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IMPUTED RENT AND INCOME INEQUALITY: A DECOMPOSITION ANALYSIS FOR GREAT BRITAIN, WEST GERMANY AND THE U.S.

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This article deals with income advantages derived from owner-occupied housing and their impact on the personal income distribution. Using micro-data from the British Household Panel Study (BHPS), the German Socio-Economic Panel (SOEP), and the U.S. Panel Study of Income Dynamics (PSID) we find distinct cross-national differences in terms of the prevalence and extent of imputed rent. Results from inequality decomposition analyses show this overall impact to be the net effect of two conflicting changes: On the one hand there is increasing income inequality *between* the groups of owner-occupiers and renters, respectively, and, on the other hand, we find inequality to be decreasing *within* the group of those owner-occupiers who own outright. When focussing on imputed rent as a means of old-age provision, our results for all three countries show an income advantage for, as well as a poverty reducing effect among the elderly. The empirical findings support the claim for the need of an improved harmonization of this non-cash income component especially for the purpose of cross-national comparative research.

1. INTRODUCTION

The rich man in his castle,
the poor man at his gate.
God made them high and lowly,
and ordered their estate.
(Cecil Frances Alexander, 1848)

The income position of private households is influenced not only by *monetary* income, but also by non-monetary or in-kind income components. And although the significance of monetary income has been analyzed extensively in the international literature,[1] the topic of non-monetary income has not received the same scrutiny,[2] in part due to limited empirical data. One component of non-

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[1]See, for example, Atkinson (1983), Atkinson *et al.* (1995), Gottschalk and Smeeding (1997), and Cowell (2000).

[2]On the significance of non-monetary income, see Wolfe and Moffitt (1991) and Smeeding *et al.* (1993).

monetary income that takes on particular quantitative significance is imputed rents from owner-occupied housing.

As early as 1968 the United Nations argued in favor of capturing *imputed rent (henceforth IR) from owner-occupied housing* in national account statistics; in 1977 the UN issued guidelines recommending the inclusion of this income type along with other property income (United Nations, 1977). The "Canberra Group on Household Income Measurement" argues in favor of including IR as a major income component of disposable income together with other in-kind income sources (Canberra Group, 2001). International literature dealing with the impact of IR on income inequality (Yates, 1994) shows that the magnitude of this effect heavily depends on (a) the population share of owner-occupiers,[3] and (b) on the respective income advantage captured in the value of IR, which again is a function of various factors like the demand for housing or the pattern of house price inflation. However, empirical results for Germany show that this income advantage—measured as a share of disposable income—varies from 2 to 27 percent, depending on the method applied (Frick and Grabka, 2001).

There are different ways in which economic advantages arise from home ownership. On the one hand, owner-occupied housing represents an income advantage in the sense that rent does not have to be paid. On the other hand, it also can be seen as a return on private investment in real estate rather than in the financial market. In fact, existing household surveys around the world make use of a variety of methods to capture the monetary value of IR. Particularly strong differences can be found in the various treatments of owner-specific costs like taxes on real property, maintenance costs, and especially interest on mortgages. The difficulty lies both in the different methods used to determine income advantages and in the varying extent to which these methods affect the income distribution. This is one reason Smeeding and Weinberg (2001) feel that a uniform definition of household income should be developed especially for the purpose of cross-national comparative research.

In principle, the discussion of income advantages derived from owner-occupied housing needs to take into consideration the institutional framework, which has a very clear impact on the magnitude of the individual costs of housing. This includes not only subsidies for housing use by homeowners,[4] but also bene-

[3]On the whole, homeownership rates are increasing in all EU countries, last but not least for the purpose of old age provision. However, there is a high degree of heterogeneity ranging from less than 50 percent in Germany to as much as about 80 percent in Spain.

