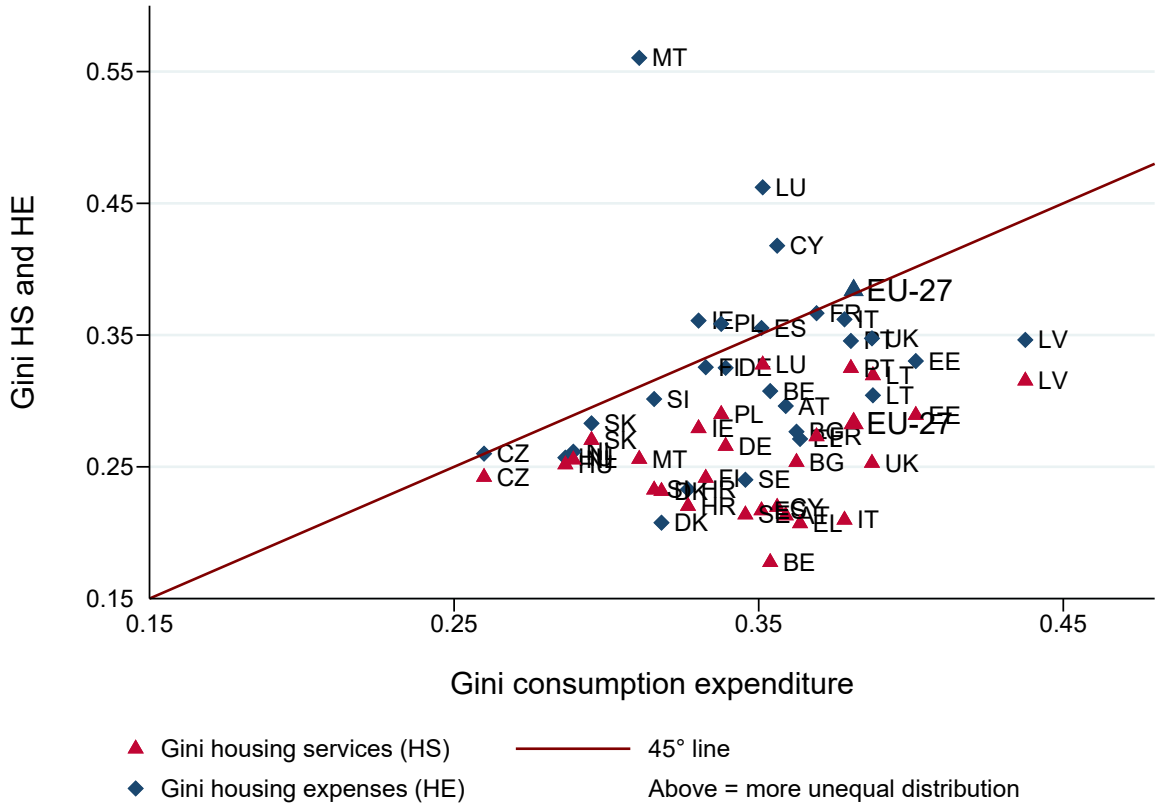
(c) Spending under in-kind housing benefits



Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable. Partial capture rate of the cash housing benefits by landlords of 50%.

Sources: EU-SILC 2017; authors' graph.

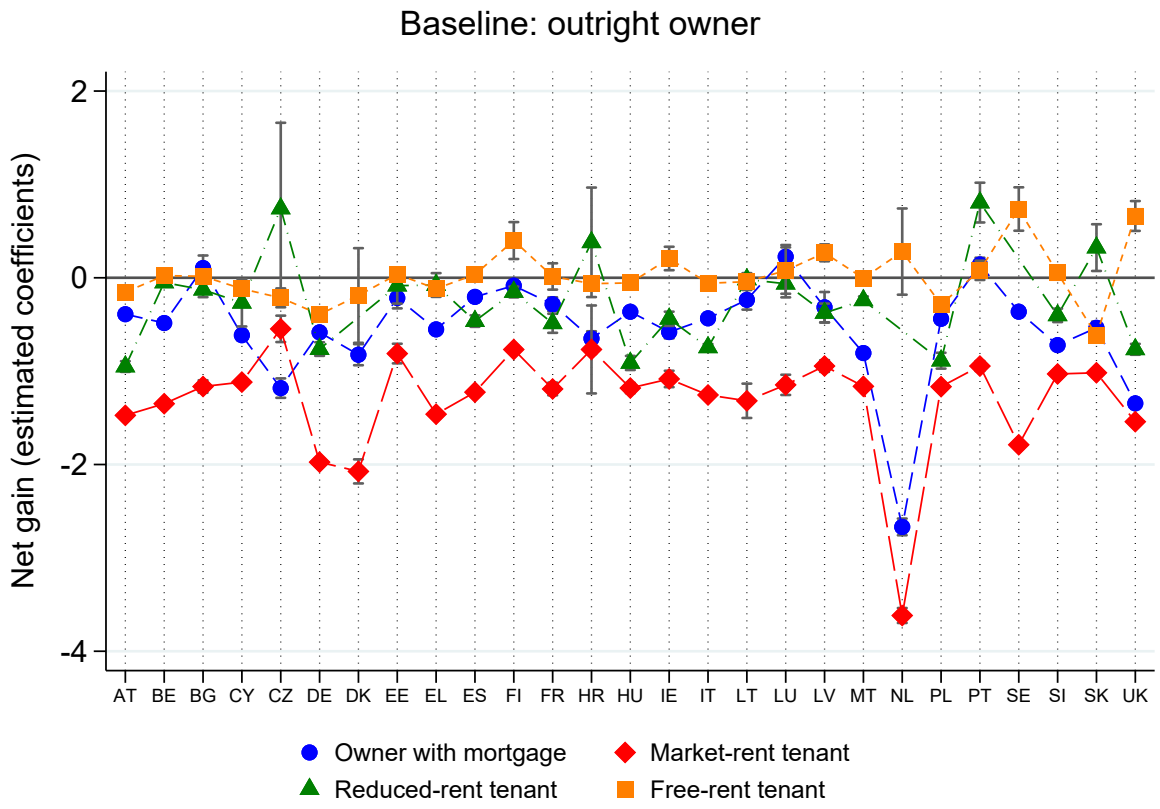
Figure G.5: Gini of non-housing consumption expenditure compared to Gini of housing services (HS) and expenses (HE), with partial capture of cash housing benefits by landlords



