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Housing Policy Impacts on Poverty and Inequality in Europe

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Keyword: Housing policy, Housing consumption, Inequality, Poverty

JEL Classification: D63, I32, D31, H23

Housing Policy Impacts on Poverty and Inequality in Europe^{*}

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March 17, 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. We find that (1) cash housing benefits are more effective than in-kind housing benefits (social housing) and more effective in reducing poverty than inequality. (2) Some countries, and especially Finland, achieve a higher reduction in inequality and poverty while spending only half of the UK. (3) Based on an econometric estimate, we show evidence that in almost all countries outright ownership is the most advantageous tenure status. (4) Inequality in housing expenses is comparable to that in consumption expenditure (excluding housing costs), which is, in turn, much higher than inequality in housing services (a difference of 10 Gini points on average).

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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).

This paper examines the effectiveness of these two housing policies in reducing inequality and poverty in households' housing expenditures in more depth than previous studies (see, Section 2). 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-SILC¹ data. We then compare the actual 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 FGT² 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.

There is one caveat, though. This study is a first step that, at best, provides a correct accounting answer to the issue since behavioral responses and equilibrium price changes were not considered. In particular, we do not allow households' tenancy choice to differ absent housing benefits. As we focus on public policies dedicated to reducing housing poverty and inequality, we do not include homeowners-oriented policies like tax deductions or zero-interest loans.

¹European Union Statistics on Income and Living Conditions.

²Foster-Greer-Thorbecke.

As far as we know, the method we suggest for calculating households' housing services (what they would have to pay in the absence of housing policy) and housing expenses (what they actually pay) is an original one. It considers total housing costs and imputed rents for owner-occupiers, reduced-rent, and free-rent tenants.

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

Our main results show that cash housing benefits are more effective than in-kind housing benefits (reduced rents), and more effective in reducing poverty than inequality. This provides additional evidence that most housing policies focus on the poorest households, thus extending the findings of [Verbist and Grabka \(2017\)](#) for Germany.

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 half as much as others. For instance, the United Kingdom, which spends 1.5% of its GDP on housing policies—twice as much as other Western European countries—obtains a reduction in inequality comparable to that of Germany, France, and Finland. Its poverty

rate has only fallen in proportions less or equal to that of France, Sweden, the Netherlands, Ireland, and Finland. In all dimensions, the performance of that last country is impressive. It is not the case for all Nordic countries, with Denmark performing poorly in cost-effectiveness for inequality and all poverty indices of the FGT class. This difference in public spending effectiveness could be explained by countries' use of targeted housing policies instead of universal ones. Germany and Belgium, for instance, which have a low share of households benefiting from housing policies (14% and 9% respectively), perform similarly or even better at reducing both inequality and poverty than the United Kingdom, France, Ireland, or Denmark, which have high shares of households benefiting from housing policies (35% - 20%).

Performing an econometric estimate, we find that, even 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](#)).

Finally, 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 consumption expenditure (excluding housing costs), 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 consumption expenditures. This provides additional evidence that housing policies reduce housing expenses 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.

In the final section, we also performed our own computation of the imputed rents as

a robustness check. We use an objective measure: a regression approach (with Heckman correction) with an additional error correction term in order to maintain the distribution of the rents. It confirms that our main results are robust to the choice of the imputed rent estimation method.

The paper is structured as follows. Section 2 provides a literature review. Section 3 presents the methodology. The section 4 is dedicated to the presentation of the data. We start the empirical part of the paper by spotting some stylized facts in section 5. This is followed by stating the results in section 6. The penultimate section 7 is devoted to the robustness check and precedes the conclusion. Many tables and further methodologies precision are reported in the Appendix.

2 Related literature

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.

For instance, cash housing benefits have been found to increase rents in different countries, where some studies find that more than 50% of the cash housing benefits accrued to landlords, at least in the rental housing markets with inelastic supply and elastic demand³. 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 (labor markets) especially for immigrants (see, [Verdugo, 2016](#) and [Schmutz and](#)

³See, [Gibbons and Manning, 2006](#) and [Brewer et al., 2019](#) for the United Kingdom, [Fack, 2006](#) and [Gislain-Letrémy and Trevien, 2014](#) 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.

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.

The economic literature on housing inequality primarily addresses housing wealth inequality. Albouy et al. (2016) estimate the variation in inequality in the US housing prices and rents over the 20th century. They find that these inequalities declined in the middle of the 20th 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. (2020), 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. Using EU-SILC first-round-based data on non-cash income, Frick

et al. (2007) show that it primarily benefits owner-occupiers and below-market renters, especially the elderly. 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. Housing expenditures are also part of the story. For Germany, Dustmann et al. (2018) obtain a steeper rise in inequality of income net of housing expenses than gross of housing expenditures. Moreover, they find that rising rental prices and falling mortgage interest rates lower the relative costs of homeownership compared to renting. 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. Interestingly, deducting housing expenses from household disposable income has the opposite effect. Finally, Figari et al. (2017) also show that we can increase tax revenue without increasing inequality, by including net imputed rent in taxable income.

Most of the country-specific studies that investigate how imputed rent for social renters impacts income distribution conclude that social housing 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.

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. A similar analysis 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 for Germany using SOEP⁴ 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

Our method of assessing the effect of housing policies on inequality and poverty relies partially on practices described in the previous literature, particularly on [Maestri \(2015\)](#) and [Verbist and Grabka \(2017\)](#).

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 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. 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

⁴German socio-economic panel study.

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:

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

Cash housing benefits correspond to the housing allowances paid by public authorities to help households meet the cost of housing (including rent benefits and owner-occupiers' benefits to help with paying their mortgages or interest), while in-kind housing benefits represent the cash advantage from being in a reduced-rent dwelling.

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), 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 income⁵ (total household cash income + cash transfers - cash housing benefits - taxes). Therefore, we estimate four different income measures, including the combined or separate gains from housing policies and the baseline income measure, as follows: (i) income excluding cash housing benefits as our baseline, (ii) income including both cash and in-kind housing benefits, i.e., $HP_{cash+in-kind}$, (iii) income including only cash housing benefits, i.e., HP_{cash} , and (iv) income including only in-kind housing benefits, i.e., $HP_{in-kind}$.

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

⁵Equivalized 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.

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), considering housing-specific subsidies (housing benefits and reduced rents). In principle, we should observe a less unequal distribution of housing services than that of housing expenses and consumption expenditure because housing policies reduce actual housing expenses for the poorest households.

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 policies⁶. 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:

$$FGT_{\alpha c} = \frac{1}{N_c} \sum_{i=1}^{N_c} \left(\frac{z_c - y_{ic}}{z_c} \right)^{\alpha} \mathbb{1}(y_{ic} \leq z_c) \quad (2)$$

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

⁶We 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.

dummy equal to 1 if the equivalized disposable income of household i is equal or below the poverty threshold z_c .

To compute the poverty threshold z_c , we follow the recommendation from Eurostat⁷, with a poverty line sets at 60% of the national median equivalized disposable income. Thus:

$$z_c \equiv \text{Poverty line}_c = \text{Median income}_c \times 0.6 \quad (3)$$

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 . We estimate four different poverty lines, one for each income measure, and compare the share of households below the poverty line for the three different income measures under housing benefits to that of the baseline income measure.

The degree of the parameter α provides different poverty measures. The higher the value of α , the greater the weight given to the poorest individuals⁸.

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.

Table 1: Distribution of cash advantages from housing policy variables by tenure status

Variable	HP _{cash+in-kind}	HP _{cash}	HP _{in-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	Housing benefits	Housing benefits	/
Market-rent tenants	Housing benefits	Housing benefits	/
Reduced-rent tenants	(IR - R) + Housing benefits	Housing benefits	IR - R
Free-rent tenants	/	/	/

Notes: HP = housing policies, IR = imputed rent, R = rent.

Sources: authors' chart.

Imputed rent IR is the equivalent market rent that shall be paid for a similar dwelling

⁷https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:At-risk-of-poverty_rate.

⁸The higher the FGT index, the more poverty there is in a country. FGT_0 corresponds to the headcount ratio (i.e., the proportion 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.

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., owners and reduced-rent tenants) or rent-free.

Rent R is the current total rent paid by the household plus housing benefits, representing the full rent payable to the owner. For example, if the household pays the owner €500 from their own resources and also receives €200 in cash housing benefits (paid directly to the owner or not), the payable rent R is equal to €700.

Finally, $HP_{cash+in-kind}$ is the cash advantage from both current housing policies (cash + in-kind housing benefits). HP_{cash} represents the cash advantage from the cash housing benefits alone, i.e., a hypothetical situation where reduced-rent subsidies do not exist. $HP_{in-kind}$ represents the cash advantage from social housing alone, i.e., a hypothetical situation where cash housing benefits do not exist.

3.2 Housing services and expenses measurement

Housing services, expenses⁹, and net gain by tenure status are computed as follows.

Table 2: Distribution of housing expenditure variables by tenure status

Variable	R	IR	HS	HE	NG
Tenure status	Rent	Imputed rent	Housing services	Housing expenses net of cash and in-kind housing benefits	Net gain HS - HE
Outright owners	.	X	IR + UC	UC - Housing benefits	IR + HB
Owners with mortgage	.	X	IR + UC	(UC + i.M) - Housing benefits	(IR - i.M) + HB
Market-rent tenants	X	.	R + UC	(R + UC) - Housing benefits	HB
Reduced-rent tenants	X	X	IR + UC	(R + UC) - Housing benefits	(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 are the total housing costs¹⁰ (except rent and mortgage interest + principal repayments) arising from a dwelling for all tenure status. Usage costs are computed as the sum of structural insurance, mandatory services and charges (sewage removal,

⁹The terms of housing expenses and housing expenditures are used interchangeably.

¹⁰EU-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 G for additional comments and references related to the user costs computation.

refuse removal, etc.), regular maintenance and repairs, taxes (property and/or dwelling), and the cost of utilities (water, electricity, gas, and heating).

i.M is the mortgage interest repayments (applied only to the owners with mortgages).

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 represent what the households actually and currently pay, taking into account cash and in-kind housing benefits¹¹.

Net gain NG is a proxy for the cash or financial advantages of the different tenure status choices¹². It considers both housing policies and owners/free-rent tenants' advantages arising from the difference between imputed rent and dwelling' related housing costs¹³.

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 econometric model using weighted least squares for each country.

$$\frac{\text{Net gain}_i}{\text{Net gain}_{c0}} = \beta_0 + \sum_{k=1}^4 \beta_k \times \mathbb{1}\{\text{Tenure status}\}_{ik} + X' \beta_2 + \epsilon_i \quad (4)$$

Net gain_{*i*} is the net gain of household *i* normalized by the average net gain of country *c* (Net gain_{*c0*}), which enables the coefficients to be easily compared (see, Table 2 for the method of computing the variable Net gain¹⁴). 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

¹¹For a matter of convenience, negative values of housing services and expenses are put to zero.

¹²We set the negative values of the net gain to zero.

¹³Therefore, Net gain is different from the variables define above, which correspond to the cash advantages of the different housing policies only.

¹⁴Net gain_{*i*} corresponds to the net gain/CU/month.

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). Finally, ϵ_i is the error term.

A first overview of the expected outcome is presented in Figure D.1 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 countries¹⁵.

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 data are divided by the consumption units (OECD modified scale)¹⁶ 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 years of the survey are 2015-2016. The data most pertinent to our study are household characteristics (income, size, age, etc.)¹⁷ and housing data (e.g., current rent, imputed rent, housing benefits, tenure status, dwelling type, housing costs, mortgage prin-

¹⁵It should be noted 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).

¹⁶OECD 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.

¹⁷For a matter of convenience, negative values of incomes are put to zero.

capital repayments, and mortgage interest repayments). Housing 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), and (iii) 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 of in-kind housing policies.

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 zero¹⁸. These missing values represent 2.5% of the total sample (i.e., all countries), ranging from 0% to 11.4% for the country-specific samples (see, [Table C.1](#)). To avoid a possible bias due to a change in the sample's weights and distribution

¹⁸We also correct the imputed rent values for reduced-rent tenants to make them comparable to another tenure status, because, in EU-SILC, imputed rents for this category are computed as the difference between the estimated imputed rent and the actual rent. Thus, for our estimates, we add (again) the actual rent to the imputed rent.

when deleting observations with missing values, we use an imputation method to account for these missing observations (see, subsection 4.4).

We limit our panel to the 28 EU countries¹⁹, excluding Romania, for which there is no available data on imputed rents. Thus, our final panel is composed of 27 EU countries (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 2010. It contains harmonized data on household 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 expenditures.

Austria and Netherlands are not part of the HBS panel. We, therefore, have to impute the 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 Variables adjusted for inflation and difference in standard of living

Inflation-adjusted. HBS data are only available for the year 2010, while the EU-SILC data are available for the years 2015-2016. Thus, to avoid a possible bias due to the price difference, all variables that represent an amount of money are adjusted for inflation. We divide these variables by the Deflator_{2016} , which is calculated as follows: $\text{Deflator}_{2016} = \text{HCPI}_{2010} \backslash \text{HCPI}_{2016}$, where HCPI corresponds to the harmonized consumer price index from the Eurostat database²⁰ for each country.

¹⁹Before Brexit.

²⁰<https://ec.europa.eu/eurostat/web/products-datasets/product?code=TEC00027>.

Currency- and purchasing-power-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 Eurostat²¹ as a reference base, which means that the variables are expressed in euros according to the average 2016 PPP of the EU-28 household final consumption expenditure.

4.4 Statistical matching and imputation of missing values

As mentioned above, consumption expenditure is 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 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 B.

5 Stylized facts

Tenure status. Using EU-SILC and OECD data, we are able to compare the European countries in terms of housing market tenure characteristics and spending in housing policies. However, in some countries there is no clear distinction between market rent and social rent, either because (almost) all households are considered as owning their home, or because all tenants live in social housing. In this case, all tenants are classified in EU-SILC as tenants at market rent. This is the case in the Netherlands, Denmark, and Sweden. Note that there is no consensus on tenants classification among the official statis-

²¹<https://ec.europa.eu/eurostat/web/purchasing-power-parities/data/database>.

tical institutes for these countries: OECD²² data show tenure status proportions that are similar to Eurostat data, while the European Social Housing Observatory (CECODHAS) reports different reduced-rent tenants shares for instance.

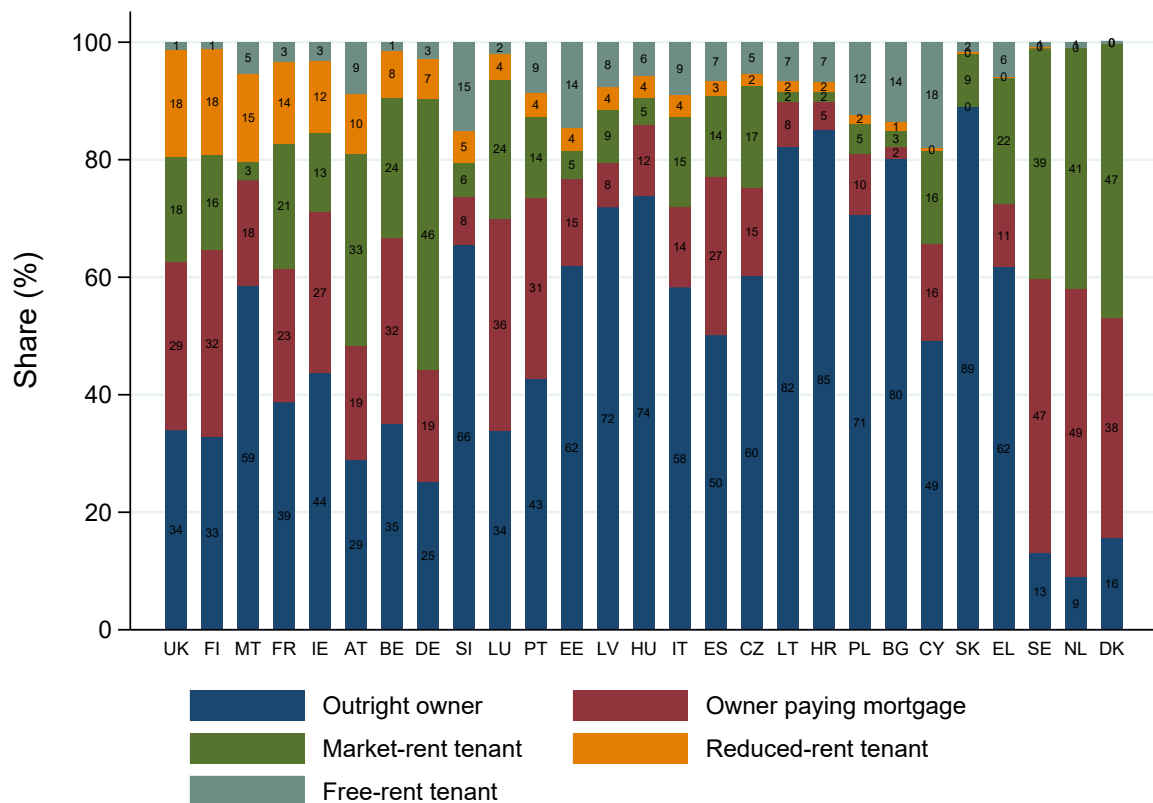
At this stage, we would like to warn that our conclusions depend on conventions on the chosen classification of housing as social housing by Eurostat. Of course, we benefit from harmonized conventions throughout Europe, but they may represent a too-straight jacket for some specific countries. These conventions 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 20th 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 Austria²³. Our concern is not limited to Austria, and is about other Northern European countries

²²<https://www1.compareyourcountry.org/housing>.

²³<http://iibw.at/documents/2017%20IIBW.%20Wien.%20Berichtstandard%20WBF.pdf>.

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 15% of reduced-rent tenants, the third highest share. Even within this group, there are differences. For example, while in the UK, Finland, Malta, and France the share of reduced-rents tenants varies from 18% to 14%, it is only 8% and 7% respectively for Belgium and Germany (see, Figure 1). In map 2, the distinction between countries with a high share of reduced-rent tenants and others is even clearer.

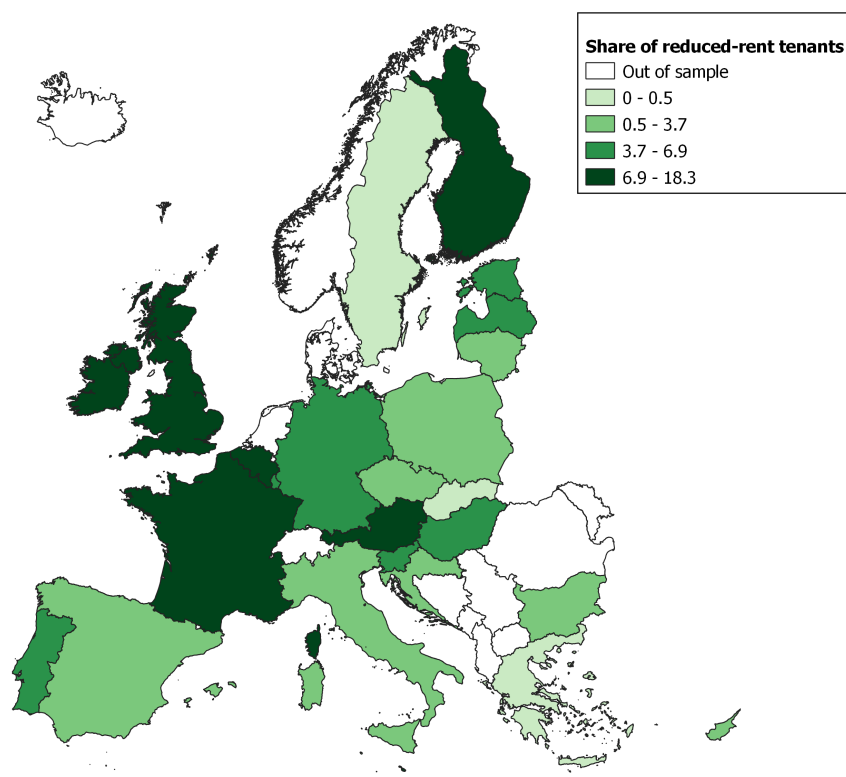
Figure 1: Distribution of tenure status



Notes: countries are sorted from high to low share of reduced-rent tenants.