[4]A significant merit comes from the tax-favored treatment of home ownership in nearly all countries. The fundamental tax advantage to owner-occupiers is the generally low taxation of the return on the equity invested in the house (Hendershott and White, 2000). The principal tax concessions applied to owner-occupied housing in the U.S. are: (1) non-taxation of net IR, (2) non-taxation of capital gains on the sale of an owner-occupied home up to a certain amount, (3) deductibility of mortgage interest, and (4) deductibility of local property taxes (Bourassa and Grigsby, 2000). When looking at the impact of IR on the income situation of owner-occupiers, the treatment of different cost components by the tax systems will be important. The most important cost component, i.e. mortgage interest, is treated differently by several tax systems. Australia, Canada, New Zealand and the U.K. do not allow interest deduction. Beginning in 1993 the maximum rate at which interest could be deducted was reduced in four steps to zero in 1999 in the U.K. In the U.S. abolishment is being discussed; however, up-to-date interest and local property taxes are fully deductible. Interest deduction is most important to high income households, while low and median income households are more likely to take the standard deduction than to itemize their tax-relevant housing expenses (Follain *et al.*, 1993). Germany

fits for tenants, such as low-income housing, other forms of rent discounts, and company housing. Subsidizing the construction of low-income housing can be viewed as a form of government transfer because if the mechanisms for low-income housing support had been structured differently, individuals would likely have housing allowances instead. Although these aspects are not explicitly considered in the following empirical analysis due to incompleteness of the underlying data, this by no means reflects their lack of relevance.

The major motivation for this study stems from the question of whether various approaches for empirically calculating income advantages derived from owner-occupied housing exacerbate or level out existing differences in income and thereby have an impact on the personal income distribution as a whole. In other words: Is owner-occupied housing more prevalent in the high-income population, thereby increasing income inequality, *ceteris paribus*? Smeeding *et al.* (1993) support evidence of a levelling effect on income distribution from IR for Germany, Sweden, Canada and the Netherlands. Using the Theil index for Belgium, Meulemans and Cantillon (1993) show that income inequality declines, especially among the older population, after taking IR into account. If interest payments are also considered, then the decline in inequality of disposable income is even larger. Based on HBS data for selected EU countries, Eurostat (1998, pp. 10–11) shows a poverty-reducing effect in six of seven observed EU countries due to the inclusion of *net* IR. For Greece, for example, the share of persons under the 50 percent poverty threshold falls from 14.6 to 12.3 percent. Wolff (1990) shows that the inclusion of *gross* IR considerably reduces poverty in the U.S. for 1983, especially among the elderly by as much as 10 percent. Studies for Australia using the Household Expenditure Survey (HES) indicate that *net* IR increases the total household income of homeowners by 10 percent (Yates, 1994). After including IR, income inequality declines slightly: the Gini coefficient decreases from 0.39 to 0.38. However, this income advantage is not distributed equally among all homeowners. Those owners who have attained complete ownership of their homes profit greatly from IR, while the income advantage for homeowners still paying interest is relatively small. Use of *net* IR can be recommended for studies on income over the lifetime of individuals. It appears obvious that changes in the *overall* income distribution caused by including IR in the employed measure of disposable income are most likely the result of conflicting effects on the relative income positions of owners and renters, respectively. In order to have better insight into these underlying processes, it is deemed necessary to control for income inequality *between* certain population subgroups as well as *within* those groups by means of inequality decomposition analyses.

overruled the deductibility of mortgage interest for new owner-occupiers in 1996; with the old rules expiring in 2002 (§10e EStG). Such cross-national differences in the tax treatment may appear crucial for analyses like those presented here: deductibility of mortgage interest and local property taxes yields an increasing loan-to-value (LTV) ratio which in turn affects the extent of debt to finance a home and finally, the implicit net return of the investment (IR) (Hendershott and White, 2000). Besides such a tax-relevant treatment of home ownership there are various other promotion programs targeting the increase in the number of owner-occupiers. In the U.K. for instance, local authority housing gives tenants the right to buy their home at a discount, either outright or by way of shared ownership. In Germany, since 1996, the purchaser of a home is eligible for direct housing support. A family with two children acquiring a newly constructed home will receive an amount of about €33,000 over a period of eight years.