Notes: Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses corresponds to housing expenditure/CU/month including housing policies (cash + in-kind benefits). Partial capture rate of the cash housing benefits by landlords of 50%.

Sources: HBS 2015 and EU-SILC 2017; authors' graphs.

Figure G.6: Regression estimates: Net Gain by tenure status, with partial capture of cash housing benefits by landlords



Notes: Estimates of equation 2 using weighted least squares with robust standard errors and 95% confidence intervals (CIs). CIs that are not visible are behind the symbols. Partial capture rate of the cash housing benefits by landlords of 50%.

Sources: EU-SILC 2017; authors' graphs.

H Robustness check

Table H.1: Variables used for the (Heckman) hedonic regression of rents

Variable	Details	EU-SILC
log(rent)	Current rent (including housing benefits)	HH060
Dwelling type	Detached house • Semi-detached house • Apartment/flat in building with < 10 dwellings • Apartment/flat in building with ≥ 10 dwellings • Other	HH010
Number of rooms	Number of available rooms in the dwelling	HH030
Bath	Bath or shower in dwelling	HH081
Toilet	Indoor flushing toilet for sole use of household	HH091
Moisture	Leaking roof, damp walls/floors/foundation, or rot in window frames or floor	HH040
Warm	Ability to keep home adequately warm	HH050
Dark	Problems with the dwelling: too dark, not enough light	HS160
Noise	Noise from neighbors or from the street	HS170
Pollution	Pollution, grime or other environment problems	HS180
Crime	Crime, violence or vandalism in the area	HS190
Degree of urbanization	• Densely populated • Intermediate area • Thinly-populated area	DB100
Region	NUTS 1	DB040
Year	Year of contract or purchasing or installation	HH031
Income	Total household disposable income	HY020
Household size	Number of people in household	HX040
	Selection equation of tenants	
Income	Total disposable household income	HY020
Income squared	income # income	/
Household size	Number of people in household	HX040
Unexpected expenses	Capacity to face unexpected financial expenses	HS060
Lone parent	Single parent household, one or more dependent children	HX060
Marital status of reference person	• Never married • Married • Widowed • Divorced	PB190
Illness	Suffer from any chronic illness or condition	PH020
Status	• Unemployed • Disabled • Retired	PL031
Stranger	Country of birth (other than EU)	PB210
Permanent contract	Permanent job/work contract of unlimited duration	PL140
Age of reference person	Age (0 - 99)	PX020
Age squared	Age # age	/

Sources: EU-SILC 2017; authors' table.

Table H.2: Reduction in inequality after inclusion of housing benefits, using regression (Heckman) approach for imputed rents

				Gini			
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	% △	**Income** + HP$_{cash}$	% △	**Income** + HP$_{in\text{-}kind}$	% △
United Kingdom	0.35	0.32	-8.57***	0.33	-5.64***	0.34	-3.99***
Finland	0.28	0.26	-8.47***	0.27	-6.49***	0.28	-2.41***
Ireland	0.33	0.31	-7.45***	0.32	-2.19***	0.31	-5.45***
France	0.3	0.29	-5.47***	0.29	-4.09***	0.3	-1.75***
Netherlands	0.29	0.28	-4.19***	0.28	-4.19***	0.29	0
Germany	0.32	0.3	-4.13***	0.31	-3.56***	0.31	-0.65***
Denmark	0.29	0.28	-3.61***	0.28	-3.61***	0.29	0
Sweden	0.29	0.28	-3.54***	0.28	-3.54***	0.29	0
Belgium	0.27	0.26	-2.43***	0.27	-0.07***	0.26	-2.38***
Czechia	0.26	0.25	-2***	0.25	-1.91***	0.26	-0.11***
Slovenia	0.26	0.25	-1.59***	0.26	-0.27***	0.25	-1.38***
Latvia	0.37	0.37	-1.17***	0.37	-0.47***	0.37	-0.71***
Portugal	0.34	0.34	-1***	0.34	-0.04***	0.34	-0.96***
Spain	0.34	0.34	-0.91***	0.34	-0.33***	0.34	-0.58***
Austria	0.29	0.29	-0.8***	0.29	-0.56***	0.29	-0.29***
Luxembourg	0.3	0.3	-0.69***	0.3	-0.17***	0.3	-0.52***
Malta	0.29	0.29	-0.68***	0.29	-0.5***	0.29	-0.22***
Croatia	0.32	0.32	-0.59***	0.32	-0.31***	0.32	-0.3***
Cyprus	0.32	0.32	-0.58***	0.32	-0.5***	0.32	-0.08***
Hungary	0.29	0.29	-0.47***	0.29	-0.21***	0.29	-0.29***
Italy	0.33	0.33	-0.28***	0.33	-0.04***	0.33	-0.24***
Estonia	0.33	0.33	-0.23***	0.33	-0.24***	0.33	0
Bulgaria	0.4	0.4	-0.13***	0.4	0	0.4	-0.13***
Poland	0.31	0.31	-0.13***	0.31	-0.1***	0.31	-0.03*
Lithuania	0.41	0.41	-0.1***	0.41	-0.08***	0.41	-0.02***
Slovakia	0.23	0.23	-0.06*	0.23	-0.03	0.23	-0.03
Greece	0.33	0.33	0	0.33	0	0.33	-0.01
EU-27	0.35	0.34	-2.94***	0.34	-2.21***	0.34	-0.97***