Sources: EU-SILC 2016; authors' graph.

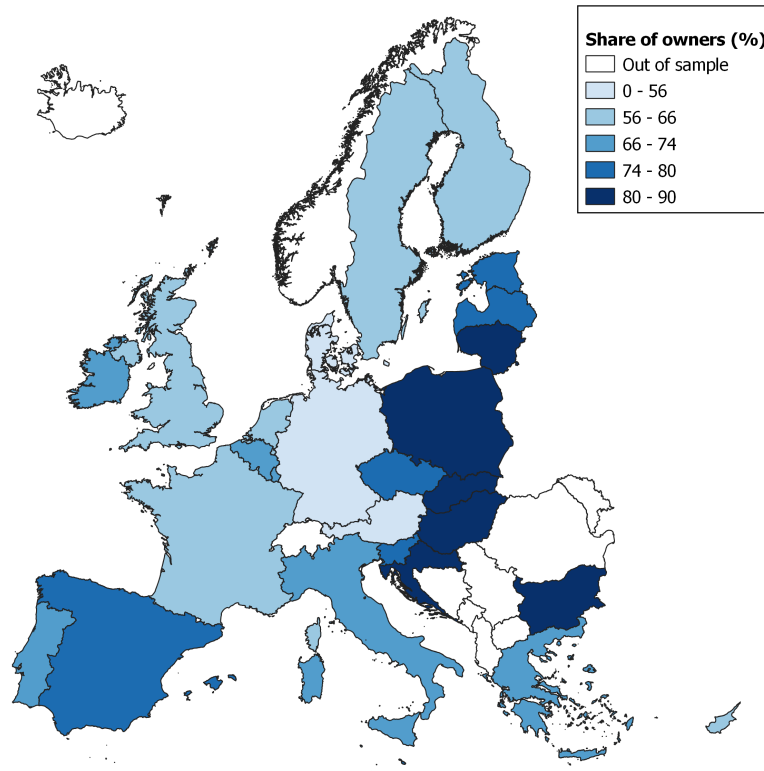
Figure 2: Share of reduced-rent tenants among total households



Sources: EU-SILC 2016; authors' drawing.

A second group with a very high home-ownership rate, especially outright owners (60%-90%), is composed mainly of Eastern European countries (see, Figure 3), for historical reasons: dwellings were privatized following the end of Communism, and households could buy their homes for a relatively cheap price.

Figure 3: Share of owners among total households



Notes: owners = outright owners and owners with mortgage.

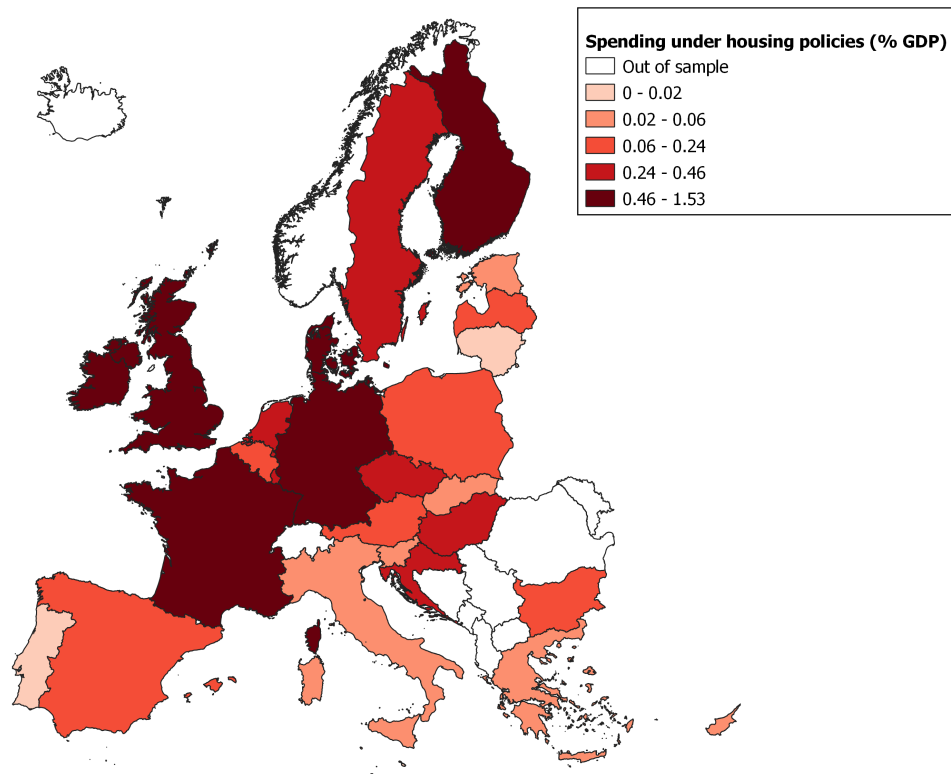
Sources: EU-SILC 2016; authors' drawing.

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 77%. The share of market-rent tenants is the highest in the Nordic countries (Denmark, Netherlands, Sweden²⁴, Germany, and Austria) and is similar in proportion to that of owners with mortgages. Finally, the share of free-rent tenants is the highest in Cyprus, Italy, Austria, Portugal, and the Eastern European countries, ranging between 7% and 18%.

²⁴As previously explained, the Netherlands, Denmark, and Sweden are a special case regarding reduced-rent tenants.

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

Figure 4: Spending under housing policies in % of GDP

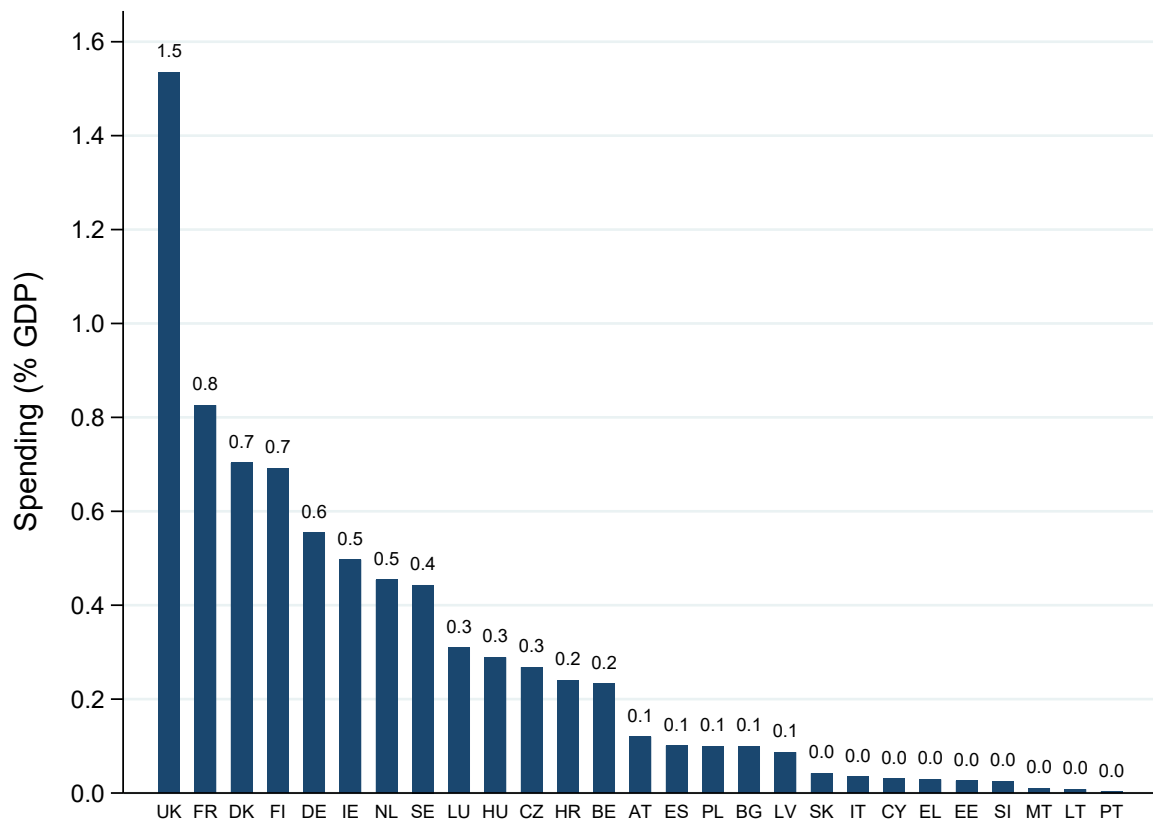


Sources: OECD 2015; authors' drawing.

Based on their spending as a percentage of GDP, European countries can be divided into four groups (see, Figure 5) as follows. (i) A top group composed of countries spending between 1.5% and 0.6%, (ii) an upper-middle group—the largest number of countries—with countries spending between 0.5% and 0.3%, (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. Obviously, most of the countries in the top two groups are Western and Nordic countries, with the exception of Hungary and Czechia (0.3%). The UK is the most generous country, devoting 1.5% of its GDP to public spending on housing. The second most generous country is France, with 0.8% of its GDP devoted to housing policies

spending, thus a ratio of 1 to 2 compared to the UK. The two bottom groups are mainly made up of Southern and Eastern European countries, with the surprising exception of Belgium and Austria, which spend only 0.2% and 0.1%, respectively.

Figure 5: Spending under housing policies in % of GDP



Notes: countries are sorted from high to low spending in % of GDP.

Sources: OECD 2015; authors' graph.

Overview of the housing policies. A first synthesis of the results can be seen in Figures 6 and 7, which present the share of households that benefit from housing policies and the average financial advantage in income proportion. Surprisingly, the country with the highest percentage of households benefiting from one or both housing policies (cash or in-kind housing benefits) is Ireland (35%). 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 25% 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 (31%), as well as in Finland (29%), Malta (25%), 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 (14%), or Belgium (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 support²⁵. For example, in Ireland, a large proportion of households receive cash housing benefits (29%), while the share of low-rent tenants is much lower (12%). In France, more households receive cash housing benefits than social housing (25% and 14% 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 gain²⁶ per household as a percentage of income from the two housing policies, the UK ranks the highest, with on average 48% of gain per recipient household, followed by Germany (46%) and Greece (34%), while Finland and France are respectively 6th and 14th. Luxembourg, Austria, and Poland are ranked last, with a mean gain of around 8%. On mean gain from cash housing benefits alone, the UK and Germany also lead the way, with around 50% per household on average, followed by Czechia (36%) and Slovakia (35%). The last one is Portugal, with only 2% on average per household.

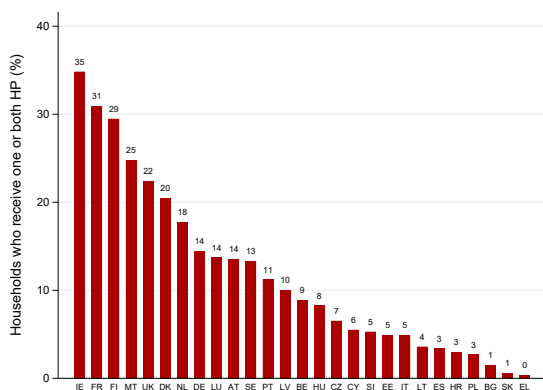
Sweden and Greece have the highest mean gain from in-kind housing benefits (36% of the disposable income on average), followed by Spain (34%). Therefore, we can conclude that, although these countries spend less or little on housing policies, and probably grant housing benefits according to very selective and targeted criteria, nevertheless the amount of housing benefits represents a substantial contribution for these households. At the

²⁵Here, we are not talking about the share of spending in each housing policy. Unfortunately, data on spending split between social housing and cash housing benefits are not harmonized nor available for all the European countries.

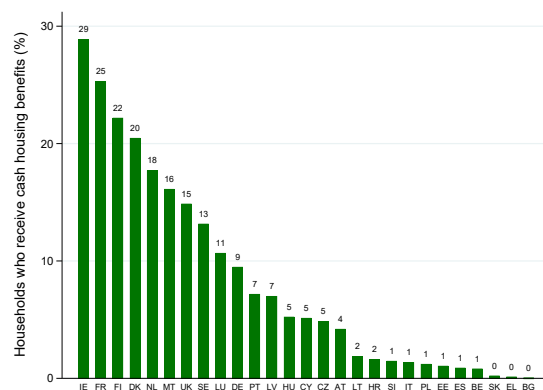
²⁶Mean gain corresponds to the cash advantage from housing policies (see, Table 1). We winsorized (or censored) the top extreme abnormal values, by replacing the values higher than the 0.1 percentile value with the top 0.1 percentile value.

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

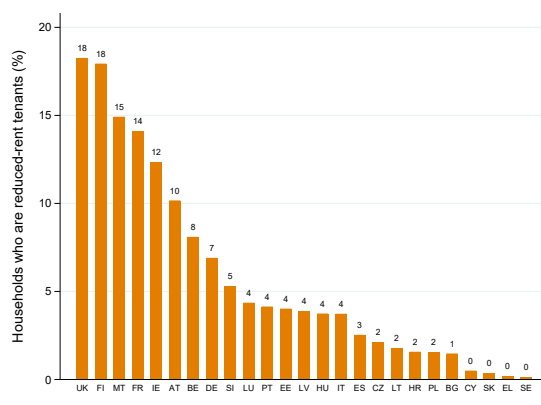
(a) Share of households receiving one or both housing benefits among total population



(b) Share of households receiving cash housing benefits among total population



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

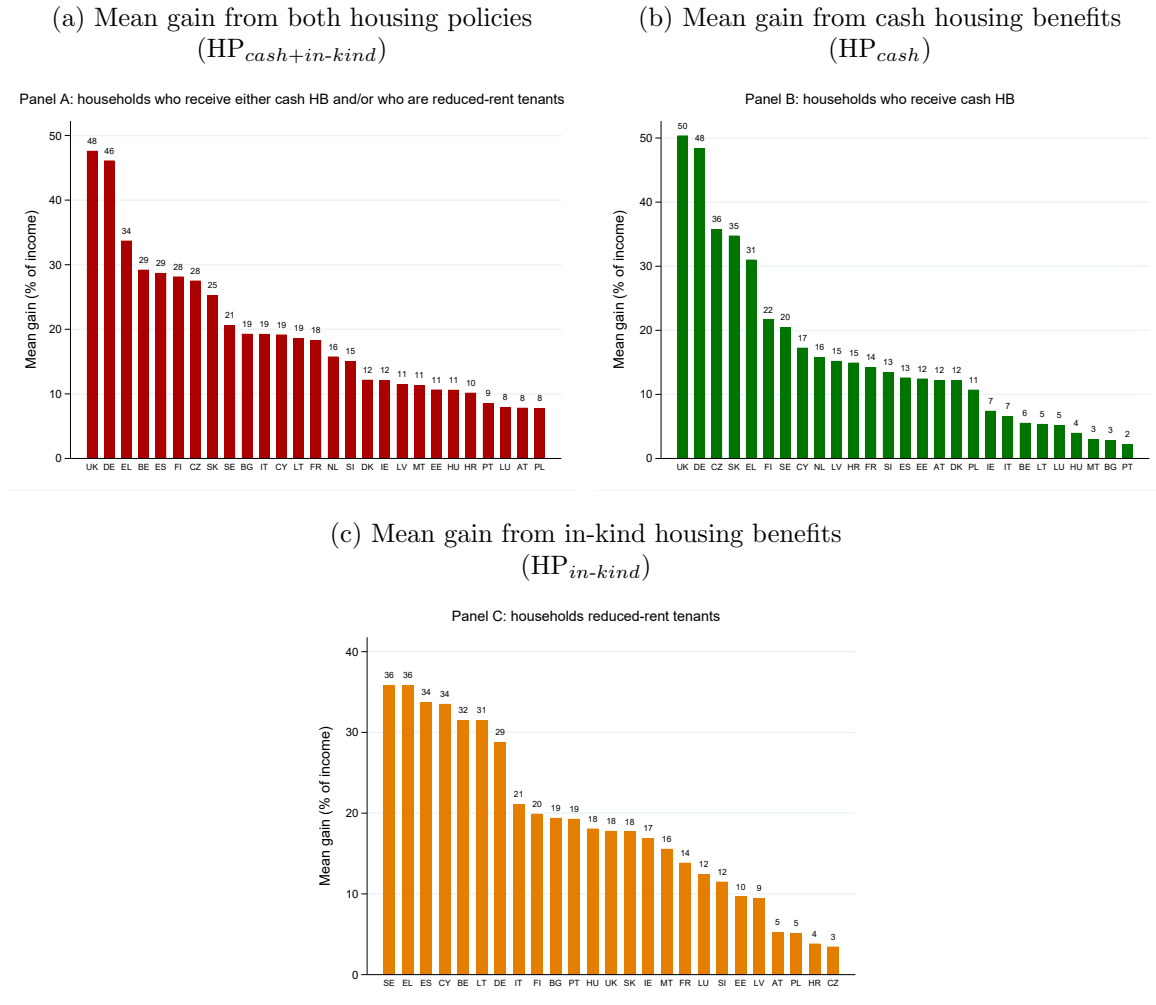


Notes: Housing Policies = cash or in-kind housing benefits. Countries are sorted from high to low percentage.

Sources: EU-SILC 2016; authors' graphs.

bottom of the distribution, the mean gain as a percentage of the income from social housing is only between 4% and 3% in Croatia and Czechia. It is also worth noting that we observe no correlation between the share of reduced-rent tenants and the mean gain from in-kind housing benefits, meaning that EU governments do not seem to trade-off the two dimensions (see, Figures D.2 and D.3).

Figure 7: Mean gain from HP in proportion of income (%)



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

Sources: EU-SILC 2016; authors' graphs.

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 live 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 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.

6 Results

6.1 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 (disposable income minus any cash housing benefits per consumption unit) to the Gini coefficients of income after including either cash housing benefits, in-kind housing benefits, or both.

Detailed results are presented in Table 3 and plotted in Figure 8. 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 Lithuania, Bulgaria, Latvia, Estonia, Portugal, and Greece, while the least unequal are Slovakia, Slovenia, Czechia, and Belgium.