An important social policy issue in almost all industrialized countries is the "ageing society" phenomenon, which puts a lot of pressure on the national old-age provision systems. Germany, with its traditionally strong public pension system, recently started to foster individual old-age provision, thereby altering the system in such a way that it bears a greater resemblance to the "Anglo-Saxon" model. Differentiating the population by age groups in a cross-national perspective, we will shed light on the question of the extent to which IR improves economic well-being after retirement in the three countries considered, as well as its contribution to income inequality over the life cycle.

This paper is structured as follows. After a brief description of different methods for determining income advantages from owner-occupied housing (Section 2) and the underlying data and methods (Section 3), we empirically analyze the prevalence and magnitude of IR based on representative micro-data for Great Britain, West Germany and the U.S. (Section 4). Firstly, changes in individual income positions are presented for all three countries, along with changes in the *overall* personal distribution of disposable equivalent income as a result of income advantages from owner-occupied housing, in light of the survey-specific approaches used to determine IR. Secondly, we perform inequality decomposition by housing tenure status in order to illuminate the different impact the inclusion of IR in disposable income exerts on the income position of homeowners and renters, respectively. We further investigate the relevance of IR as a means of old-age provision from a cross-national perspective: Again we look at overall trends as well as inequality decomposition results (Section 5). The final section concludes and gives recommendations for future research.

2. Definitions and Alternative Procedures for Determining Imputed Rent

As early as 1968, the United Nations recommended that income advantages from owner-occupied housing should be included in national accounts. The following definition formed the basis of that recommendation: "The total of owner-occupied dwellings which is to be included in gross output should, in principle, be valued at the rent on the market of the same facilities. It may be necessary to approximate the market rent by an estimate which should cover items such as operating, maintenance and repair outlays, water charges, insurance service charges, taxes, depreciation and mortgage interest in addition to interest on owner's investment in the dwelling and other elements of net return" (UN, 1968; quoted according to Yates, 1994, p. 44).

This "aggregate income" approach, developed for international comparisons, assumes an estimate of gross rent and then deducts maintenance, operating, and insurance costs as well as taxes. In the context of calculating income distribution, income advantages from owner-occupied housing should be classified as a component of the unearned income of private households. Imputed rent is therefore placed in the same category as income from interest, dividends and the letting or leasing of property (United Nations, 1977). The Canberra Group (2001) also recommends including imputed *net* rent in calculations of disposable income in international surveys. In the remainder of this section we therefore briefly discuss

selected methods for calculating IR which are currently being employed in national accounting (exemplified here for Germany in Section 2.1) as well as in household surveys like those underlying our analysis for Great Britain, the U.S. (Section 2.2) and Germany (Section 2.3). It should be noted beforehand that a major distinction of these approaches comes with the differential consideration of owner-related costs, in particular with that of mortgage interest.

2.1. *The Market-value Approach*

The market-value approach is the procedure that has traditionally been used for calculating *gross* IR in national accounts (SNA). For example, in the German case, IR is calculated on the basis of surveys on rent from various statistics (buildings and housing survey, census, income and expenditure survey). Those expenditures of private households used for calculating average rents include costs for water, sewage, garbage disposal, street cleaning and other additional costs such as lighting, regardless of whether or not these costs are included in the rent. Costs for heating, hot water, and parking garages are not included. The households of homeowners are then assigned the resulting average rents according to selected criteria. Finally, the aggregation across all homeowners yields the respective value for the national accounts. Main stratification criteria include the type of dwelling, year of construction, flat size, type of financing used, housing equipment, and regional information.[5]

National accounts have the aim of calculating the total *gross* value added from letting or leasing housing and indicating related income flows. The value of production is calculated for all occupied housing, including that which is owner-occupied. It is therefore calculated according to gross rent without deducting owner-related costs.[6]

2.2. *Capital-market Approach*

A second way to calculate income advantages from owner-occupied housing has its starting point in the alternative use of capital on the capital market. A household's decision to move into homeownership represents a trade-off, as it foregoes the opportunity to invest in financial assets from which real income flows are created in the form of income from interest and dividends. Along the lines of the capital-market approach, empirical calculation of the imputed interest from capital tied up in housing for homeowners is described by Saunders *et al.* (1992) as follows: "Hence the implicit rate of return on housing equity will equal a safe private market rate of return . . . on an equal value of investment. The annual rate of return which is used in this case is approximated by a two percent real return (two percent above the change in overall consumer prices for a country in the year

[5]See Hartmann (1992) for a description of the German case. Here, the share of IR in the total value of production for the letting and leasing of housing was over 52 percent (about DM 212 billion) in 1990.