Notes: Income represents disposable income/CU/month without housing benefits. Countries are sorted from the most to the least reduction of inequality after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

Table H.3: Reduction in poverty (FGT_0) after inclusion of housing benefits, using regression (Heckman) approach for imputed rents

Households below the poverty line (%) - FGT_0							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	17.4	11.87	-31.8***	12.36	-28.94***	16.5	-5.17***
Netherlands	16.67	12.04	-27.79***	12.04	-27.79***	16.67	0
United Kingdom	21.06	16.18	-23.17***	17.33	-17.73***	19.27	-8.52***
Ireland	19.88	15.39	-22.57***	16.15	-18.75***	17.74	-10.74***
Sweden	19.02	15.24	-19.88***	15.24	-19.88***	19.02	0
France	14.78	12.22	-17.29***	12.82	-13.23***	14.28	-3.36**
Czechia	9.35	8.51	-8.99***	8.56	-8.5***	9.29	-0.69
Denmark	14.34	13.12	-8.5***	13.12	-8.5***	14.34	0
Belgium	13.24	12.3	-7.08***	13.18	-0.44	12.34	-6.81***
Germany	19.42	18.06	-7.03***	18.29	-5.83***	19.32	-0.53
Slovenia	16.02	15.18	-5.22***	15.87	-0.9***	15.28	-4.56***
Malta	14.85	14.32	-3.58***	14.35	-3.37***	14.66	-1.26
Austria	16.13	15.66	-2.92***	15.83	-1.82***	15.94	-1.18
Portugal	18.54	18.04	-2.69***	18.51	-0.16	18.04	-2.7***
Hungary	14.3	13.92	-2.64***	14.19	-0.77**	14	-2.08**
Latvia	24.79	24.18	-2.47***	24.54	-1.03***	24.42	-1.49**
Cyprus	16.01	15.66	-2.19	15.7	-1.91	15.9	-0.67
Luxembourg	17.48	17.13	-1.99*	17.4	-0.42	17.37	-0.62
Spain	20.67	20.35	-1.54**	20.58	-0.43	20.57	-0.46
Croatia	21.55	21.24	-1.43***	21.43	-0.52**	21.32	-1.03**
Italy	20.84	20.64	-0.98***	20.8	-0.19	20.71	-0.64**
Estonia	24.21	24.06	-0.64	24.1	-0.46*	24.14	-0.3
Poland	16.58	16.5	-0.53*	16.52	-0.38**	16.56	-0.14
Slovakia	11.07	11.05	-0.21	11.07	0	11.05	-0.21
Bulgaria	22.51	22.48	-0.16	22.51	0	22.48	-0.16
Lithuania	23.77	23.76	-0.04	23.75	-0.11	23.79	0.07
Greece	19.4	19.4	0	19.4	0	19.4	0
EU-27	18.4	16.63	-9.63***	17.01	-7.58***	17.98	-2.33***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

Table H.4: Reduction in poverty (FGT_1) after inclusion of housing benefits, using regression (Heckman) approach for imputed rents

Households below the poverty line (%) - FGT_1							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	4.62	2.44	-47.2***	2.69	-41.79***	4.06	-12.08***
United Kingdom	6.69	4.53	-32.24***	4.83	-27.8***	5.8	-13.24***
France	4.01	2.79	-30.36***	2.91	-27.51***	3.75	-6.58***
Germany	6.77	5	-26.14***	5.16	-23.81***	6.57	-2.91***
Czechia	2.43	1.83	-24.92***	1.83	-24.64***	2.43	-0.27
Sweden	5.81	4.49	-22.76***	4.49	-22.76***	5.81	0
Ireland	4.37	3.39	-22.26***	3.73	-14.53***	3.99	-8.7***
Netherlands	4.61	3.71	-19.53***	3.71	-19.53***	4.61	0
Belgium	3.07	2.79	-9.14***	3.05	-0.4**	2.79	-9.03***
Denmark	4.2	3.9	-7.07***	3.9	-7.07***	4.2	0
Latvia	7.63	7.19	-5.78***	7.38	-3.36***	7.44	-2.48***
Slovenia	3.87	3.65	-5.62***	3.8	-1.75***	3.67	-5.05***
Malta	3.11	2.96	-4.87***	2.99	-4***	3.06	-1.69***
Portugal	5.58	5.31	-4.83***	5.57	-0.18	5.32	-4.7***
Austria	5.09	4.87	-4.33***	4.92	-3.51***	5.05	-0.94**
Cyprus	3.3	3.17	-3.97***	3.17	-3.98***	3.28	-0.68**
Spain	8.26	7.97	-3.47***	8.13	-1.51***	8.08	-2.09***
Croatia	7.2	6.99	-3***	7.06	-2.01***	7.11	-1.24***
Luxembourg	5.56	5.42	-2.53***	5.54	-0.34*	5.45	-1.94***
Estonia	6.2	6.08	-1.85***	6.08	-1.87***	6.19	-0.12
Hungary	4.83	4.75	-1.69***	4.76	-1.39***	4.81	-0.45
Italy	8.01	7.92	-1.08***	7.98	-0.29***	7.94	-0.8***
Poland	5	4.95	-0.83***	4.96	-0.73***	4.99	-0.12
Lithuania	8.05	7.99	-0.74***	7.99	-0.74***	8.05	-0.01
Slovakia	4.16	4.15	-0.24	4.15	-0.2	4.16	-0.03
Bulgaria	7.01	7.01	-0.08	7.01	0	7.01	-0.08
Greece	7.12	7.12	-0.05	7.12	0	7.12	-0.05
EU-27	6.08	5.11	-15.94***	5.24	-13.83***	5.84	-3.95***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

Sources: EU-SILC 2017; authors' table.