Table 3: Reduction in inequality after inclusion of housing benefits

Gini							
Country	Income (baseline)	Income + HP _{cash+in-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}	% Δ
Finland	0.29	0.26	-8.57***	0.27	-6.23***	0.28	-2.85***
United Kingdom	0.34	0.32	-7.75***	0.32	-6.24***	0.33	-2.3***
Germany	0.32	0.31	-5.12***	0.31	-3.84***	0.32	-1.39***
France	0.31	0.3	-4.74***	0.3	-3.85***	0.31	-1.12***
Ireland	0.32	0.31	-4.53***	0.31	-2.38***	0.31	-2.21***
Netherlands	0.3	0.29	-3.89***	0.29	-3.89***	0.3	0
Sweden	0.3	0.28	-3.69***	0.28	-3.61***	0.29	-0.08*
Denmark	0.29	0.28	-3.55***	0.28	-3.55***	0.29	0
Malta	0.29	0.28	-3.14***	0.29	-0.69***	0.29	-2.5***
Belgium	0.27	0.27	-3***	0.27	-0.05**	0.27	-2.96***
Czechia	0.26	0.26	-2.11***	0.26	-2.03***	0.26	-0.1***
Austria	0.29	0.28	-1.05***	0.29	-0.66***	0.29	-0.4***
Slovenia	0.26	0.26	-0.93***	0.26	-0.29***	0.26	-0.69***
Luxembourg	0.29	0.28	-0.89***	0.29	-0.44***	0.29	-0.49***
Latvia	0.37	0.37	-0.8***	0.37	-0.55***	0.37	-0.25***
Italy	0.33	0.32	-0.77***	0.33	-0.11***	0.32	-0.66***
Spain	0.34	0.34	-0.75***	0.34	-0.1***	0.34	-0.65***
Cyprus	0.33	0.33	-0.59***	0.33	-0.52***	0.33	-0.08*
Portugal	0.35	0.34	-0.58***	0.35	-0.05***	0.35	-0.54***
Hungary	0.28	0.28	-0.5***	0.28	-0.27***	0.28	-0.25***
Lithuania	0.39	0.39	-0.45***	0.39	-0.09***	0.39	-0.36***
Estonia	0.35	0.35	-0.34***	0.35	-0.16***	0.35	-0.18**
Croatia	0.32	0.32	-0.29***	0.32	-0.25***	0.32	-0.04***
Poland	0.31	0.31	-0.2***	0.31	-0.14***	0.31	-0.07***
Bulgaria	0.38	0.38	-0.13***	0.38	0	0.38	-0.13***
Slovakia	0.25	0.25	-0.12**	0.25	-0.07*	0.25	-0.05*
Greece	0.34	0.34	-0.04*	0.34	-0.02*	0.34	-0.02
EU-27	0.35	0.34	-2.91***	0.34	-2.27***	0.34	-0.82***

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-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 2016; authors' table.

On reduction of inequality, combining both policies (cash and in-kind housing benefits), the countries showing with the most effective inequality reduction are obviously Western and Nordic countries (at the exception of Malta): Finland (-8.57%), the UK (-7.75%), Germany (-5.12%), France (-4.74%), Ireland (-4.53%), the Netherlands (-3.89%), Sweden (-3.69%), Denmark (-3.55%), Malta (-3.14%), and Belgium (-3%). In contrast, the worst

performers at reducing inequality are Eastern and Southern countries: Greece (-0.04%), Slovakia (-0.12%), Bulgaria (-0.13%), Poland (-0.2%), Croatia (-0.29%), Estonia (-0.34%), Lithuania (-0.45%), and Hungary (-0.5%). Between these extremes are countries whose policies yield a limited overall effect.

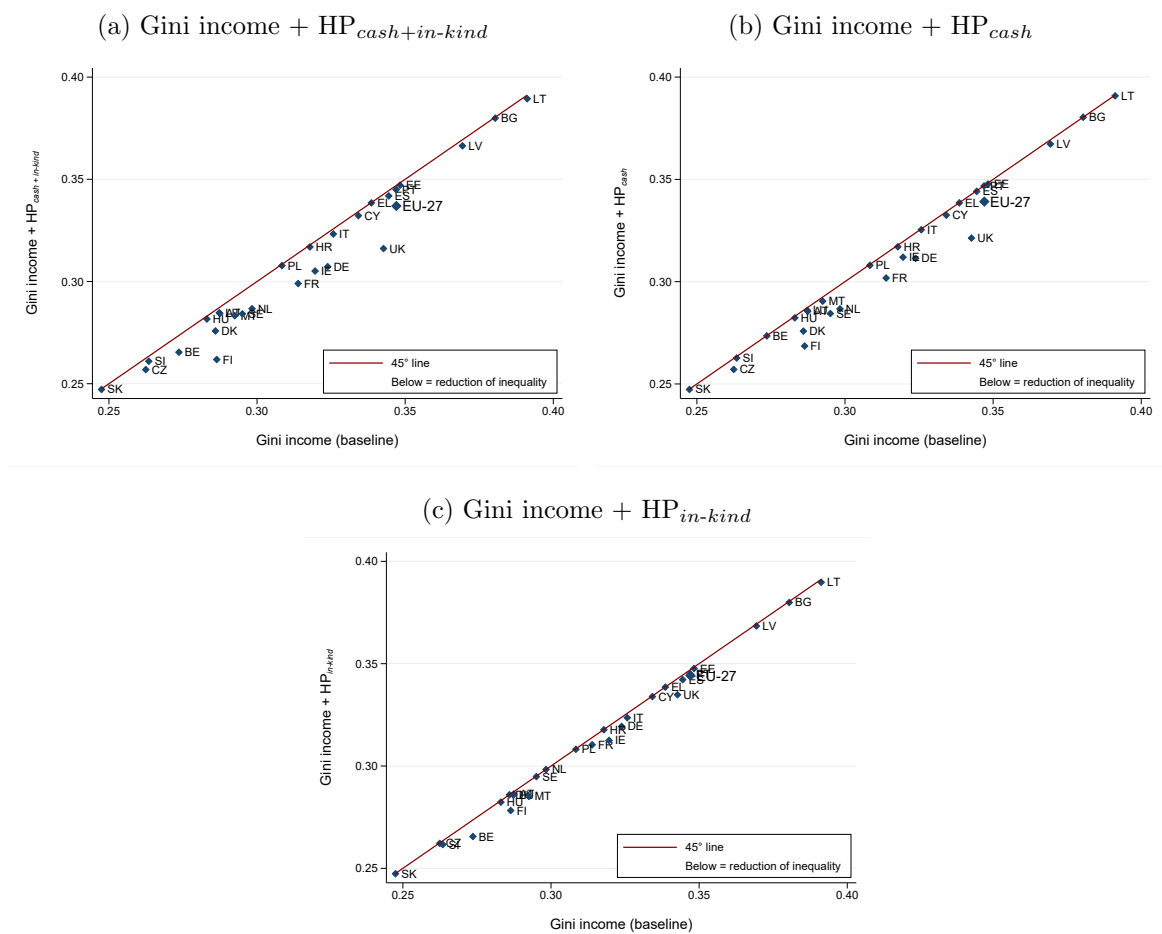
The inequality-reducing effect of cash housing benefits follows a similar distribution among European countries. At the top, we find the UK (-6.24%), Finland (-6.23%), the Netherlands (-3.89%), France (-3.85%), Germany (-3.84%), Sweden (-3.61%), and Denmark (-3.55%). At the bottom, Bulgaria, Greece, Portugal, Belgium, Slovakia, and Lithuania experience an inequality-reducing effect close to 0%.

Regarding the inequality-reducing effect of social housing, Belgium is ranked first with -2.96%, followed by Finland (-2.85%), Malta (-2.5%), the UK (-2.3%), and Ireland (-2.21%). While Germany and France are among the countries with the highest share of reduced-rent tenants, the effectiveness of their policies is lower, with only -1.39% and -1.12% reduction of inequality, respectively.

Finally, the overall inequality-reducing effect of the two housing benefits combined in the EU-27 is quantified at -2.91%. Cash housing benefits appear to have the largest reducing effect, with -2.27% compared to -0.82% 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 9, 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 $[0; 0.5[$, medium $[0.5; 1[$, high $[1; 1.5[$), 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 effective than the average in reducing inequality accounting for their GDP share devoted to redistributive housing policies. Finland strongly leads the league, being 5 points more efficient than its predicted reduction value. Other cost-effective countries in reducing housing inequality are Germany, Ireland,

Figure 8: Gini of baseline income compared to income including housing benefits

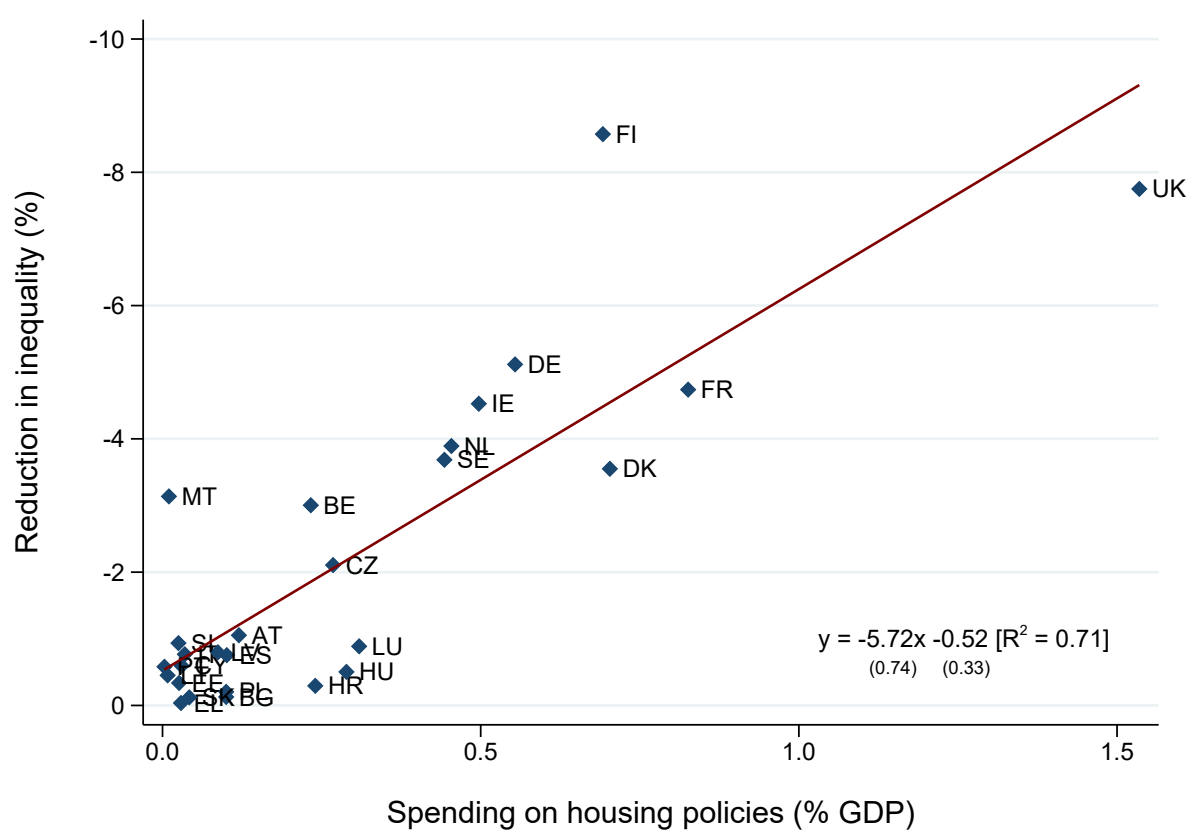


Notes: income represents disposable income/CU/month without housing benefits.

Sources: EU-SILC 2016; authors' graphs.

the Netherlands, Sweden, Belgian, and Malta. On the opposite, the UK, which spends around 1.5% of its GDP on housing policies—twice as much as 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.

Figure 9: Percentage of reduction in inequality according to the spending under housing policies in % of GDP



Notes: 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 standards errors (in parentheses).

Sources: EU-SILC 2016; authors’ graph.

6.2 Poverty

We now look at the poverty-reducing effect of separate and combined housing benefits. To do so, we compare the proportion of households below the poverty line (60% of median income) with baseline income (disposable income minus any cash housing benefits

per consumption unit) to the percentage 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, Lithuania, Estonia, Croatia, Bulgaria, and the United Kingdom, with poverty rates ranging from 23.68% to 21.13%, while the mean in the EU-27 is 18.57%. In contrast, the countries with the lowest poverty rate are France, Hungary, Belgium, Denmark, Slovakia, and Czechia, with poverty rates ranging between 14.8% and 9.91% (see, Table 4 for details).

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—Ireland, the Netherlands, the United Kingdom, Sweden, France, Malta, Belgium, and Germany, with a reduction of one-tenth. We observe a poverty-reducing effect of housing policies for all countries except Estonia, where the poverty rate increases 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 -27.76% (Finland) to -6.61% (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 -11.57% (Belgium) and -2.94% (Germany) for the most effective countries, and there is even some increase in the poverty rate for the remaining countries (mainly Eastern European countries).

The difference in poverty reduction between cash and in-kind housing benefits is exemplified in Figure 10, 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

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-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}	% Δ
Finland	17.2	11.65	-32.24***	12.43	-27.76***	15.91	-7.48***
Ireland	20.61	15.16	-26.43***	16.62	-19.34***	18.84	-8.59***
Netherlands	16.01	12.1	-24.45***	12.1	-24.45***	16.01	0
United Kingdom	21.13	16.65	-21.24***	16.96	-19.73***	20.24	-4.25***
Sweden	19.54	15.47	-20.82***	15.5	-20.7***	19.56	0.09
France	14.8	12.35	-16.58***	12.99	-12.24***	14.23	-3.88***
Malta	15.5	13.56	-12.49***	14.89	-3.91***	13.99	-9.72***
Belgium	13.55	11.95	-11.82***	13.52	-0.25	11.98	-11.57***
Germany	20.56	18.44	-10.3***	19.2	-6.61***	19.95	-2.94***
Denmark	13.53	12.43	-8.08***	12.43	-8.08***	13.53	0
Czechia	9.91	9.28	-6.34***	9.31	-6.05***	9.86	-0.5*
Austria	15.37	14.6	-4.97***	14.81	-3.65***	15.22	-0.95
Slovenia	16.5	15.93	-3.47***	16.28	-1.32***	16.21	-1.77**
Latvia	23.68	23.18	-2.11***	23.25	-1.82***	23.43	-1.04*
Luxembourg	15.87	15.58	-1.81	15.64	-1.43	15.54	-2.05*
Spain	20.96	20.74	-1.03**	20.89	-0.34	20.82	-0.69
Italy	19.89	19.71	-0.92*	19.85	-0.2	19.71	-0.9*
Cyprus	16.93	16.78	-0.89	16.79	-0.85	17.26	1.96**
Portugal	18.93	18.78	-0.82	18.91	-0.13	18.78	-0.8
Croatia	21.8	21.67	-0.6**	21.69	-0.5**	21.78	-0.1
Lithuania	22.38	22.27	-0.49	22.33	-0.2*	22.29	-0.37
Poland	17.3	17.26	-0.19	17.22	-0.47**	17.32	0.14
Hungary	14.32	14.29	-0.17	14.11	-1.41***	14.48	1.15
Greece	20.62	20.6	-0.1	20.61	-0.03	20.61	-0.06
Bulgaria	21.31	21.31	-0.01	21.31	0	21.31	-0.01
Slovakia	11	10.99	-0.01	11	0.03	11.01	0.16
Estonia	21.95	22	0.22	21.85	-0.47	22.01	0.29
EU-27	18.57	16.76	-9.8***	17.12	-7.82***	18.15	-2.26***

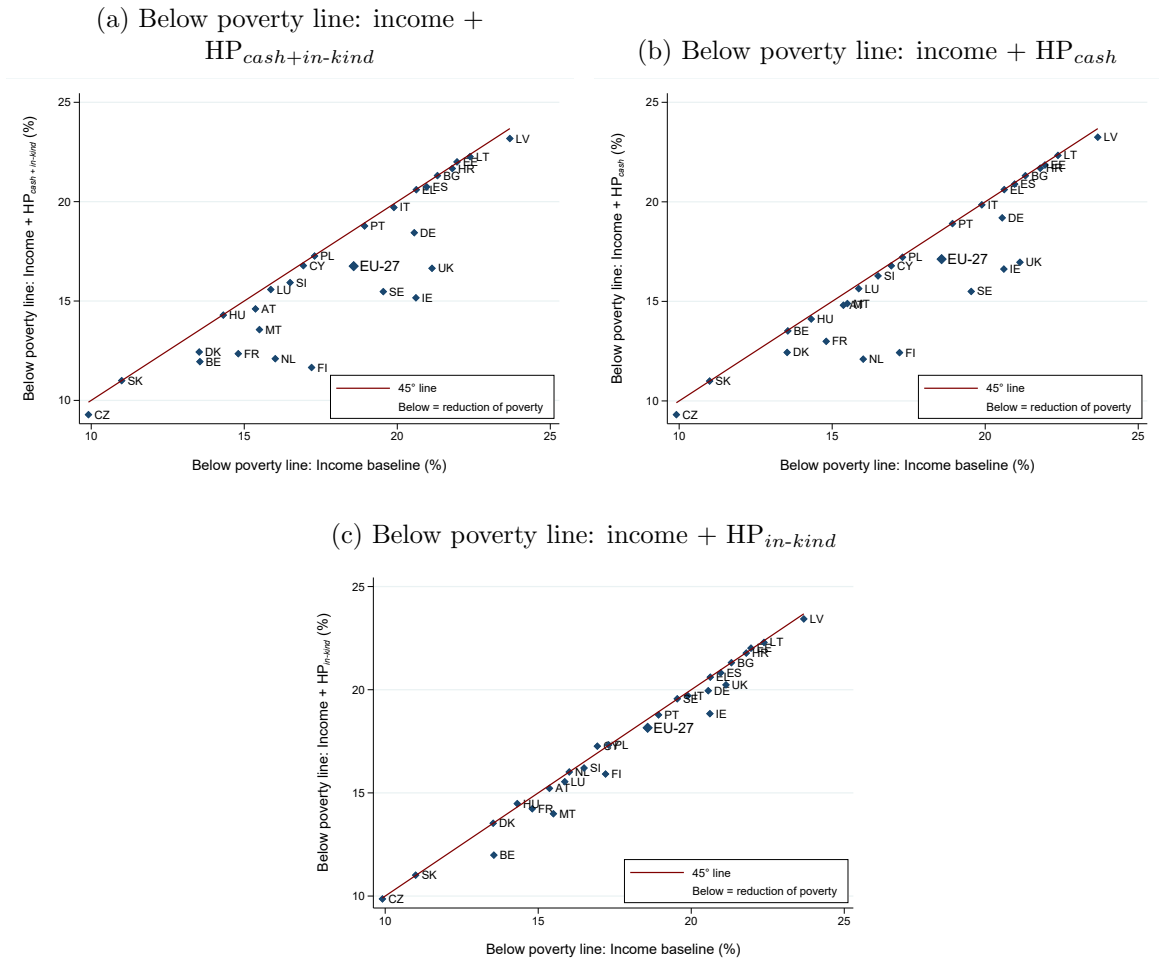
Notes: poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing policies. For the EU-27, we use floating poverty lines that allow for spatial variation, i.e., country-specific poverty lines, rather than one poverty line for all 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-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 2016; authors' table.

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 9.8%; the reduction is 7.82% with only cash housing benefits, and it drops to 2.26% with only in-kind housing benefits (see, Table 4).