[6]However, it should be noted that the United States National income and product accounts (NIPA) also uses a concept of *net* imputed rental value when determining personal income (Perozek and Reinsdorf, 2002).

studied). Inflation plus two percent was thus multiplied by home equity to estimate imputed rent" (Saunders *et al.*, 1992, p. 11).

The capital market approach à la Saunders *et al.* has been applied to the "Anglo-Saxon" data sets considered in our analysis: in the U.S. Panel Study of Income Dynamics (PSID) the current market value of owner-occupied housing, V, is estimated by the homeowner himself, and outstanding mortgages, M, are deducted from the estimated market value. If the resulting value of home equity, $V - M$, is positive, IR is calculated on the basis of this value and a nominal interest rate, i, of 6 percent, otherwise IR is assigned a value of Zero (Lillard, 2001).

In the case of the British Household Panel Study (BHPS) IR is also given as 6 percent of net equity of the owner-occupiers, $i(V - M)$. Information on regional and county-level housing prices is used to construct estimates of current home value. In combination with details about house purchases and mortgages provided by the respondents, a value for current outstanding mortgage debt and therefore net housing wealth or home equity is generated (Henley, 2000).

Although widely used in income distribution analyses, this operationalization may seriously overestimate the true return on the investment in real estate because applying a nominal interest rate to equity confounds the effect of inflation on returns.[7] Instead of applying a nominal interest rate, i, to total home equity given by the difference of market value, V, and outstanding mortgages, M, this nominal interest rate may be applied to the outstanding mortgage only, while the calculation of the return on the investment in housing needs to consider inflation, i.e. the real interest rate, r, should be applied to the dwelling's current market value, V. Obviously, even in the absence of taxation, $i(V - M)$, is different from $(rV) - (iM)$. By definition, the latter measure will produce smaller estimates for IR.

As such, a realization of the capital market approach according to Saunders *et al*. (1992) bears the risk of resulting in an overstated income advantage from owner-occupied housing for both, PSID and BHPS. In our following empirical analyses we will address this issue for the U.S. only by providing results based on PSID data for both alternative specifications, i.e. specification A will use $i(V - M)$, and specification B will be based on $(rV) - (iM)$, with $i = 6$ percent nominal interest rate, $r = 2$ percent real interest rate and V and M as given by the underlying data.[8]

Another problem with the capital market approach as applied to the PSID data is that it revolves around the estimation of the current market value of the property in the opinion of the homeowner, which may distort objective estimation. This is especially true for homeowners who are living in their home for a long period of time and are continuing to base their estimation on the original purchase price, which does not necessarily reflect the value of the object if it were to be sold *now*.[9] Besides this potential overestimation the failure to consider

[7]We are grateful to an anonymous referee for clarifying this point.

[8]Unfortunately, we cannot perform this comparative analysis on the basis of BHPS data due to lacking access to the explicit values for V and M. However, we may draw from the U.S. results of this exercise for the British case.

[9]Kiel and Zabel (1999) provide evidence that the self-estimates by U.S. home-owners are slightly overestimating actual house prices by approximately 5 percent. Recent buyers report house values 8.4 percent higher than the stated sales prices. Length of tenure has a significant negative effect on owners' valuation.

depreciation as the building becomes older may be an additional problem in this approach.