Table H.5: Reduction in poverty (FGT_2) after inclusion of housing benefits, using regression (Heckman) approach for imputed rents

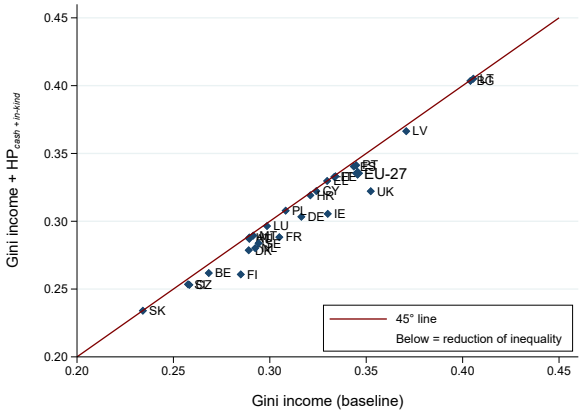
Households below the poverty line (%) - FGT_2							
Country	**Income (baseline)**	**Income** + HP$_{cash+in\text{-}kind}$	**% △**	**Income** + HP$_{cash}$	**% △**	**Income** + HP$_{in\text{-}kind}$	**% △**
Finland	1.99	1	-49.6***	1.13	-43.5***	1.7	-14.7***
Czechia	1.14	0.73	-36.06***	0.73	-35.87***	1.13	-0.34
United Kingdom	3.48	2.23	-35.84***	2.37	-31.83***	2.94	-15.52***
France	1.79	1.16	-35.54***	1.2	-32.87***	1.65	-7.99***
Germany	3.64	2.39	-34.22***	2.47	-32.05***	3.49	-4.17***
Ireland	1.85	1.45	-21.71***	1.64	-11.34***	1.65	-11.06**
Sweden	2.98	2.45	-17.63***	2.45	-17.63***	2.98	0
Netherlands	2.37	2.03	-14.51***	2.03	-14.51***	2.37	0
Belgium	1.4	1.28	-8.43***	1.4	-0.43	1.29	-8.2***
Latvia	4.12	3.79	-8.16***	3.93	-4.64***	3.97	-3.8***
Portugal	2.64	2.47	-6.52***	2.63	-0.4	2.48	-6.25***
Denmark	2.13	1.99	-6.47***	1.99	-6.47***	2.13	0
Spain	4.98	4.72	-5.3***	4.87	-2.23***	4.82	-3.32***
Malta	1.23	1.17	-4.99***	1.19	-3.48***	1.2	-2.28**
Slovenia	1.44	1.36	-4.94***	1.41	-1.86***	1.37	-4.58***
Croatia	3.71	3.54	-4.59***	3.58	-3.62***	3.67	-1.34**
Austria	2.72	2.62	-3.9***	2.65	-2.63***	2.69	-1.38
Luxembourg	3.08	2.97	-3.51***	3.07	-0.31	2.99	-3.06***
Estonia	3.17	3.07	-3.31***	3.07	-3.38***	3.17	-0.09
Cyprus	1.17	1.13	-2.88**	1.13	-3.04**	1.16	-0.47*
Poland	2.47	2.44	-1.21***	2.44	-1.1***	2.46	-0.12
Italy	5.12	5.06	-1.19***	5.1	-0.37***	5.08	-0.83***
Hungary	3.23	3.2	-1***	3.19	-1.02***	3.23	-0.08
Lithuania	4.49	4.44	-0.97***	4.45	-0.92***	4.48	-0.06
Bulgaria	3.55	3.54	-0.42	3.55	0	3.54	-0.42
Slovakia	2.79	2.78	-0.39	2.78	-0.29	2.79	-0.09
Greece	4.12	4.12	-0.1	4.12	0	4.12	-0.1
EU-27	3.32	2.73	-17.72***	2.8	-15.61***	3.16	-4.64***

Notes: Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all countries. Income represents disposable income/CU/month without housing benefits. Countries are sorted from greatest to the smallest reduction in poverty after including both housing policies (Income + HP$_{cash+in\text{-}kind}$). Differences between the baseline income's index and the other incomes' indices are computed using a paired t-test as in Goedemé et al. (2013). Stars indicate significance level: * p<0.1, ** p<0.05 and *** p<0.01.

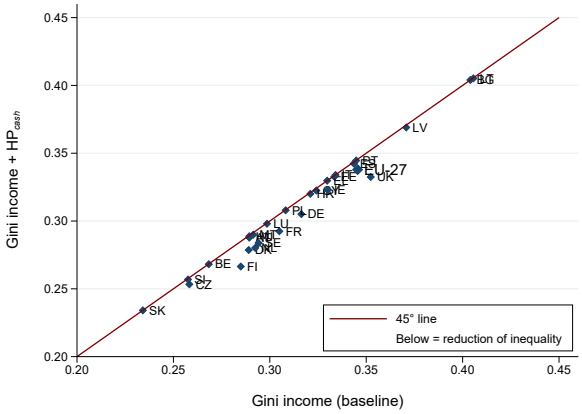
Sources: EU-SILC 2017; authors' table.