Figure 10: Poverty rate (FGT_0) with baseline income compared to income including housing benefits



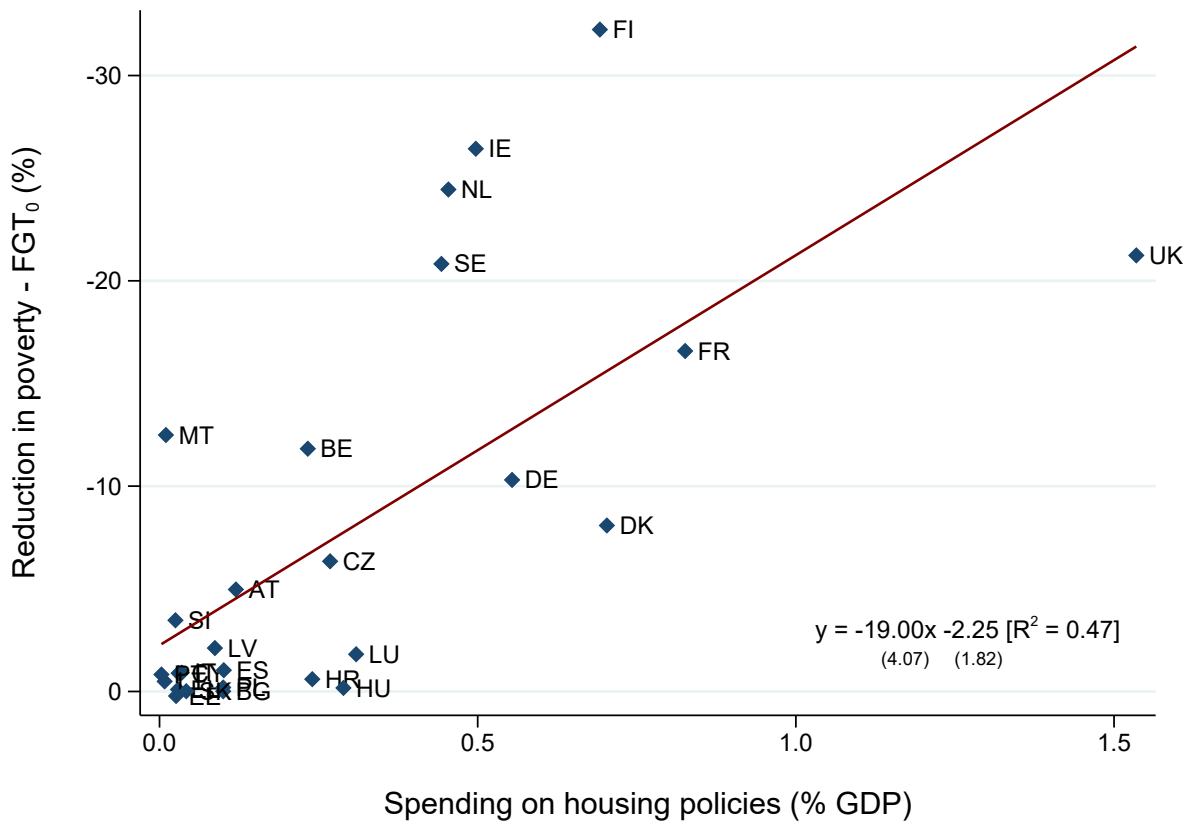
Notes: poverty rate represents the share of households below the poverty line. Poverty line = 60% of median income. We estimate four different poverty lines, one for each income measure with and without housing benefits. Income represents disposable income/CU/month without housing benefits.

Sources: EU-SILC 2016; authors' graphs.

Regarding the poverty-reducing effectiveness of public spending under housing policies, Finland ranks top, with an average poverty reduction of 32.24% for public spending of

0.7% of GDP. Next are Ireland and the Netherlands, with a poverty reduction of 26.43% and 24.45% respectively, for public spending of 0.5% 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 Sweden and France (around 20%) and much less than that of the Netherlands, Ireland, and Finland, although its public spending on housing is between twice and three times as high (see, Figure 11). It should be noted that again Denmark, and this time Germany, belong to the group of least efficient countries.

Figure 11: Percentage of reduction in poverty (FGT_0) according to the spending under housing policies in % of GDP



Notes: 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. 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 standards errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

Regarding the results using FGT_1 and FGT_2 , which examine the intensity and severity of poverty, we observe 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, 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 public policies focused on the poorest. In terms of the poverty-reducing effectiveness of public spending under housing policies, we again find that the UK and Denmark perform far worse than most Western countries and in particular, with respect to the above-quoted countries (see, Figures E.1 and E.2).

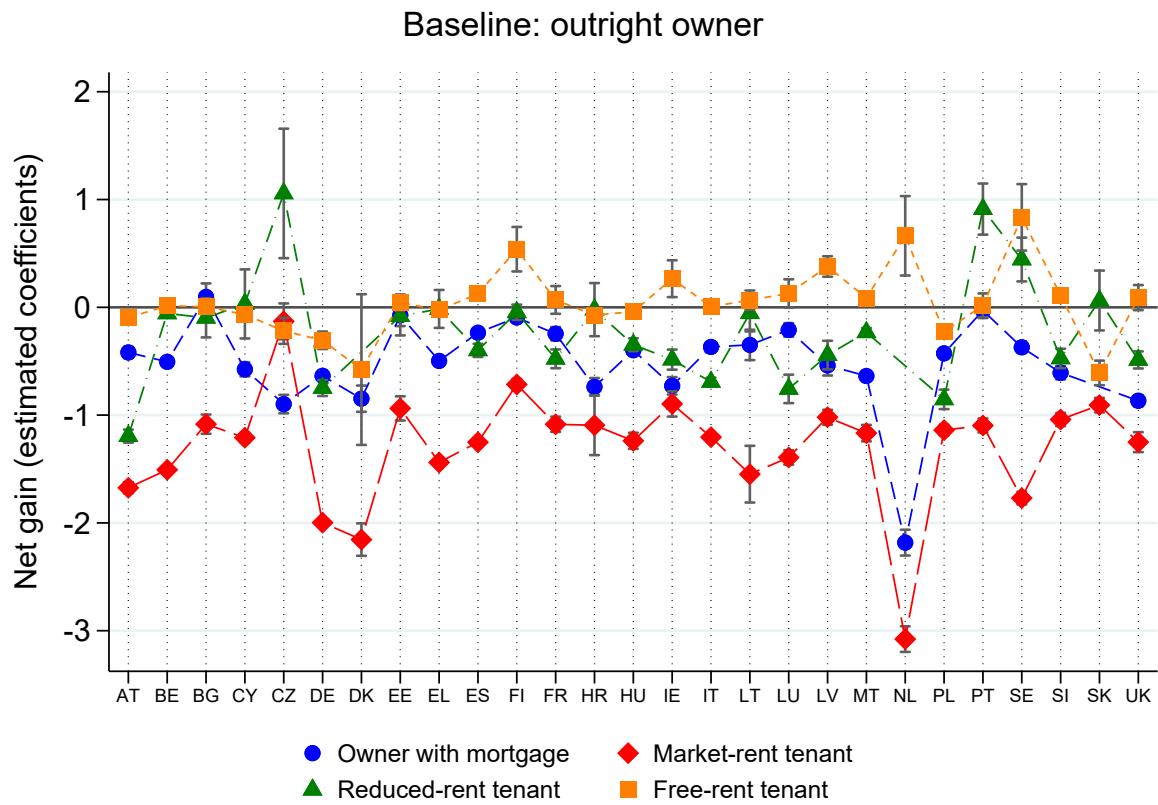
6.3 Net gain associated with tenure status

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. Outright owners are considered the baseline for comparison. Figure 12 provides the estimates using weighted least squares with robust standard errors from equation 4 for each country, with their 95% confidence intervals. 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 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".

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 Czechia, Poland, and Sweden,

Figure 12: Regression estimates: Net Gain by tenure status



Notes: estimates of equation 4 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 2016; authors' graph.

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.

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, ranging roughly between 1 and 2 times lower, except for the Netherlands again, where the net gain is 3 times lower. This means that on average, outright owners everywhere in European countries are significantly better off than market-rent tenants.

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.

6.4 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 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 consumption expenditure, which in turn is more equally distributed than housing expenses. 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 E.3, E.4, E.5, and E.6 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 Denmark, Lithuania, and Slovakia where all three curves overlap or intersect. Table 5 summarizes the Lorenz dominance relations at the country level. Housing services distributions dominate the two other distributions for 24 out of 27 countries and are never dominated. Results are more ambiguous for the comparison between consumption expenditures vs housing expenditures. The latter dominates the former for 13 countries while it is the opposite for 5 countries. There are also 9 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, Consumption expenditure

	Variable	Lorenz dominance		
		Housing services (HS)	Housing expenses (HE)	Consumption expenditure
Lorenz dominated	Housing services (HS)	/	0	0
	Housing expenses (HE)	24	/	5
	Consumption expenditure	24	13	/

Notes: for details, see Figures E.3, E.4, E.5, and E.6. 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.

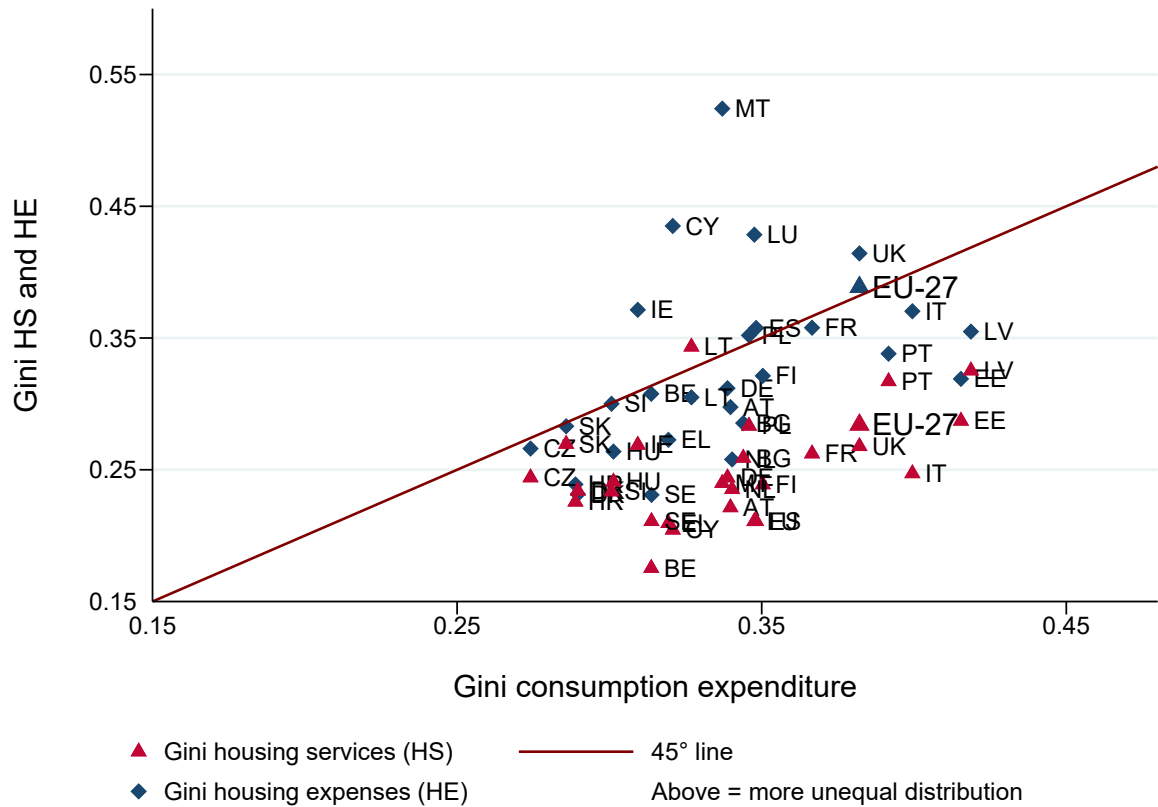
Sources: authors' table.

The difference is even clearer in Figure 13, which plots the Gini coefficients of 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 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 expenses²⁷. The figure reveals that the inequality of

²⁷In the EU-27, the Gini of HS is equal to 0.284 and the Gini of HE is equal to 0.389. Thus, a difference of 0.104 (p-value = 0.000).

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 average²⁸. It is also worth it to note that Belgium appears here as the European country with the lowest inequality in housing services, with an impressive Gini below 0.2.

Figure 13: Gini of 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 costs. Housing expenses corresponds to housing expenditures/CU/month including housing policies (cash + in-kind benefits).

Sources: HBS 2010 and EU-SILC 2016; authors' graph.

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

²⁸In the EU-27, the Gini of HS is equal to 0.284 and the Gini of consumption expenditure is equal to 0.382. Thus, a difference of 0.098 (p-value = 0.000).

7 Robustness check

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 tenants²⁹, 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 (see, [Table F.1](#) for the detail). 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

²⁹Market-rent + reduced-rent tenants.

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, her age, whether or not the reference person is a lone parent, 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 F.2 for the detail). If there is no convergence of the maximum likelihood estimator, then we run an OLS instead of using the same variables. This is the case for Czechia, Denmark, Estonia, Greece, Spain, Lithuania, the Netherlands, Poland, Sweden, and Slovakia. (2) We use the estimated coefficients to predict the imputed rents for owners, reduced-rent and free-rent tenants³⁰. (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 F.3, F.4. We see that most of the countries' rankings are maintained (e.g., Finland, the UK, Germany, France, the Netherlands, Ireland, Sweden, Denmark, Malta, and Belgium are still in the lead) as compared to the main results using EU-SILC's imputed rents. The magnitudes change only marginally.³¹ Ranking and magnitudes are also mostly maintained regarding FGT_1 and FGT_2 (see, Tables F.5 and F.6).

The preserved ranking in general, and the overall increase in inequality and poverty reduction for the Western countries are more vivid in Figures F.3, F.4, F.5 and F.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

³⁰We 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. This is done for only a few observations (between 1 and 49), for Cyprus, France, Germany, Italy, Lithuania, Luxembourg, Malta, and Portugal.

³¹Regarding the main results for inequality reductions including both housing benefits: the UK increases from -7.75% to -10.1%, Finland from -8.57% to -8.6%, France from -4.74% to -5.27%, Germany decreases from -5.12% to -4.39%; for poverty reductions: the UK increases from -21.24% to -22.62%, Finland from -32.24% to -35.32%, Germany decreases from -10.3% to -8.26% and France from -16.58% to -16.44%.

most of the countries is unchanged, with the exception of the UK, Finland, Ireland, and France, where inequality and poverty reduction increase, and Germany, where inequality and poverty reduction decrease slightly. But our results that the cash housing benefits performed better than in-kind housing benefits (i.e., reduced rents) are confirmed (see, Figures [F.1](#) and [F.2](#)).

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

Finally, our main results, are confirmed overall. Therefore, we can conclude that they are robust to the choice of the imputed rents 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. While previous investigations focused on a single policy or on the redistributive effect of the inclusion of imputed rents in income, we estimate and disentangle 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 effective than in-kind housing benefits (social housing) and more effective in reducing poverty than inequality. They provide evidence supporting and extending the finding by [Verbist and Grabka \(2017\)](#) for Germany, that most housing policies focus on the poorest households. We also find a positive correlation between this reducing effect and the level of public spending on housing. However, some countries, like Finland, Germany, France, Ireland, or Czechia achieve better results in reduced inequality and poverty at half the cost of the UK. The performance of Finland is particularly outstanding, the opposite of Denmark's one, which does not seem to be particularly cost-effective, just like the UK.

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

Finally, using a statistical matching method on the basis of EU-SILC and HBS³² datasets, we retrieve the households' total consumption expenditure and compare it to housing services and expenses. The analysis confirms that housing policies reduce housing

³²Household Budget Survey.

costs for the poorest households and therefore housing inequality between households, which becomes comparable to 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 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.

We also performed our own computation of the imputed rents as a robustness check. It shows that our main results are robust to the choice of the imputed rent estimation method.

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 2021).

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Appendices

A Tables

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

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	<ul style="list-style-type: none"> • Outright owner • Owner paying mortgage • Market-rent tenant • Reduced-rent tenant • Free-rent tenant 	HH021
Dwelling type	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Densely populated • Intermediate area • Thinly-populated area 	DB100
Region	NUTS 2	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	<ul style="list-style-type: none"> • Never married • Married • Widowed • Divorced 	PB190
Illness	Suffer from any chronic illness or condition	PH020
Status	<ul style="list-style-type: none"> • 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 2016; authors' table.

B 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 Agafitei \(2013\)](#) and [Tonkin and Serafino \(2017\)](#). The first step log-level regression model used to perform the statistical matching between HBS and EU-SILC is:

$$\log(\text{Expenditure}_i) = \beta_0 + X'\beta_1 + \epsilon_i \quad (5)$$

where Expenditure_i is the total consumption expenditure (without housing expenditures) 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 B.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 per decile of standards of living of the households' total consumption expenditure (i.e., matched variable) between EU-SILC (recipient dataset) and HBS (donor dataset). In [Figure B.1](#), we can see that the densities of both EU-SILC and HBS follow similar patterns for all countries. The mean households' consumption expenditure also shows a similar pattern per decile of standard of living between datasets (see, [Figure B.2](#)). Thus, the statistical matching can be considered accurate: and based on households' characteristics, the consumption expenditure values appear to be matched without bias.

Imputing missing values. The first step used to perform the imputation of missing imputed rent or rent³³ relies upon the following regression model:

$$\text{Rent}_i = \beta_0 + X'\beta_1 + \epsilon_i \quad (6)$$

where Rent_i ³⁴ represents the (non-missing) current imputed rents, or actual rents³⁵ 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 4: 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.

³³We also impute 500 missing or zero rent values for market-rent tenants at the same time.

³⁴We 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.

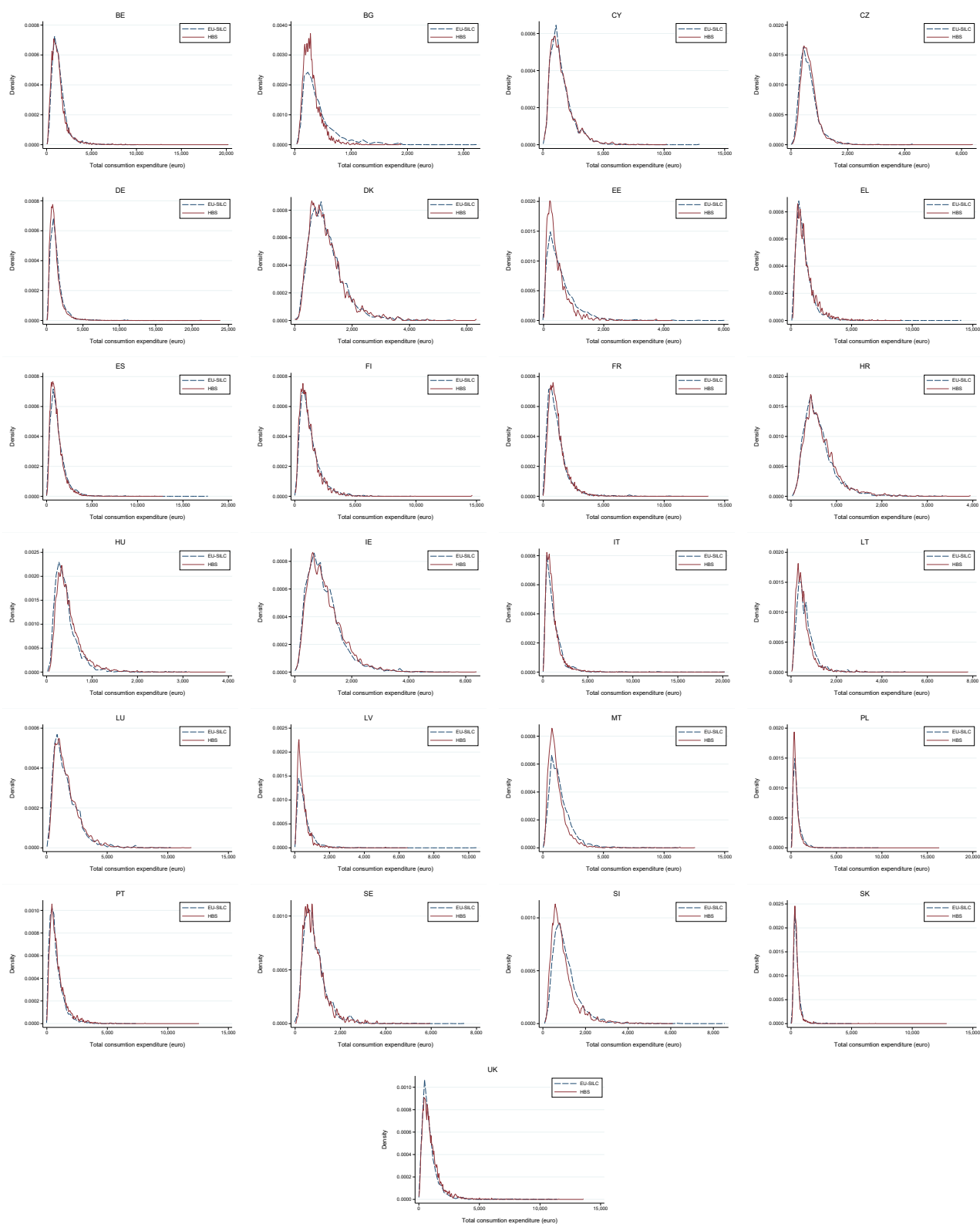
³⁵Including housing benefits. See, subsection 3.2 for the exact definition of imputed rents and rents variables.

Table B.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 costs	/	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	<ul style="list-style-type: none"> • Never married • Married • Widowed • Divorced 	PB190	MB04_Recoded_3Categ
Consensual union of reference person	<ul style="list-style-type: none"> • Person living in consensual union • Person not living in consensual union • Not specified 	PB200	MB042
Current activity status	<ul style="list-style-type: none"> • At work • Unemployed • Retired • Inactive 	RB210	ME01
Hours worked	<ul style="list-style-type: none"> • Full time • Part time • Not applicable • Not specified 	PL031	ME02
Type of contract	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Owner • Tenant • Free-rent tenant 	HH021	Deduced from EUR_HE0421 EUR_HE0411 EUR_HE0421
Degree of urbanization	<ul style="list-style-type: none"> • Densely populated • Intermediate area • Thinly-populated area 	DB100	HA09

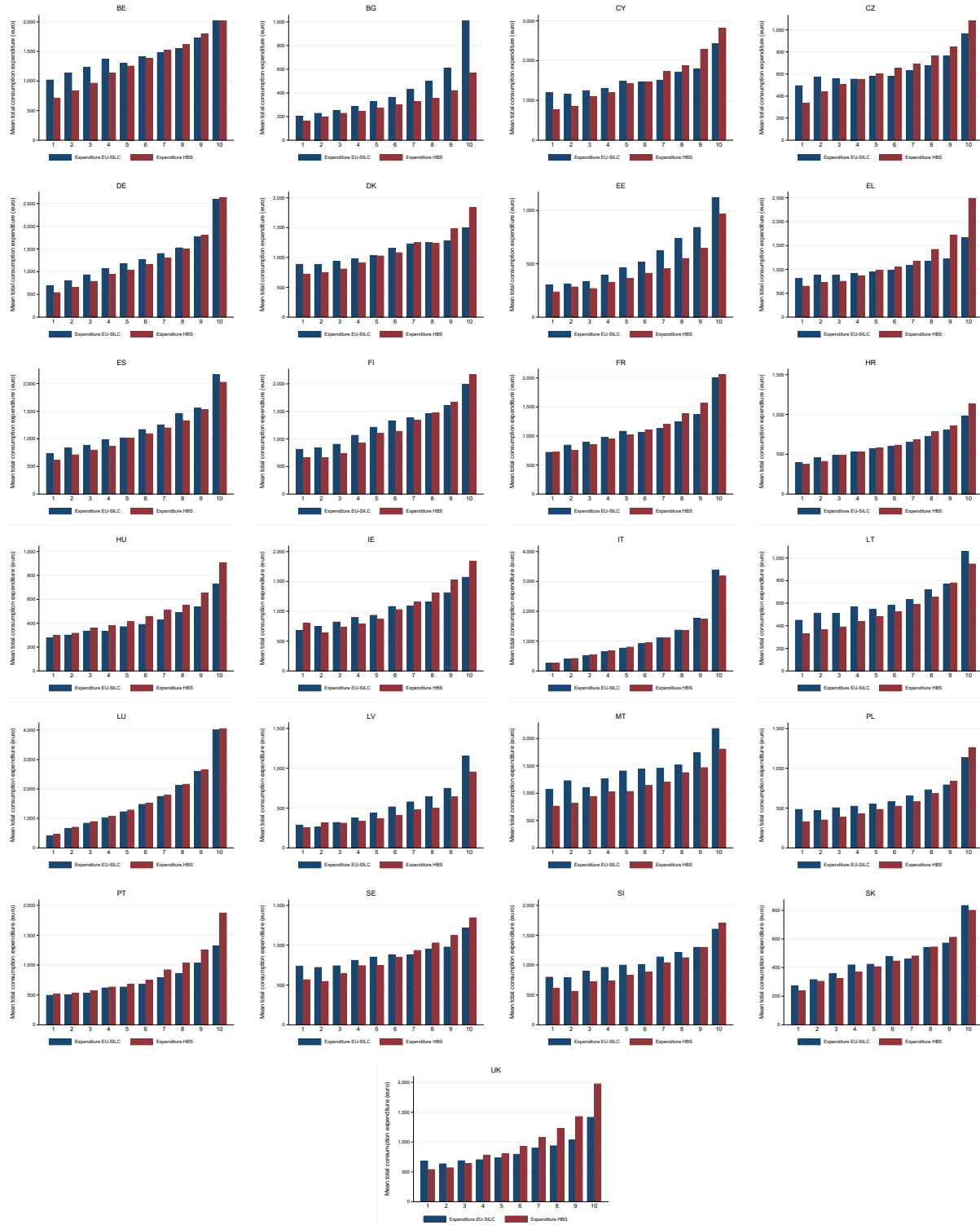
Sources: HBS 2010 and EU-SILC 2016; authors' table.

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



Notes: graphs represent the weighted densities.
Sources: HBS 2010 and EU-SILC 2016; authors' graphs.

Figure B.2: Distribution of mean household consumption expenditure per decile of standard of living for EU-SILC and HBS



Notes: graphs represent the weighted means of households' total consumption expenditure (without rents and costs)/CU/month. Standard of living = disposable income/CU/month. Because income data are missing in the HBS dataset for Italy and Luxembourg, we use the decile per total consumption expenditure for these countries instead.

Sources: HBS 2010 and EU-SILC 2016; authors' graphs.

C Imputation of missing values

Table C.1: Percentage of missing values on imputed rents or rents

Country	Missing imputed rents or rents (%)
Austria	0.2
Belgium	0.4
Bulgaria	0
Croatia	0.1
Cyprus	0.4
Czechia	1
Denmark	2.5
Estonia	2.3
Finland	5.8
France	6
Germany	6.2
Greece	0
Hungary	3.5
Ireland	1.4
Italy	0.2
Latvia	0.6
Lithuania	0
Luxembourg	0
Malta	0.4
Netherlands	2.3
Poland	1.9
Portugal	9.6
Slovakia	0.3
Slovenia	1.1
Spain	0.5
Sweden	0.1
United Kingdom	11.4

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 2016; authors' table.

D Stylized facts

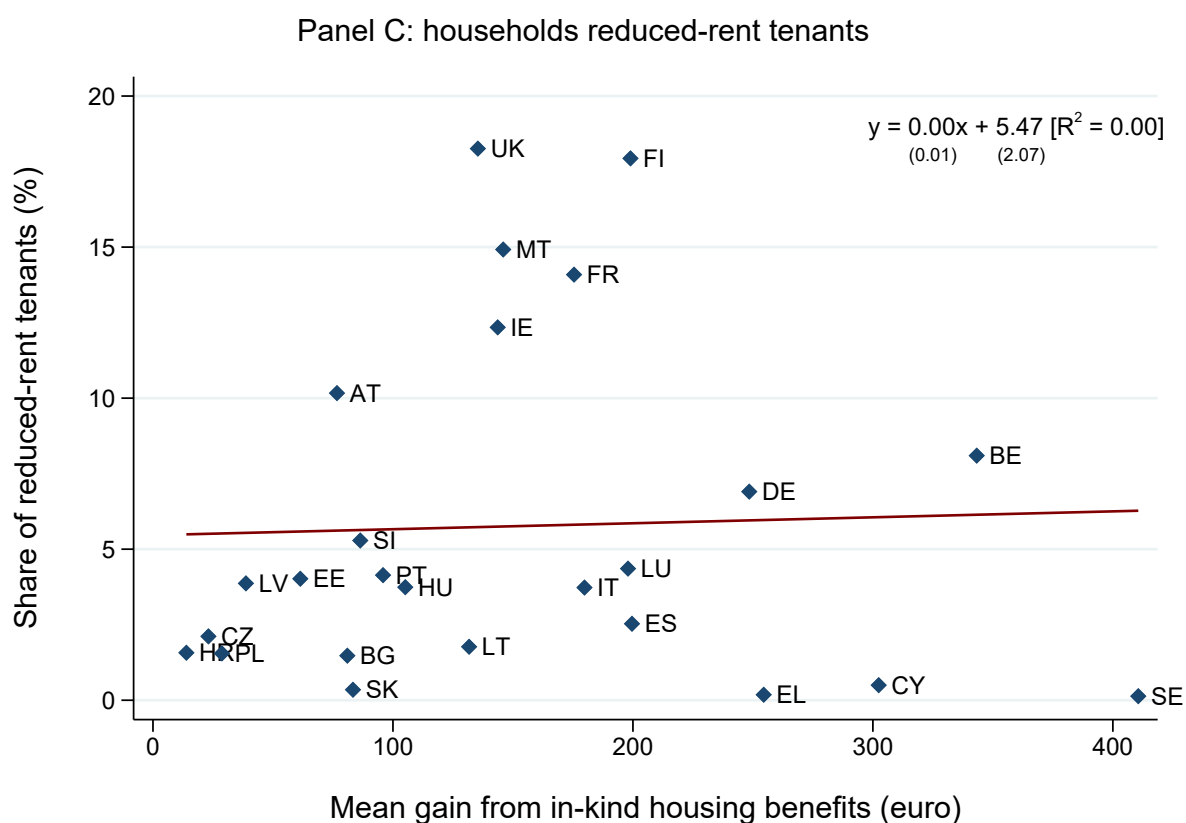
Figure D.1: Mean housing services (HS) and housing expenses (HE) by tenure status



Notes: graphs represent the weighted means. Housing services and housing expenses are expressed per consumption units (CU) per month.

Sources: EU-SILC 2016; authors' graphs.

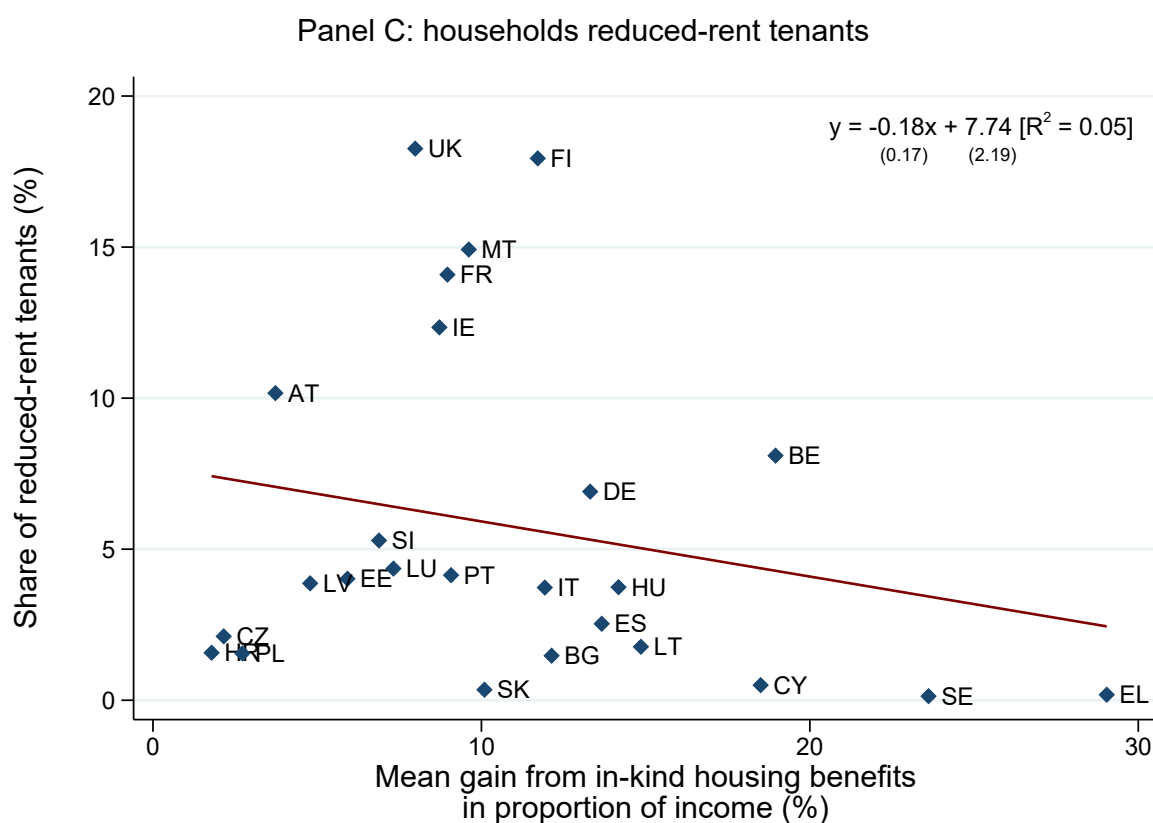
Figure D.2: Share of reduced-rent tenants according to the mean gain from in-kind housing benefits (euro)



Notes: income represents disposable income/CU/month without housing benefits. 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 standard errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

Figure D.3: 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. 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 standard errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

E Results

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

Country	Households below the poverty line (%) - FGT_1					
	Income (baseline)	Income + HP _{cash+in-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}
Finland	4.57	2.47	-46.07***	2.69	-41.09***	4.03
France	4.08	2.89	-29.32***	3.01	-26.22***	3.9
Germany	7.4	5.24	-29.19***	5.59	-24.47***	6.95
United Kingdom	7.38	5.25	-28.96***	5.5	-25.53***	6.78
Czechia	2.66	1.99	-24.98***	2	-24.87***	2.65
Sweden	5.78	4.49	-22.29***	4.51	-21.94***	5.76
Ireland	4.73	3.75	-20.63***	4.05	-14.26***	4.33
Netherlands	4.37	3.61	-17.57***	3.61	-17.57***	4.37
Malta	2.99	2.58	-13.79***	2.8	-6.2***	2.73
Belgium	3.1	2.79	-9.85***	3.09	-0.2**	2.8
Denmark	3.62	3.41	-5.92***	3.41	-5.92***	3.62
Austria	4.58	4.34	-5.3***	4.41	-3.8***	4.51
Latvia	7.13	6.79	-4.86***	6.83	-4.19***	7.06
Slovenia	4.23	4.03	-4.64***	4.14	-2.11***	4.09
Cyprus	3.84	3.7	-3.84***	3.72	-3.25**	3.85
Luxembourg	4.29	4.15	-3.41***	4.22	-1.72***	4.21
Spain	7.85	7.63	-2.79***	7.83	-0.31***	7.66
Hungary	4.27	4.17	-2.39***	4.18	-2.13***	4.25
Lithuania	7.6	7.42	-2.34***	7.54	-0.79***	7.47
Portugal	5.78	5.67	-1.92***	5.77	-0.3**	5.68
Croatia	7.17	7.04	-1.83***	7.06	-1.61***	7.16
Italy	7.38	7.25	-1.64***	7.33	-0.62***	7.29
Estonia	5.81	5.73	-1.34**	5.73	-1.36***	5.8
Poland	5.15	5.1	-1.13***	5.1	-1***	5.15
Slovakia	3.79	3.78	-0.49	3.78	-0.38	3.79
Bulgaria	6.92	6.91	-0.2	6.92	0	6.91
Greece	7.77	7.77	-0.03	7.77	-0.09*	7.78
EU-27	6.18	5.15	-16.64***	5.32	-14.01***	5.94

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-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 2016; authors' table.