Figure H.1: Gini of baseline income compared to income including housing benefits, using regression (Heckman) approach for imputed rents

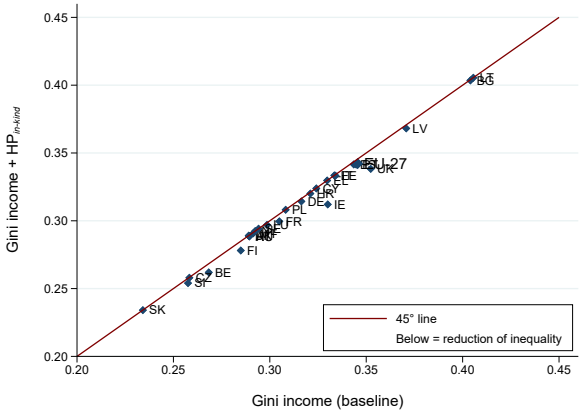
(a) Gini income + HP$_{cash+in\text{-}kind}$



(b) Gini income + HP$_{cash}$



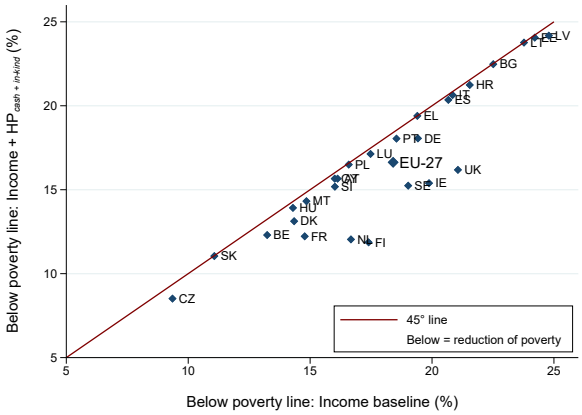
(c) Gini income + HP$_{in\text{-}kind}$



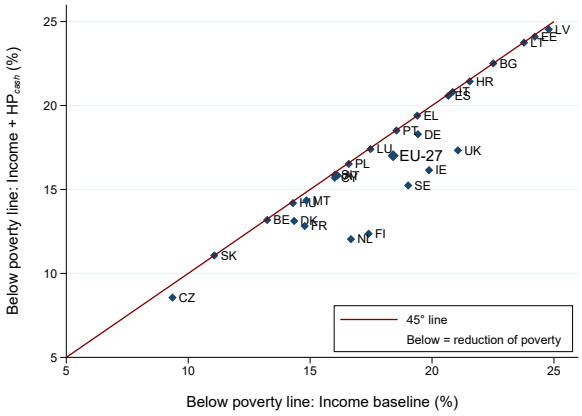
Notes: Income represents disposable income/CU/month without housing benefits.
Sources: EU-SILC 2017; authors' graphs.

Figure H.2: Poverty rate (FGT_0) with baseline income compared to income including housing benefits, using regression (Heckman) approach for imputed rents

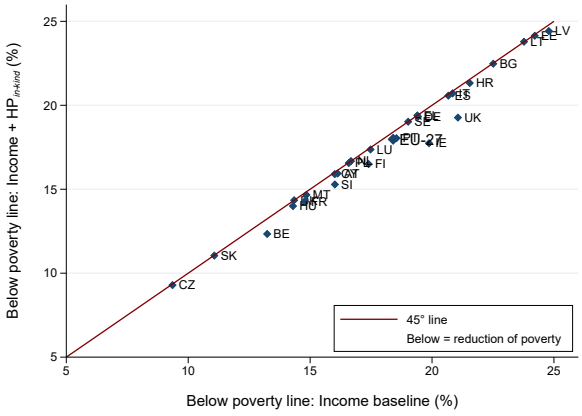
(a) Below poverty line: income + HP$_{cash+in\text{-}kind}$



(b) Below poverty line: income + HP$_{cash}$



(c) Below poverty line: income + HP$_{in\text{-}kind}$

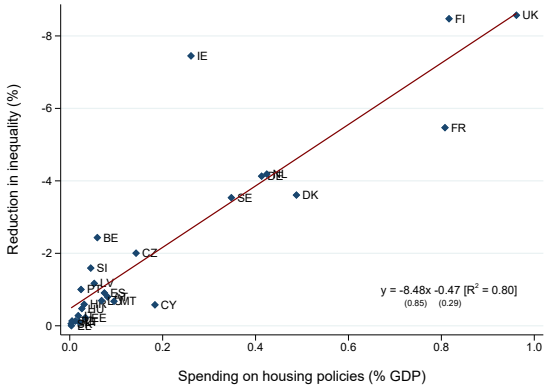


Notes: Poverty rate represents the share of households below the poverty line. Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing benefits. Income represents disposable income/CU/month without housing benefits.

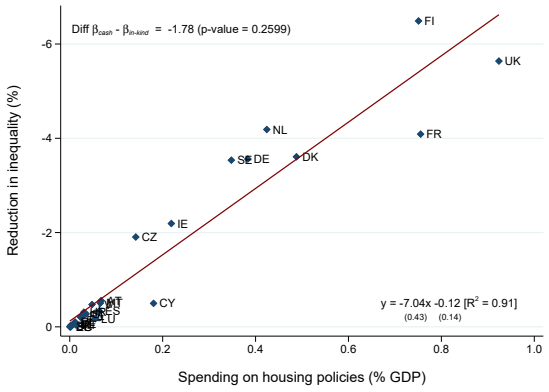
Sources: EU-SILC 2017; authors' graphs.