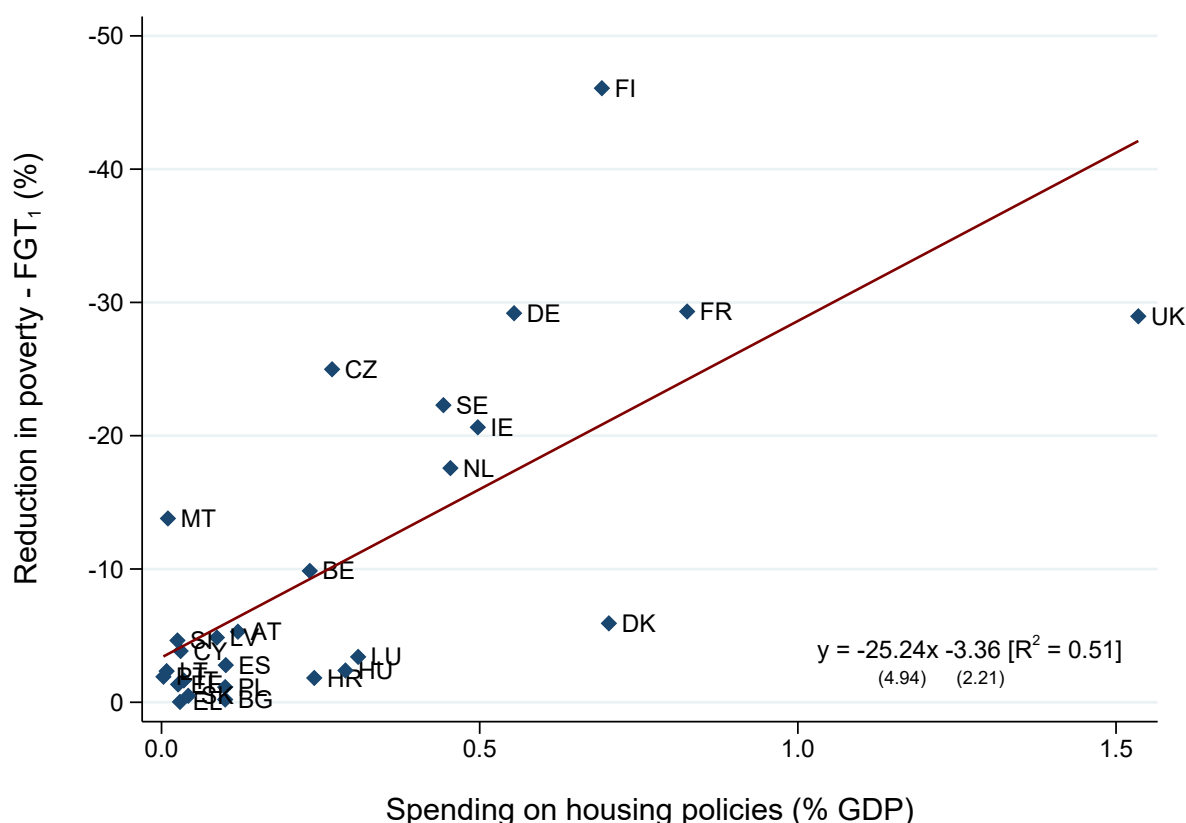
Table E.2: Reduction in poverty (FGT_2) after inclusion of housing benefits

Households below the poverty line (%) - FGT_2							
Country	Income (baseline)	Income + HP _{cash+in-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}	% Δ
Finland	2.01	1.02	-49.16***	1.16	-42.18***	1.7	-15.12***
Czechia	1.19	0.73	-38.54***	0.73	-38.65***	1.18	-0.46**
Germany	4.08	2.63	-35.58***	2.81	-31.06***	3.77	-7.63***
France	1.86	1.22	-34.38***	1.26	-32.04***	1.76	-5.3***
United Kingdom	4.04	2.85	-29.49***	3.01	-25.55***	3.64	-10.03***
Sweden	2.94	2.44	-17***	2.46	-16.35***	2.92	-0.64
Ireland	2.19	1.89	-13.78***	1.98	-9.39***	2.06	-6.05***
Malta	1.02	0.89	-12.29***	0.95	-6.33***	0.95	-7.12***
Netherlands	2.21	1.96	-11.42***	1.96	-11.42***	2.21	0
Belgium	1.35	1.23	-8.87***	1.35	-0.3	1.24	-8.59***
Latvia	3.82	3.6	-5.89***	3.63	-5.02***	3.78	-1.17***
Austria	2.44	2.31	-5.31***	2.36	-3.47***	2.4	-1.94***
Slovenia	1.63	1.55	-5.01***	1.59	-2.53***	1.58	-3.25***
Cyprus	1.43	1.36	-4.79**	1.38	-3.48**	1.42	-0.53
Denmark	1.66	1.58	-4.68***	1.58	-4.68***	1.66	0
Spain	4.56	4.37	-4.25***	4.54	-0.35**	4.38	-3.9***
Luxembourg	2.22	2.14	-3.53***	2.17	-2**	2.17	-2.12**
Lithuania	4.32	4.17	-3.43***	4.29	-0.8***	4.2	-2.75**
Croatia	3.68	3.56	-3.28***	3.57	-3***	3.67	-0.32***
Estonia	3.09	3	-3**	3.01	-2.58***	3.07	-0.69
Hungary	2.27	2.21	-2.65***	2.22	-2.43***	2.26	-0.48
Portugal	2.79	2.71	-2.62***	2.77	-0.55*	2.72	-2.38***
Italy	4.57	4.45	-2.59***	4.53	-0.89**	4.49	-1.8***
Poland	2.54	2.5	-1.57***	2.51	-1.33***	2.54	-0.24
Slovakia	2.25	2.22	-1.07*	2.23	-0.81	2.24	-0.21
Bulgaria	3.73	3.72	-0.36	3.73	0	3.72	-0.36
Greece	4.6	4.6	-0.15	4.59	-0.21	4.61	0.07
EU-27	3.36	2.75	-18.31***	2.84	-15.42***	3.2	-4.91***

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-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 2016; authors' table.

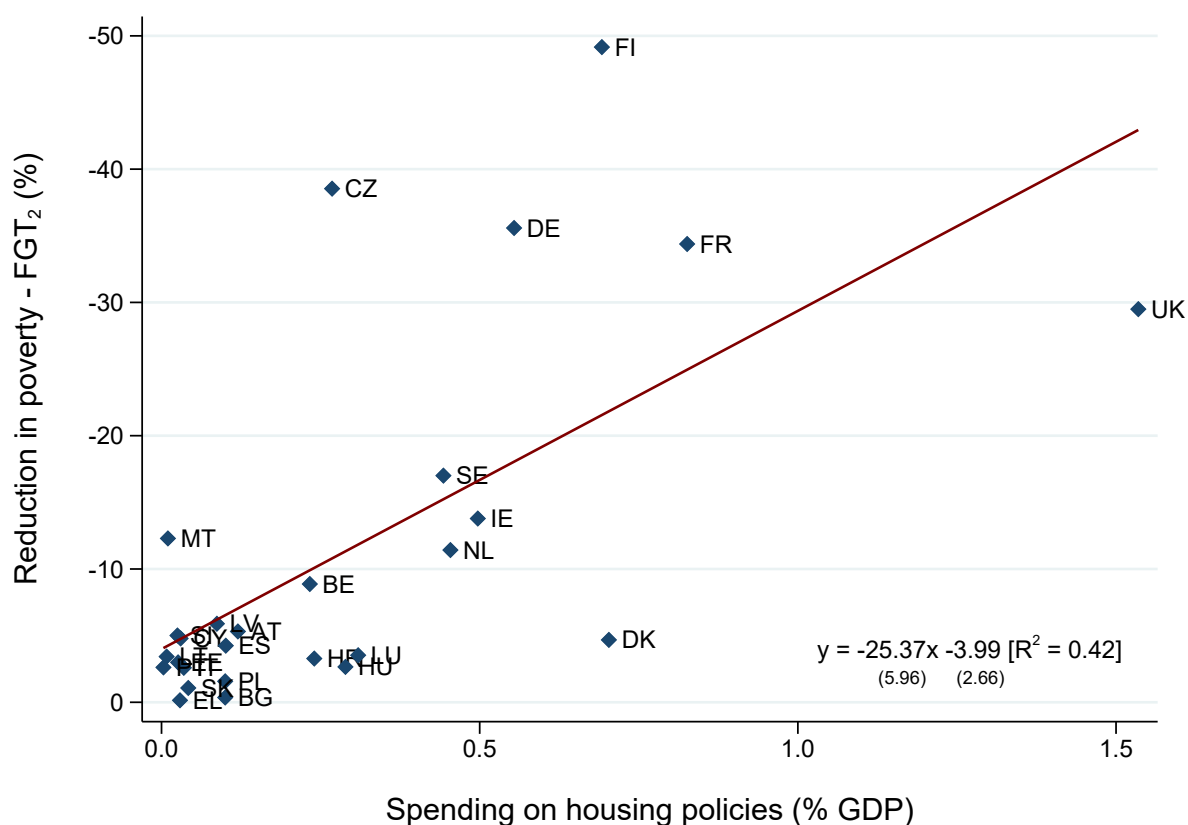
Figure E.1: Percentage of reduction in poverty (FGT_1) according to the spending under housing policies in % of GDP



Notes: 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. 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 standard errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

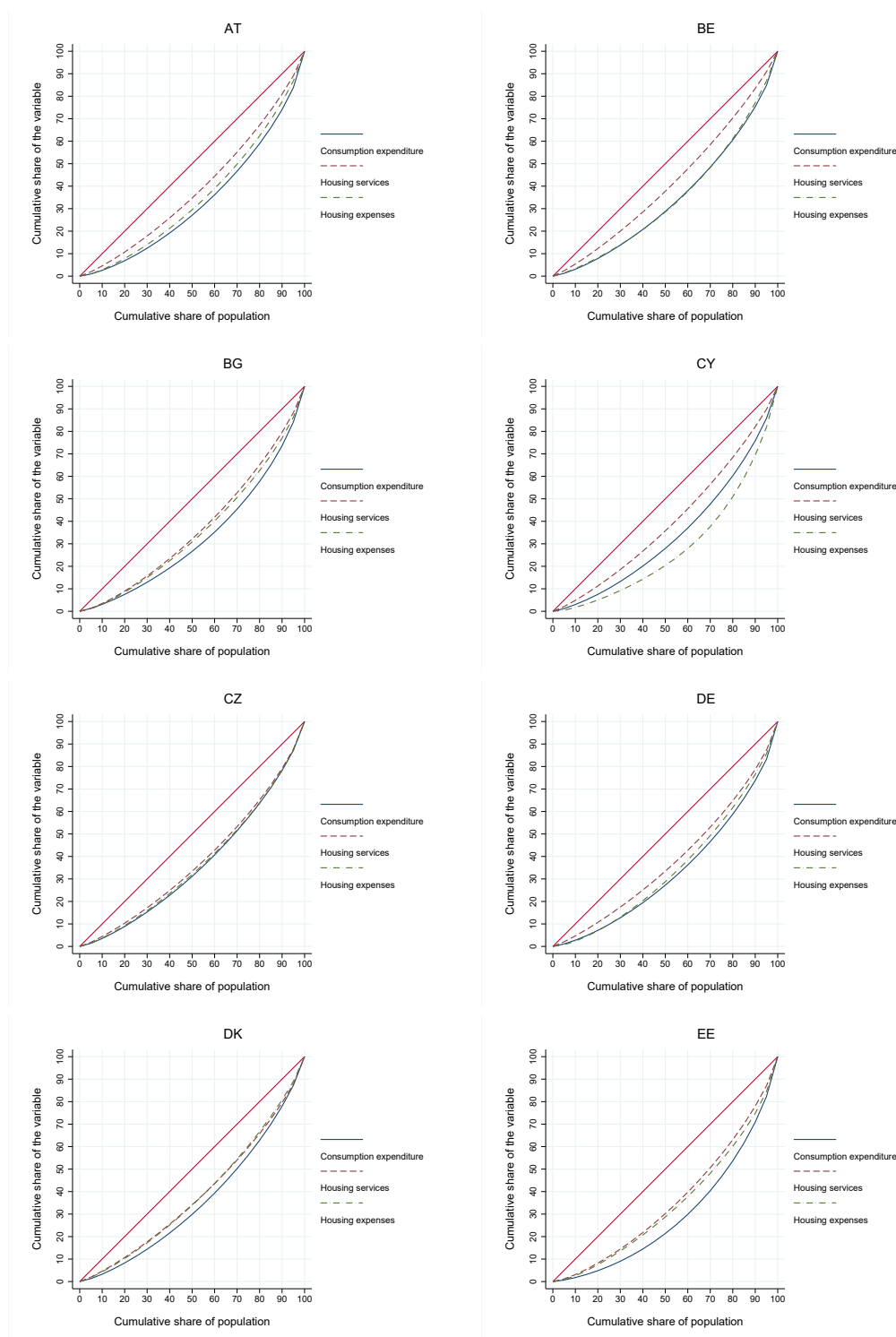
Figure E.2: Percentage of reduction in poverty (FGT_2) according to the spending under housing policies in % of GDP



Notes: 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. 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 standard errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

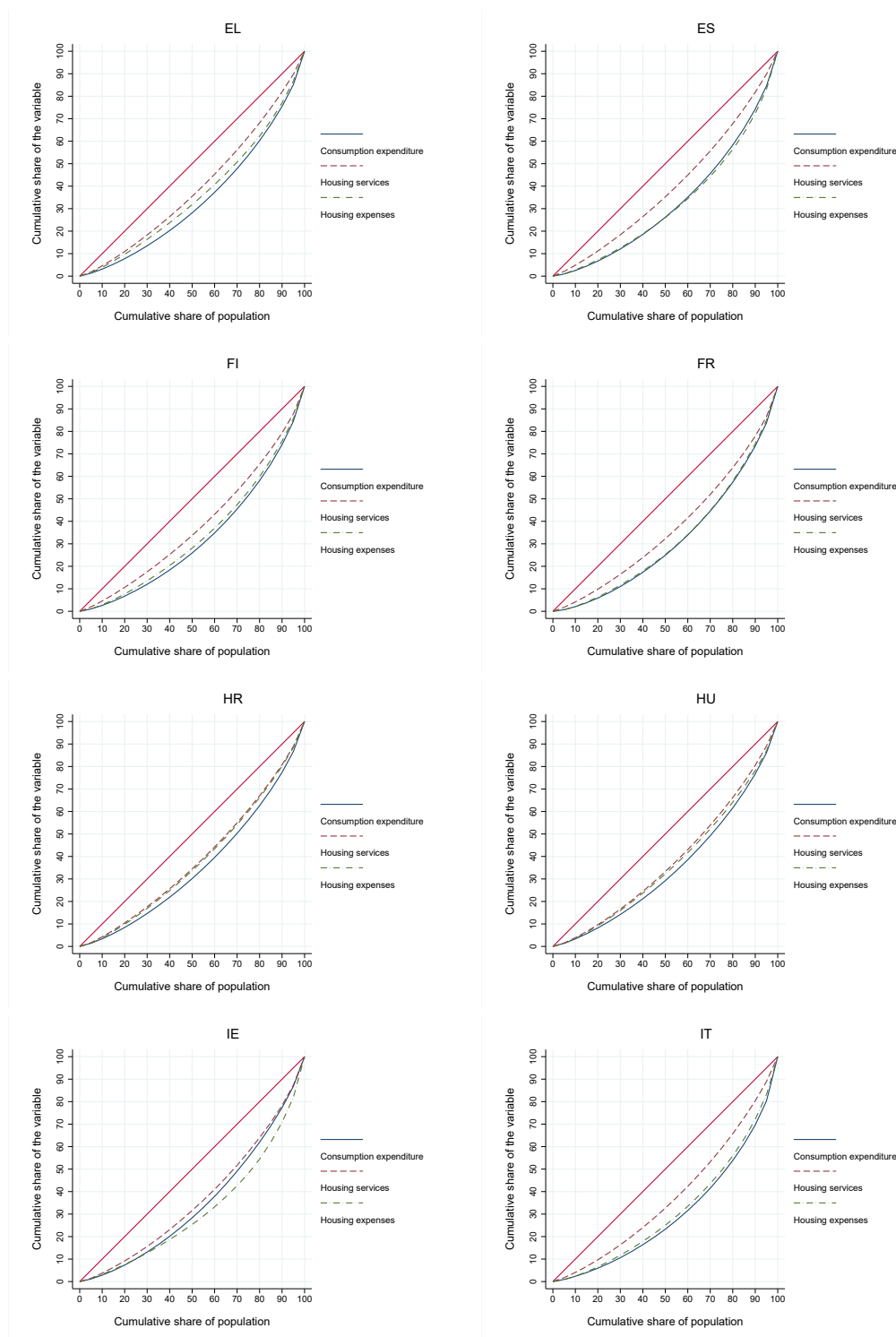
Figure E.3: Comparisons of households' consumption expenditure, housing services and housing expenses 1/4



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

Sources: HBS 2010 and EU-SILC 2016; authors' graphs.

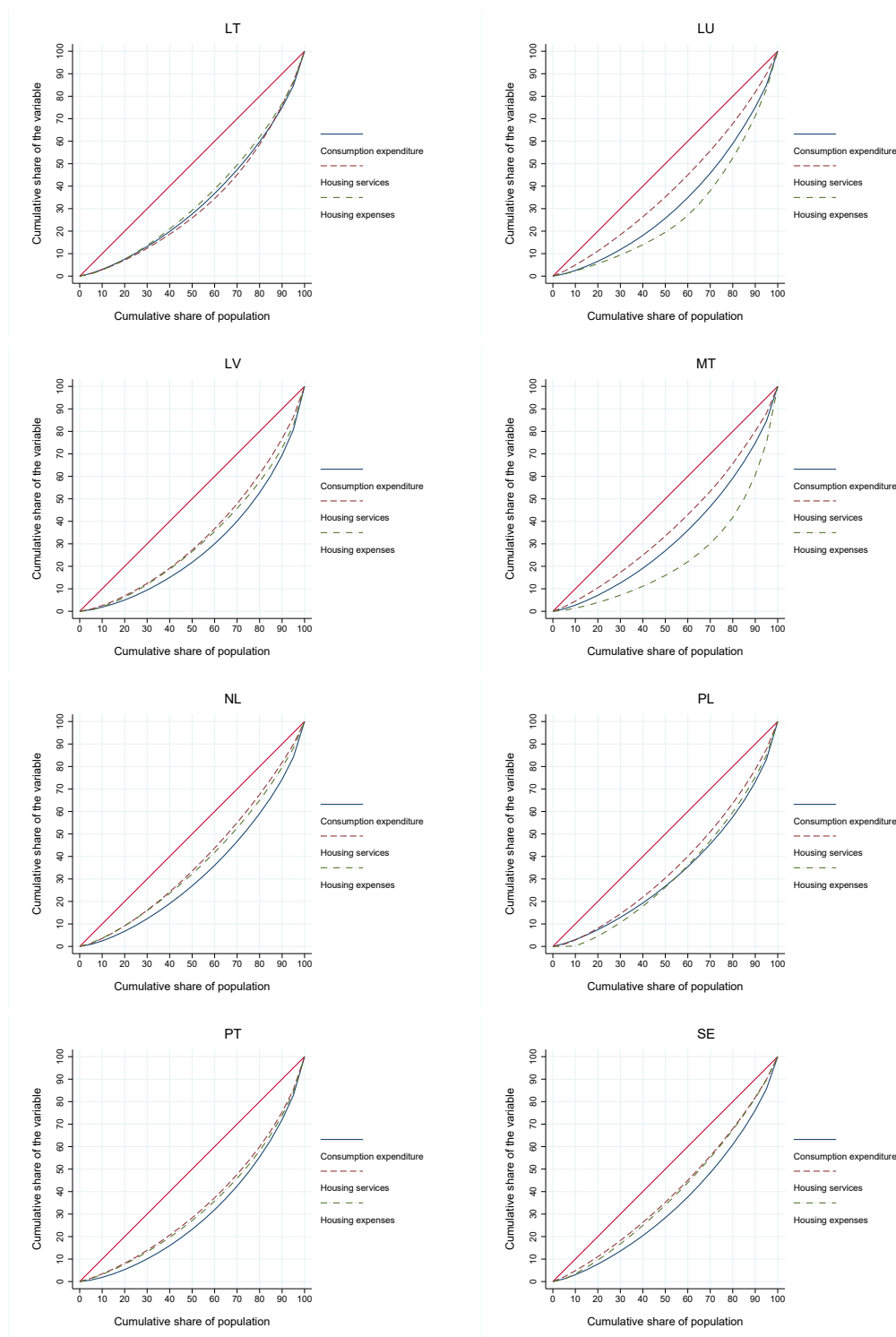
Figure E.4: Comparisons of households' consumption expenditure, housing services and housing expenses 2/4



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

Sources: HBS 2010 and EU-SILC 2016; authors' graphs.

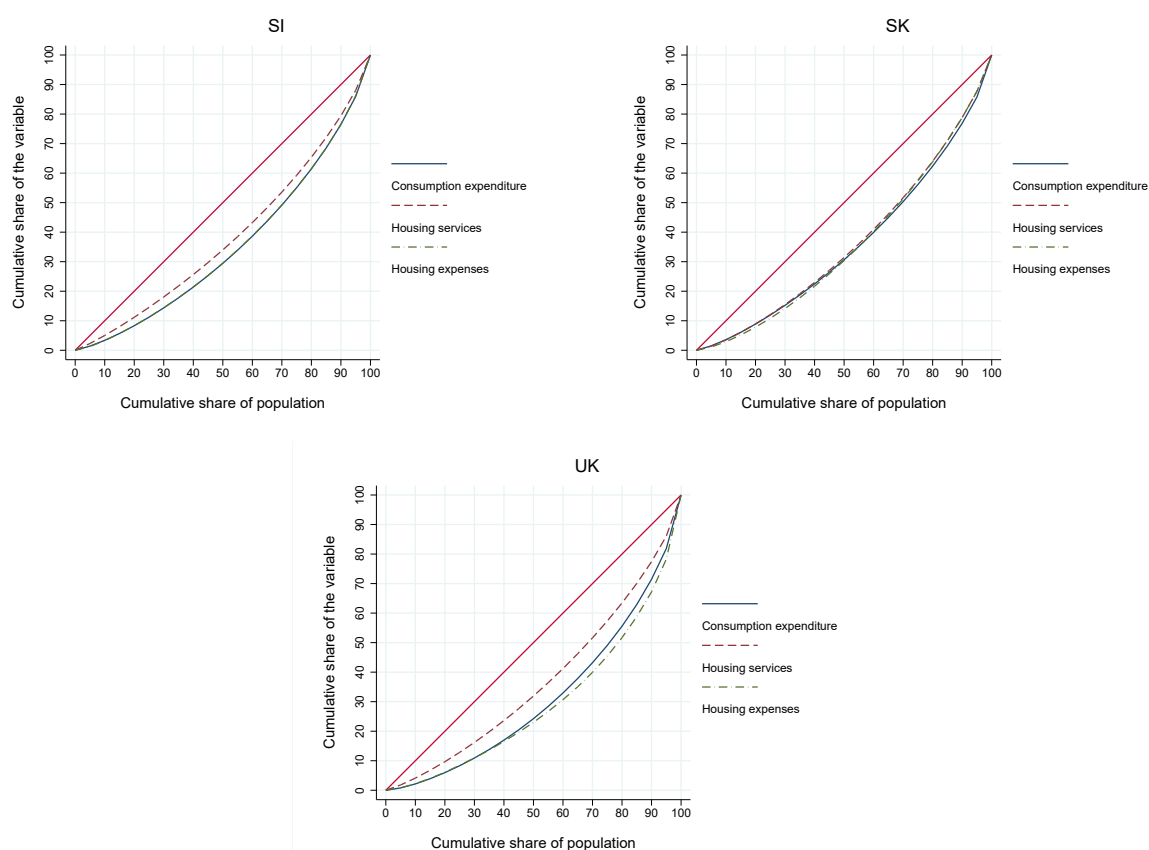
Figure E.5: Comparisons of households' consumption expenditure, housing services and housing expenses 3/4



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

Sources: HBS 2010 and EU-SILC 2016; authors' graphs.

Figure E.6: Comparisons of households' 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 costs. Housing expenses corresponds to housing expenditures/CU/month including housing policies (cash + in-kind benefits).

Sources: HBS 2010 and EU-SILC 2016; authors' graphs.

F Robustness check

Table F.1: Variables used for the hedonic regression (Heckman) 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 2	DB040
Year	Year of contract or purchasing or installation	HH031
Income	Total household disposable income	HY020
Household size	Number of people in household	HX040

Sources: EU-SILC 2016; authors' table.

Table F.2: Variables used for the selection equation (Heckman) of tenants

Variable	Details	EU-SILC
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	<ul style="list-style-type: none"> • Never married • Married • Widowed • Divorced 	PB190
Illness	Suffer from any chronic illness or condition	PH020
Status	<ul style="list-style-type: none"> • 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 2016; authors' table.

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

Country	Income (baseline)	Gini					
		Income + HP _{cash+in-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}	% Δ
United Kingdom	0.34	0.31	-10.1***	0.32	-6.24***	0.32	-5.44***
Finland	0.29	0.26	-8.6***	0.27	-6.23***	0.28	-2.79***
Ireland	0.32	0.3	-5.95***	0.31	-2.38***	0.31	-3.68***
France	0.31	0.3	-5.27***	0.3	-3.85***	0.31	-1.71***
Germany	0.32	0.31	-4.39***	0.31	-3.84***	0.32	-0.62***
Netherlands	0.3	0.29	-3.89***	0.29	-3.89***	0.3	0
Sweden	0.3	0.28	-3.61***	0.28	-3.61***	0.3	0
Denmark	0.29	0.28	-3.55***	0.28	-3.55***	0.29	0
Malta	0.29	0.29	-2.35***	0.29	-0.69***	0.29	-1.75***
Belgium	0.27	0.27	-2.18***	0.27	-0.05**	0.27	-2.13***
Czechia	0.26	0.26	-2.1***	0.26	-2.03***	0.26	-0.11***
Latvia	0.37	0.36	-1.24***	0.37	-0.55***	0.37	-0.7***
Austria	0.29	0.28	-1***	0.29	-0.66***	0.29	-0.38***
Luxembourg	0.29	0.28	-0.97***	0.29	-0.44***	0.29	-0.57***
Slovenia	0.26	0.26	-0.75***	0.26	-0.29***	0.26	-0.52***
Italy	0.33	0.32	-0.71***	0.33	-0.11***	0.32	-0.6***
Portugal	0.35	0.34	-0.71***	0.35	-0.05***	0.34	-0.67***
Croatia	0.32	0.32	-0.61***	0.32	-0.25***	0.32	-0.36***
Cyprus	0.33	0.33	-0.56***	0.33	-0.52***	0.33	-0.05*
Hungary	0.28	0.28	-0.28***	0.28	-0.27***	0.28	-0.05*
Spain	0.34	0.34	-0.27***	0.34	-0.1***	0.34	-0.17***
Estonia	0.35	0.35	-0.24***	0.35	-0.16***	0.35	-0.08**
Poland	0.31	0.31	-0.21***	0.31	-0.14***	0.31	-0.08***
Bulgaria	0.38	0.38	-0.18***	0.38	0	0.38	-0.18***
Lithuania	0.39	0.39	-0.13***	0.39	-0.09***	0.39	-0.04***
Slovakia	0.25	0.25	-0.08*	0.25	-0.07*	0.25	-0.01
Greece	0.34	0.34	-0.02**	0.34	-0.02*	0.34	-0.01
EU-27	0.35	0.34	-3.06***	0.34	-2.27***	0.34	-1.09***

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-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 2016; authors' table.

Table F.4: 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-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}	% Δ
Finland	17.2	11.13	-35.32***	12.43	-27.76***	16.25	-5.53***
Ireland	20.61	14.42	-30.05***	16.62	-19.34***	17.8	-13.61***
Netherlands	16.01	12.1	-24.45***	12.1	-24.45***	16.01	0
United Kingdom	21.13	16.35	-22.62***	16.96	-19.73***	18.82	-10.95***
Sweden	19.54	15.5	-20.7***	15.5	-20.7***	19.54	0
France	14.8	12.37	-16.44***	12.99	-12.24***	14.01	-5.38***
Malta	15.5	14.05	-9.34***	14.89	-3.91***	14.7	-5.12**
Belgium	13.55	12.41	-8.41***	13.52	-0.25	12.5	-7.75***
Germany	20.56	18.86	-8.26***	19.2	-6.61***	20.27	-1.38***
Denmark	13.53	12.43	-8.08***	12.43	-8.08***	13.53	0
Czechia	9.91	9.28	-6.34***	9.31	-6.05***	9.83	-0.79
Austria	15.37	14.64	-4.7***	14.81	-3.65***	15.28	-0.59
Slovenia	16.5	16	-3.04***	16.28	-1.32***	16.21	-1.72**
Luxembourg	15.87	15.46	-2.59	15.64	-1.43	15.41	-2.85**
Latvia	23.68	23.18	-2.08**	23.25	-1.82***	23.4	-1.17
Portugal	18.93	18.69	-1.25**	18.91	-0.13	18.68	-1.33**
Hungary	14.32	14.18	-0.97**	14.11	-1.41***	14.33	0.14
Italy	19.89	19.72	-0.86*	19.85	-0.2	19.75	-0.69
Cyprus	16.93	16.79	-0.85	16.79	-0.85	17.09	0.91*
Croatia	21.8	21.66	-0.64	21.69	-0.5**	21.75	-0.2
Poland	17.3	17.2	-0.55*	17.22	-0.47**	17.28	-0.08
Lithuania	22.38	22.3	-0.33**	22.33	-0.2*	22.35	-0.14
Spain	20.96	20.95	-0.07	20.89	-0.34	21	0.17
Greece	20.62	20.61	-0.04	20.61	-0.03	20.62	-0.01
Slovakia	11	11	0.03	11	0.03	11.01	0.09
Bulgaria	21.31	21.33	0.08	21.31	0	21.33	0.08
Estonia	21.95	22.13	0.8	21.85	-0.47	22.26	1.39*
EU-27	18.57	16.81	-9.49***	17.12	-7.82***	18.02	-2.98***

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-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 2016; authors' table.

Table F.5: 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-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}	% Δ
Finland	4.57	2.37	-48.17***	2.69	-41.09***	3.95	-13.72***
United Kingdom	7.38	5.14	-30.33***	5.5	-25.53***	6.23	-15.64***
France	4.08	2.89	-29.16***	3.01	-26.22***	3.86	-5.5***
Germany	7.4	5.41	-26.92***	5.59	-24.47***	7.17	-3.1***
Czechia	2.66	2	-24.77***	2	-24.87***	2.65	-0.26*
Ireland	4.73	3.68	-22.08***	4.05	-14.26***	4.23	-10.43***
Sweden	5.78	4.51	-21.94***	4.51	-21.94***	5.78	0
Netherlands	4.37	3.61	-17.57***	3.61	-17.57***	4.37	0
Belgium	3.1	2.83	-8.57***	3.09	-0.2**	2.84	-8.35***
Malta	2.99	2.74	-8.25***	2.8	-6.2***	2.89	-3.25**
Denmark	3.62	3.41	-5.92***	3.41	-5.92***	3.62	0
Latvia	7.13	6.73	-5.66***	6.83	-4.19***	7.01	-1.74***
Austria	4.58	4.34	-5.39***	4.41	-3.8***	4.51	-1.71***
Luxembourg	4.29	4.11	-4.15***	4.22	-1.72***	4.18	-2.67***
Slovenia	4.23	4.06	-4.02***	4.14	-2.11***	4.11	-2.65***
Cyprus	3.84	3.7	-3.73***	3.72	-3.25**	3.84	-0.08
Portugal	5.78	5.59	-3.33***	5.77	-0.3**	5.6	-3.15***
Croatia	7.17	6.98	-2.67***	7.06	-1.61***	7.09	-1.1**
Hungary	4.27	4.18	-2.07***	4.18	-2.13***	4.26	-0.2
Italy	7.38	7.26	-1.54***	7.33	-0.62***	7.31	-0.95***
Poland	5.15	5.09	-1.28***	5.1	-1***	5.14	-0.35*
Lithuania	7.6	7.52	-0.99***	7.54	-0.79***	7.58	-0.2***
Spain	7.85	7.8	-0.68***	7.83	-0.31***	7.83	-0.34**
Estonia	5.81	5.78	-0.6	5.73	-1.36***	5.86	0.78**
Slovakia	3.79	3.77	-0.58*	3.78	-0.38	3.79	-0.08
Bulgaria	6.92	6.9	-0.42	6.92	0	6.9	-0.41
Greece	7.77	7.77	-0.11**	7.77	-0.09*	7.77	-0.02
EU-27	6.18	5.19	-16.11***	5.32	-14.01***	5.92	-4.29***

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-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 2016; authors' table.

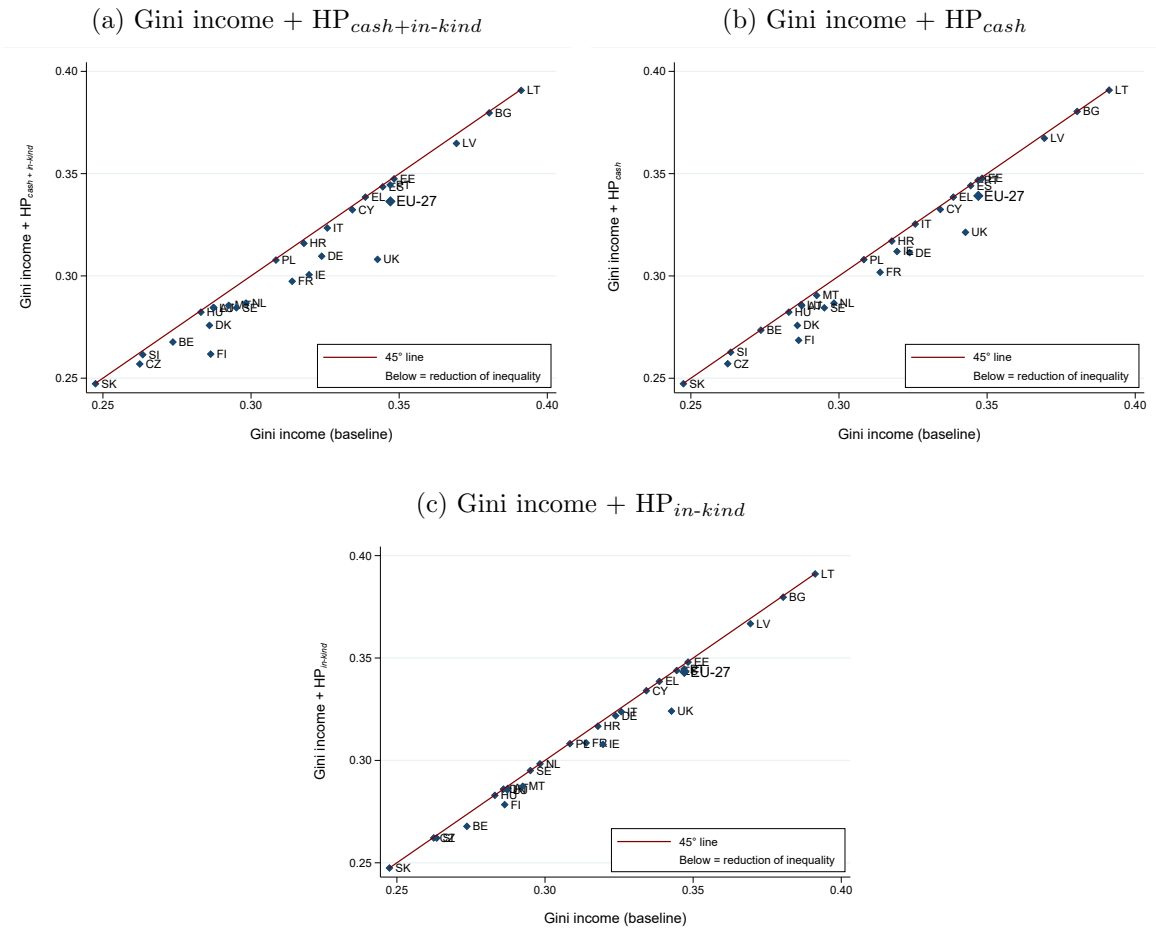
Table F.6: Reduction in poverty (FGT_2) after inclusion of housing benefits, using regression (Heckman) approach for imputed rents

Households below the poverty line (%) - FGT_2							
Country	Income (baseline)	Income + HP _{cash+in-kind}	% Δ	Income + HP _{cash}	% Δ	Income + HP _{in-kind}	% Δ
Finland	2.01	0.98	-51.24***	1.16	-42.18***	1.63	-18.47***
Czechia	1.19	0.74	-38.2***	0.73	-38.65***	1.19	-0.15
France	1.86	1.23	-34.08***	1.26	-32.04***	1.74	-6.38***
Germany	4.08	2.72	-33.37***	2.81	-31.06***	3.92	-3.94***
United Kingdom	4.04	2.81	-30.59***	3.01	-25.55***	3.34	-17.48***
Sweden	2.94	2.46	-16.35***	2.46	-16.35***	2.94	0
Ireland	2.19	1.86	-15.03***	1.98	-9.39***	2.02	-7.68***
Netherlands	2.21	1.96	-11.42***	1.96	-11.42***	2.21	0
Belgium	1.35	1.24	-8.31***	1.35	-0.3	1.25	-8.02***
Malta	1.02	0.94	-7.55***	0.95	-6.33***	1	-2.19
Latvia	3.82	3.54	-7.27***	3.63	-5.02***	3.72	-2.6***
Austria	2.44	2.31	-5.32***	2.36	-3.47***	2.4	-1.9***
Denmark	1.66	1.58	-4.68***	1.58	-4.68***	1.66	0
Cyprus	1.43	1.36	-4.61**	1.38	-3.48**	1.42	-0.8
Slovenia	1.63	1.56	-4.49***	1.59	-2.53***	1.59	-2.79***
Portugal	2.79	2.66	-4.42***	2.77	-0.55*	2.67	-3.99***
Croatia	3.68	3.52	-4.3***	3.57	-3***	3.63	-1.5**
Luxembourg	2.22	2.13	-3.92***	2.17	-2**	2.16	-2.48***
Italy	4.57	4.45	-2.56***	4.53	-0.89**	4.49	-1.71***
Hungary	2.27	2.22	-2.3***	2.22	-2.43***	2.27	-0.14
Estonia	3.09	3.02	-2.27**	3.01	-2.58***	3.1	0.23
Poland	2.54	2.5	-1.8***	2.51	-1.33***	2.53	-0.56**
Spain	4.56	4.51	-1.18***	4.54	-0.35**	4.52	-0.81***
Slovakia	2.25	2.22	-1.11*	2.23	-0.81	2.24	-0.21
Lithuania	4.32	4.28	-1.07***	4.29	-0.8***	4.31	-0.28**
Bulgaria	3.73	3.71	-0.65	3.73	0	3.71	-0.65
Greece	4.6	4.59	-0.22	4.59	-0.21	4.6	-0.01
EU-27	3.36	2.77	-17.61***	2.84	-15.42***	3.2	-4.98***

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-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 2016; authors' table.