Figure H.3: Percentage of reduction in inequality according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents

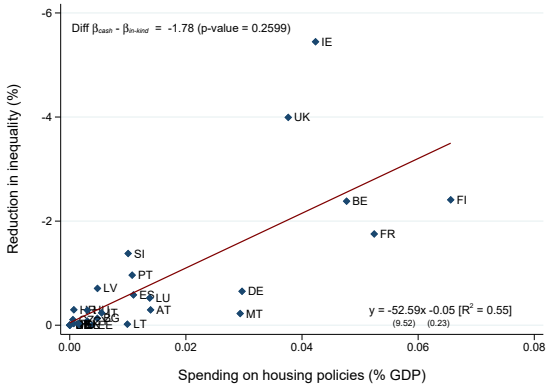
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

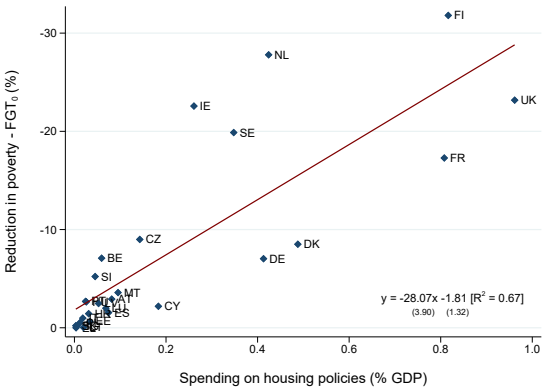


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

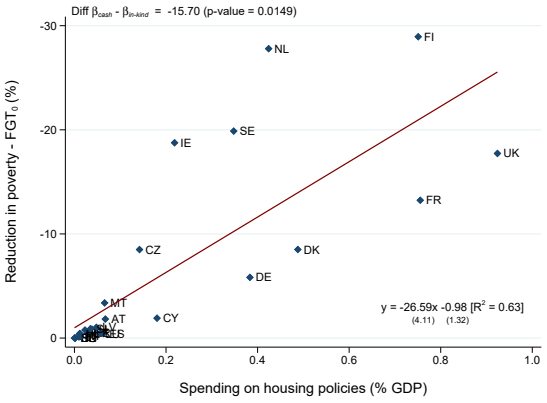
Sources: EU-SILC 2017; authors' graph.

Figure H.4: Percentage of reduction in poverty (FGT_0) according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents

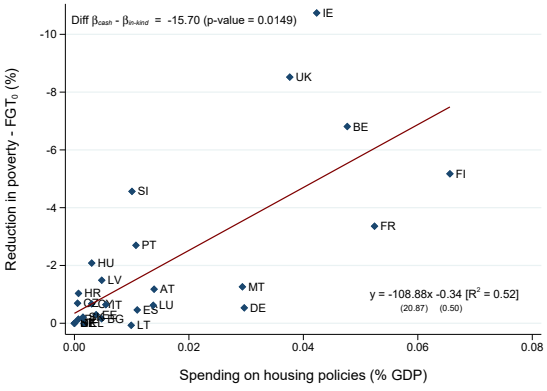
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

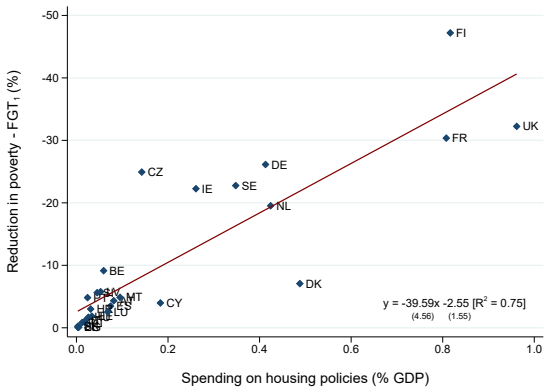


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

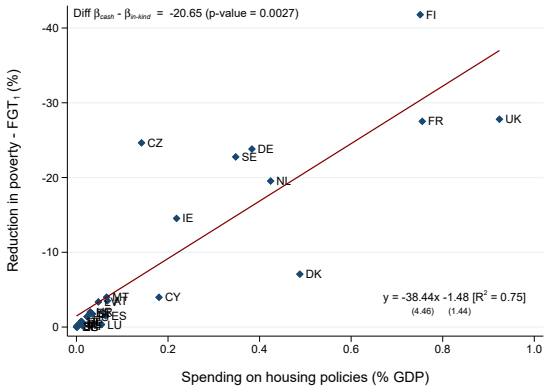
Sources: EU-SILC 2017; authors' graph.

Figure H.5: Percentage of reduction in poverty (FGT_1) according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents