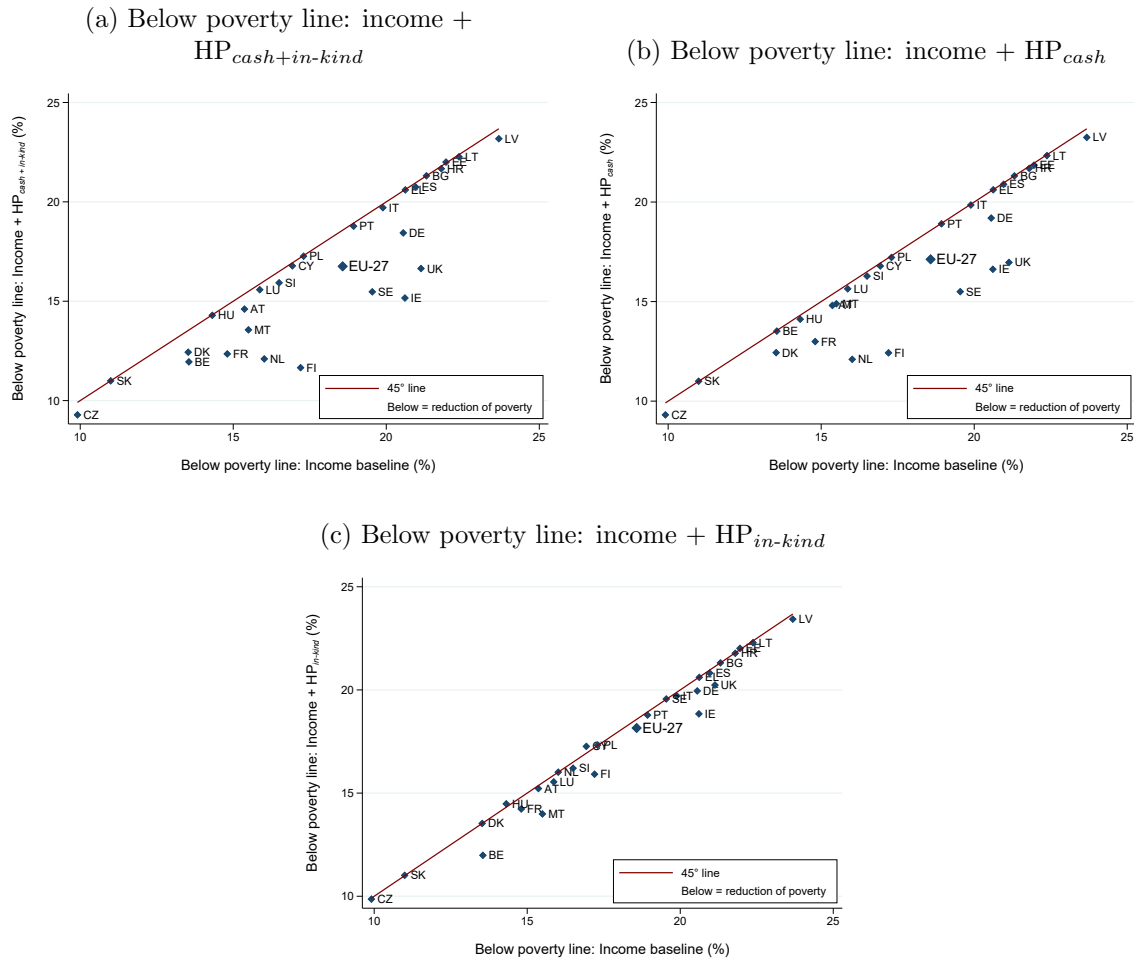
Figure F.1: Gini of baseline income compared to income including housing benefits, using regression (Heckman) approach for imputed rents



Notes: income represents disposable income/CU/month without housing benefits.

Sources: EU-SILC 2016; authors' graphs.

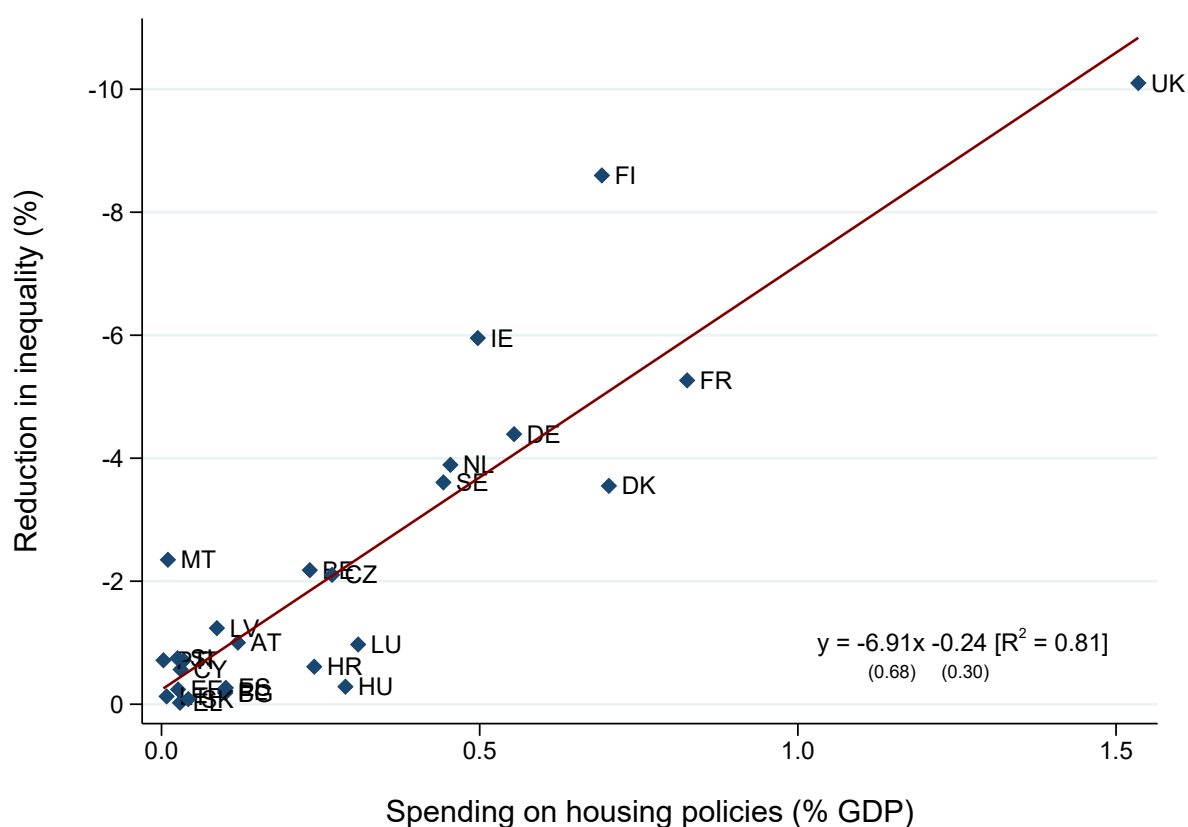
Figure F.2: Poverty rate (FGT_0) with baseline income compared to income including housing benefits, using regression (Heckman) approach for imputed rents



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 2016; authors' graphs.

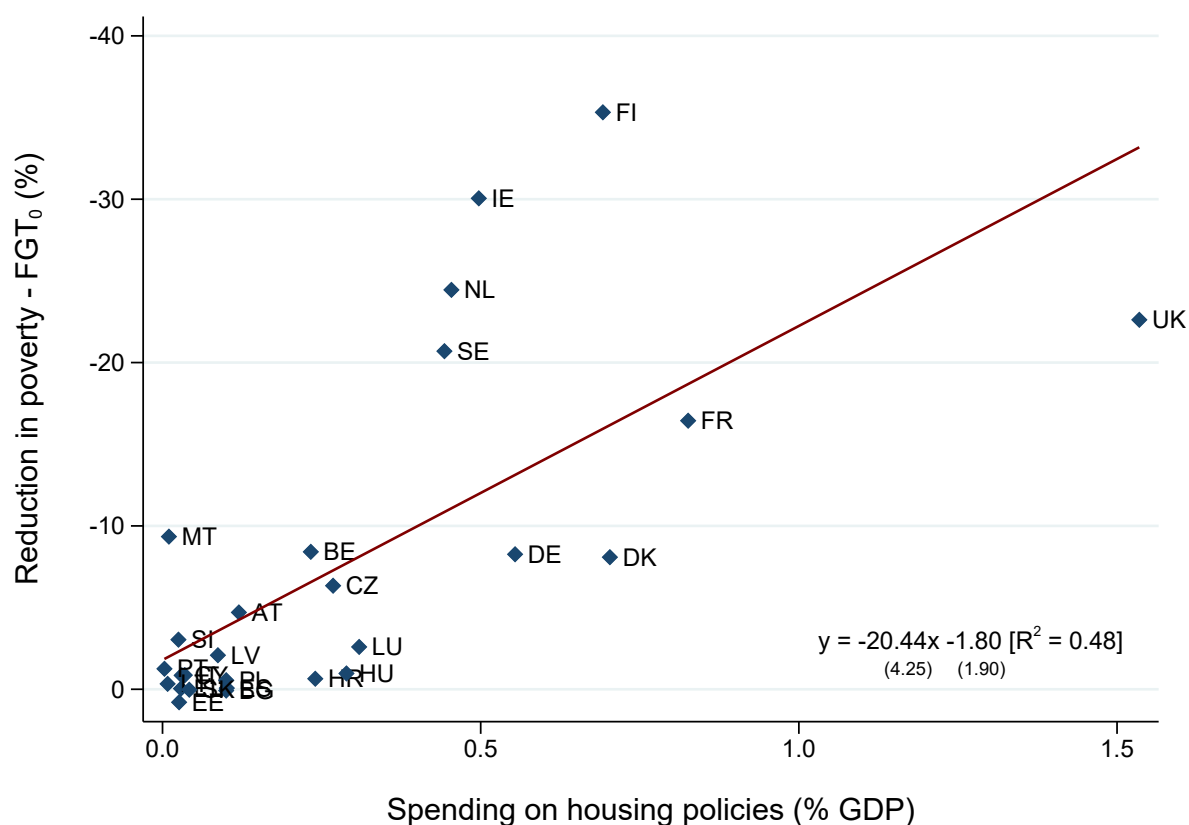
Figure F.3: Percentage of reduction in inequality according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents



Notes: 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 standards errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

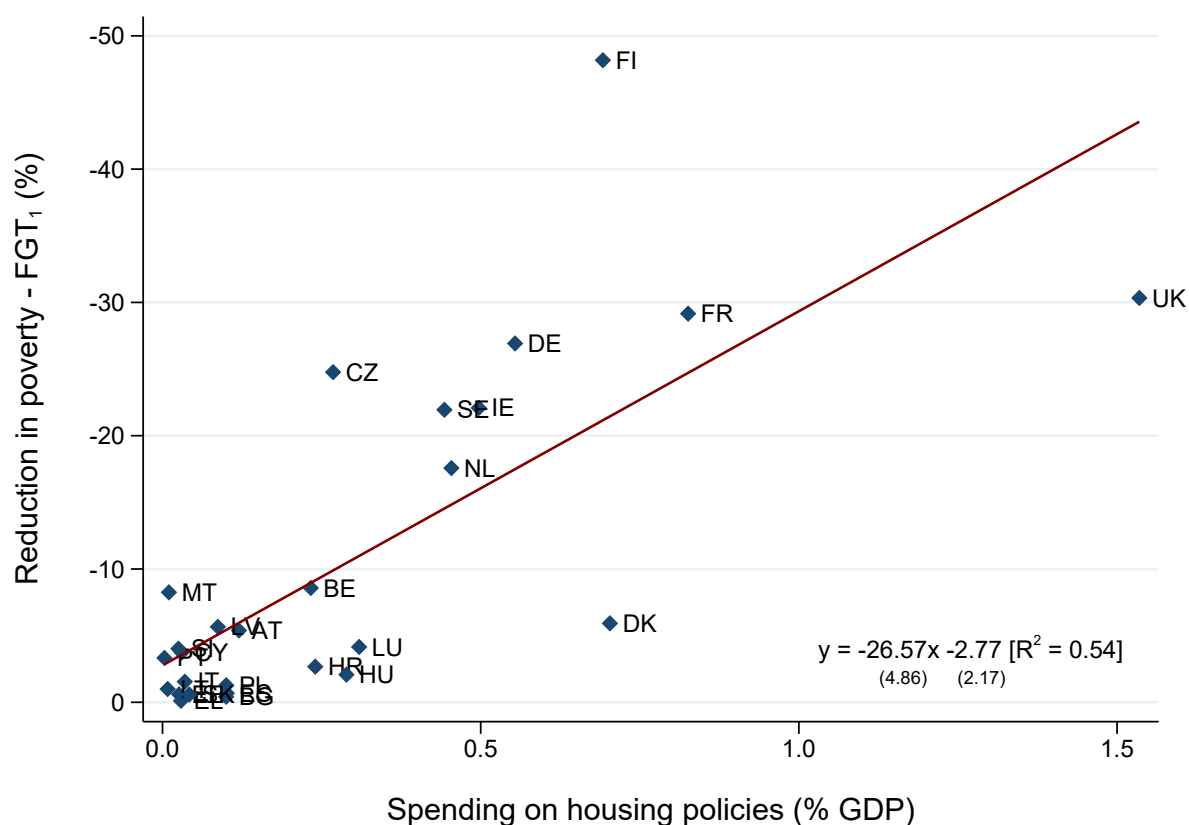
Figure F.4: Percentage of reduction in poverty (FGT_0) according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents



Notes: 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. 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 standard errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

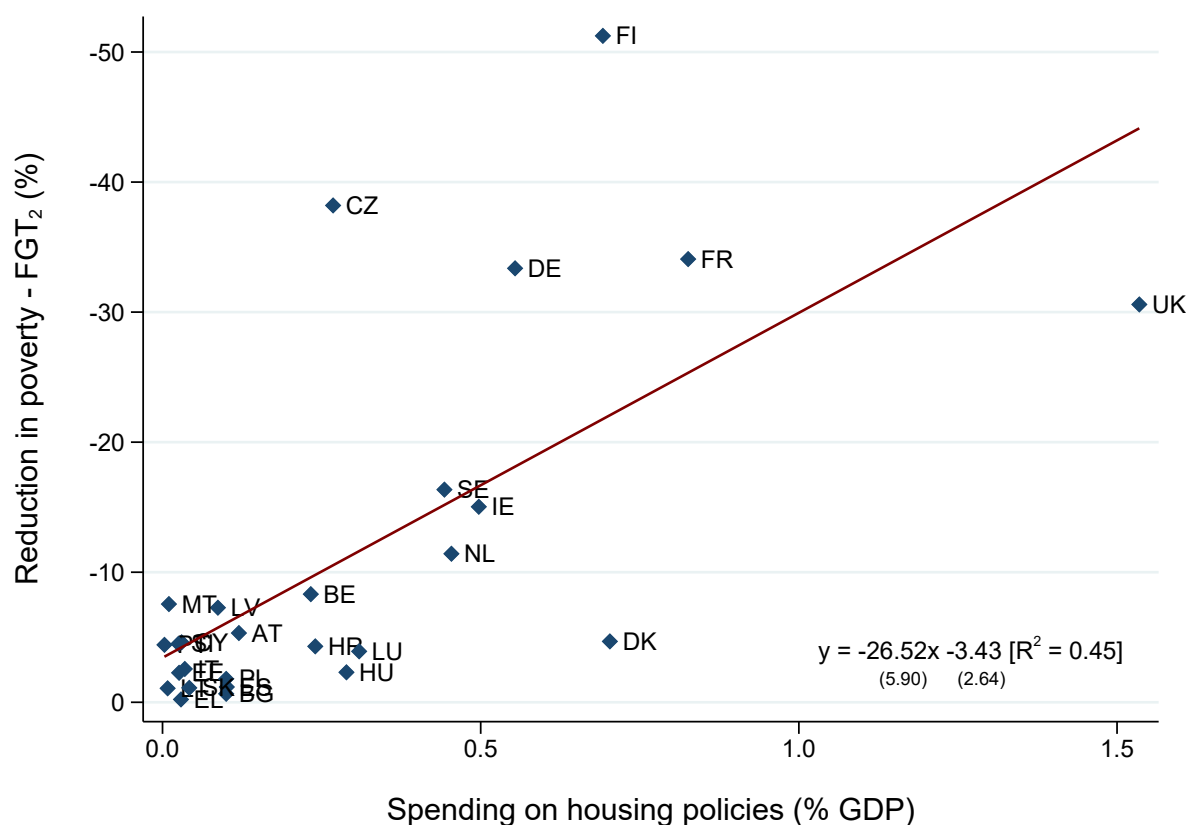
Figure F.5: Percentage of reduction in poverty (FGT_1) according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents



Notes: 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. 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 standard errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

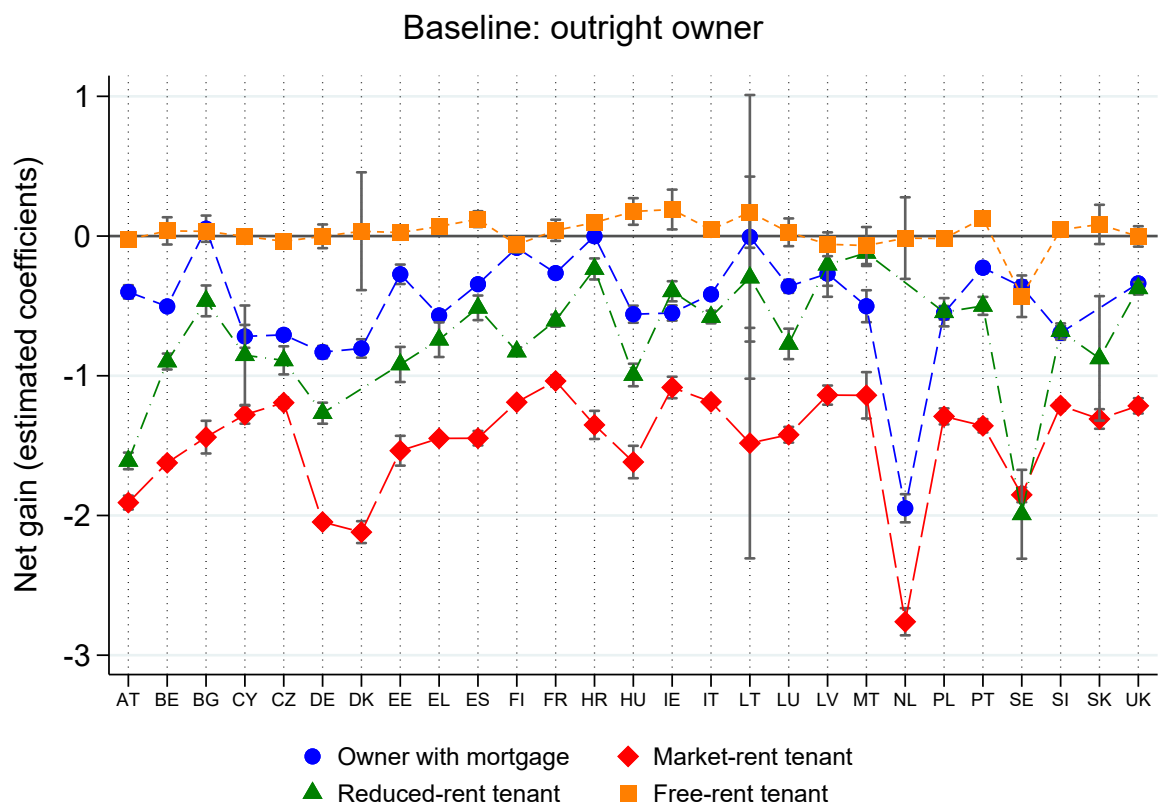
Figure F.6: Percentage of reduction in poverty (FGT_2) according to the spending under housing policies in % of GDP, using regression (Heckman) approach for imputed rents



Notes: 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. 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 standards errors (in parentheses).

Sources: EU-SILC 2016; authors' graph.

Figure F.7: Regression estimates: Net Gain by tenure status, using regression (Heckman) approach for imputed rents



Notes: estimates of equation 4 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 2016; authors' graph.

Scatter plot comparing Gini housing services (HS) and Gini housing expenses (HE) for EU countries. The x-axis is 'Gini consumption expenditure' and the y-axis is 'Gini HS and HE'. A 45-degree line is shown. Most countries are above the line, indicating higher inequality in housing expenses than in housing services. The legend identifies red triangles as Gini housing services (HS) and blue diamonds as Gini housing expenses (HE).

Legend:

- ▲ Gini housing services (HS)
- ◆ Gini housing expenses (HE)
- 45° line
- Above = more unequal distribution

Sources: HBS 2010 and EU-SILC 2016; authors' graph.

G Supplementary materials: usage cost versus user costs

The missing terms to [Poterba \(1992\)](#) user-cost definition are the owner's interest of foregone 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 user costs. Moreover, the housing costs for this tenure choice include the interest repayment on the mortgage (net of any tax relief), 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.