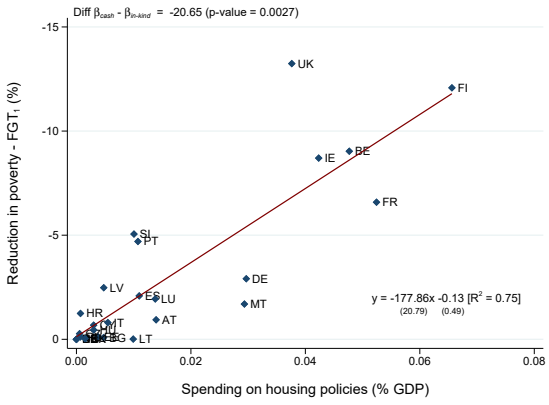
(a) Total spending



(b) Spending under cash housing benefits



(c) Spending under in-kind housing benefits

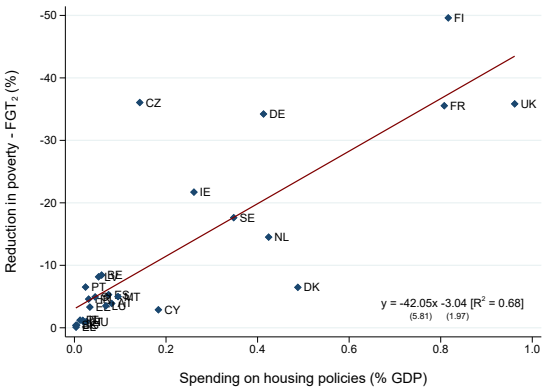


Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

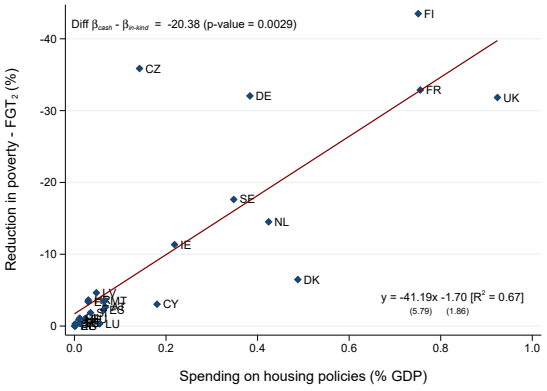
Sources: EU-SILC 2017; authors' graph.

Figure H.6: Percentage of reduction in poverty (FGT_2) according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents

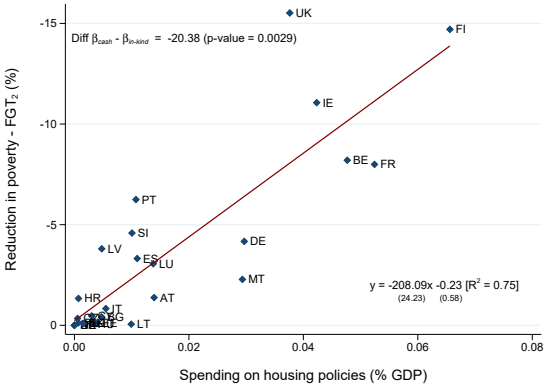
(a) Total spending



(b) Spending under cash housing benefits



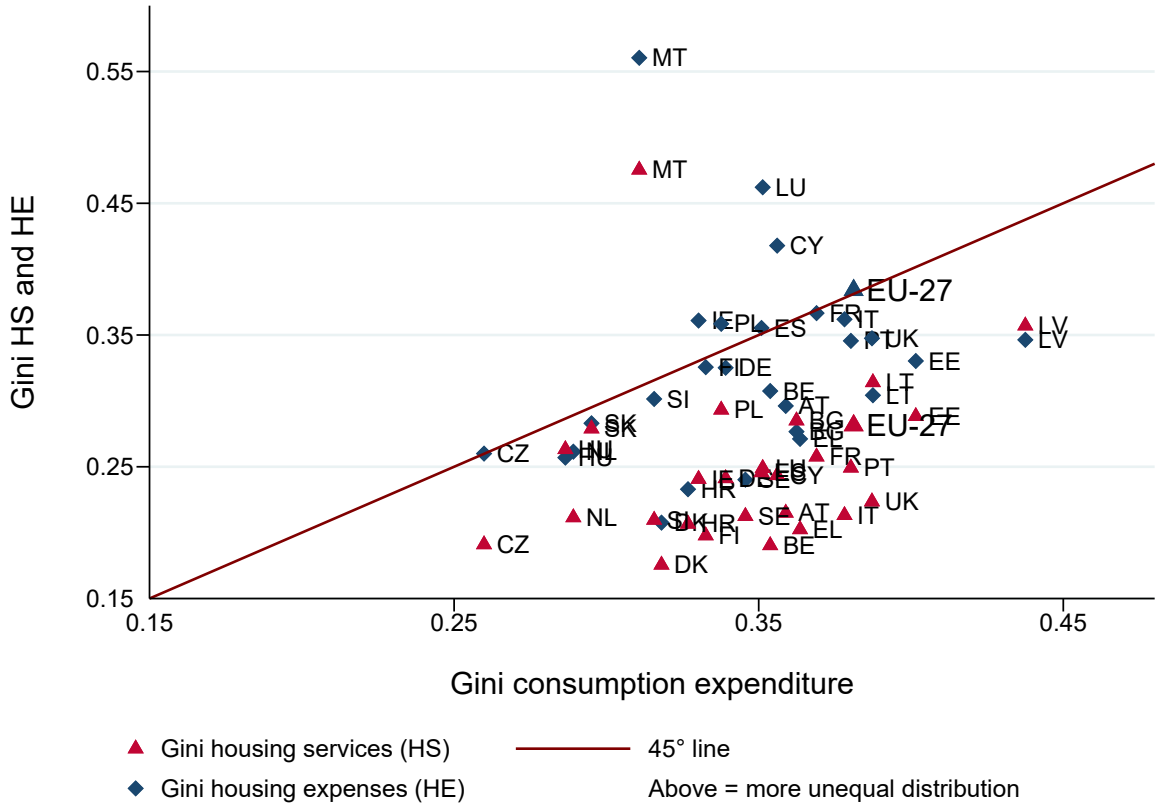
(c) Spending under in-kind housing benefits



Notes: The subfigures' y-axis represents the reduction after including both housing policies (Income + $\text{HP}_{cash+in\text{-}kind}$) or each policy separately. Poverty line = 60% of median income. Income represents disposable income/CU/month without housing benefits. Regression line represents the linear relationship between the variable represented on the y-axis and the variable represented in the x-axis. Associated equation displays estimated coefficients and their robust standard errors (in parentheses). The difference between the coefficients of the spending of both policy, is estimated with a Welch's t-test, after rescaling the spending under in-kind housing benefits (by dividing the coefficient and its standard error by 10) in order to make them comparable.

Sources: EU-SILC 2017; authors' graph.

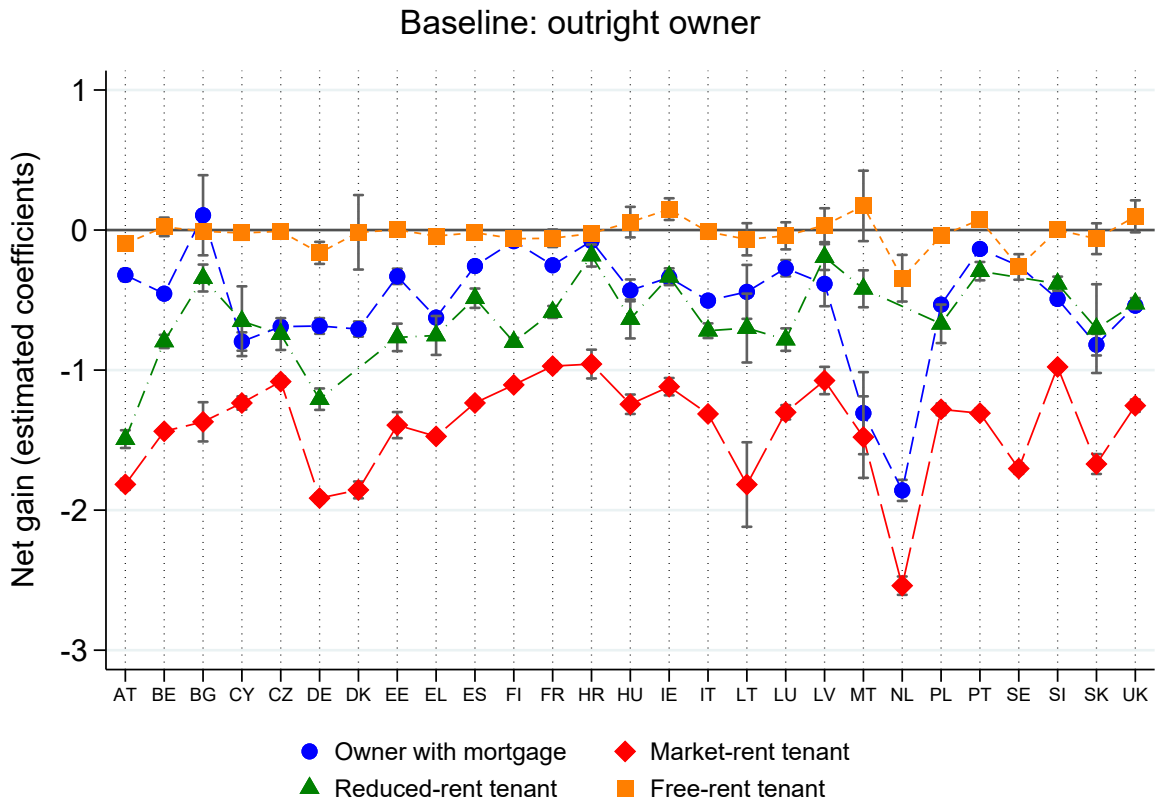
Figure H.7: Gini of non-housing consumption expenditure compared to Gini of housing services (HS) and expenses (HE), using regression (Heckman) approach for imputed rents



Notes: Consumption expenditure corresponds to households' total consumption expenditure/CU/month excluding rent and housing-related expenditure. Housing expenses correspond to housing expenditure/CU/month, including housing policies (cash + in-kind benefits).

Sources: HBS 2015 and EU-SILC 2017; authors' graph.

Figure H.8: Regression estimates: Net Gain by tenure status, using regression (Heckman) approach for imputed rents



Notes: Estimates of equation 2 using weighted least squares with robust standard errors and 95% confidence intervals (CIs). CIs that are not visible are behind the symbols.

Sources: EU-SILC 2017; authors' graph.

I Supplementary materials: usage cost versus user costs

The missing terms to Poterba (1992) user-cost definition are the owner's interest of forgone equity cost measured by the interest rate, the risk premium for housing investment, the depreciation cost (different notion from the maintenance cost), and owner's nominal capital gain. The proposed definition by Díaz and Luengo-Prado (2008) encompasses Poterba's one, in adding a transaction cost term and a term depending upon the leverage of the housing purchase. User costs may vary across households because of differences in mortgage loan-to-value ratios and differences in house purchase timing.

Nevertheless, if not perfect, the EU-SILC usage costs provide a first approximation of the household's housing costs. Some of its items represent additional services not captured by the rents or the imputed rents. Indeed, the cost of utilities is among them, as well as mandatory services and charges, insurance, regular maintenance, and repairs. But the difficulty comes from the fact that the EU-SILC does not fully detail all these expenses as variables. Some delicate compromises must be made in weighing the pros and cons of adding or not the usage cost to the rent or imputed rent to obtain housing services. The least bad solution seems to be adding the usage cost to all tenure status types. For the owners paying mortgage, the housing services is then the imputed rent plus the usage costs. Moreover, the housing costs for this tenure choice include the interest repayment on the mortgage, which represents the opportunity cost of being a homeowner. Apart from the home attachment, one can cite as advantages associated with this tenure choice to be free of any rent volatility and variance in the landlord's willingness to maintain the housing services quality. Since interest repayments depend on the loan-to-value ratio, our housing cost estimation depends upon leverage. Therefore, it is more in tune with what Díaz and Luengo-Prado (2008) recommend.