2.3. *Opportunity-cost Approach*

The opportunity-cost approach for determining IR is based on the market-value approach and is also known as the modified market-value approach. All owner-related costs are deducted from calculated average rents or comparable rents, which means that operating and maintenance costs (excluding heating), interest payments from the purchase of the home, and property taxes, etc. are all taken into account (Yates, 1994). It is particularly the deduction of interest payments within this *net* calculation that reduces the income advantage from owner-occupied housing. Interest and mortgage payments are especially important over the course of an entire lifetime, because, with time, total mortgage payments represent a higher percentage of the total mortgage that has to be paid off and the level of actual ownership increases. As a result, older homeowners tend to benefit more from the income advantages of owner-occupied housing.[10]

IR information used in our empirical analyses for Germany (based on SOEP data) relies on a hedonic regression estimation of the gross rent per square meter (not including heating) actually paid by main tenants in privately financed housing (excluding social housing and households with reduced rent). Indicators of the condition of the building, the year of construction, size (in square meters), length of occupancy, community size and disposable income are used as criteria for further classification. Based on these estimates, IR is assigned to otherwise comparable owner-occupiers, thereby avoiding distortions resulting from subjective estimation by the homeowners. Another advantage of this approach lies in the possibility to further differentiate than is possible in the categorization method used in national accounts. Finally, all relevant costs (due to operation, maintenance and repair, and financing) are deducted from imputed gross rents without heating.[11]

2.4. *Concluding Remarks*

It should be clear at this point that the rationale for including IR in national accounts differs from that of welfare analysis: whereas the SNA considers only the *gross* value of the housing stock as relevant, independent of how much of this stock is owner-occupied, the distribution of (cash and non-cash) income in the context of applied welfare analysis directly relates to the distribution of home-ownership and the implicit net income advantages derived from it.

The market-value approach is suitable as a gross value for calculating IR in macroeconomic analysis and national accounts (value of production for the sector of letting and leasing housing). The capital-market approach, as employed in the PSID, may suffer from the normative decision on behalf of the interviewed owner-occupiers. Additionally, neglecting certain owner-specific costs (costs for maintenance and repair) in the calculation of IR yields an overestimation of such an income

[10]In the case that owner-related costs are higher than the income advantage (especially at the start of the mortgage repayment period when the burden of interest is highest), IR is assigned the value of zero.

[11]For further details see Frick and Grabka (2001).

advantage of homeowners.[12] More important may be the differential treatment of inflation in the realization of the capital market approach. The procedure suggested by Saunders *et al.* (1992) will most likely overestimate the true value of IR.

The opportunity-cost approach, however, appears to be more suitable for calculating IR as a *net* value for microeconomic analysis (such as the personal distribution of disposable income). Thus we cannot rule out that the differential treatment of certain owner-specific costs in the data sets used in our empirical analyses also may affect the cross-national comparability of our results. Comparing the results for the two optional specifications used for the PSID data will shed some light on the impact of a differential treatment of inflation when calculating net equity.

3. Data and Methods

The aim of the following empirical analyses is to measure the magnitude of IR in the three countries under consideration and the extent to which IR influences the income distribution for the respective societies as well as for certain subgroups. Micro-data is taken from the British BHPS, the German SOEP and the U.S. PSID. Annual income data comes from the Cross National Equivalent File (CNEF) with income measures being harmonized to the greatest possible extent according to the Canberra Group recommendations.[13]

Our analyses consist of two points of measurement over a five-year period from 1993 to 1998 for Great Britain and Germany, and from 1994 to 1999 for the U.S.[14] Comparing two points in time is thought to provide some insight into the country-specific development of private household investment in real estate.[15] The basic unit for the study is the individual in the context of his or her household. In order to better capture the selective effect of IR, we differentiate according to housing status and housing costs. The first differentiation is made between owners and tenants. Homeowners are then divided into two groups: persons in owner-occupied households who still have a mortgage on their home and have to make interest payments ("on mortgage"), and persons in homeowner households, who can claim complete ownership of their homes and thus do not have to pay interest ("owned outright").[16]

[12]An improved measure of IR developed based on the capital-market approach, with sufficient adjustment for owner-related costs, is being applied by the Dutch Centraal Bureau voor de Statistiek (CBS) (van de Donk, 1994).

[13]See for the BHPS (Taylor *et al.*, 1998, or http://www.iser.essex.ac.uk/bhps/), the SOEP (SOEP Group, 2001, or http://www.gsoep.de/), the PSID (Hill, 1992, or http://www.isr.umich.edu/src/psid/) and the CNEF (Burkhauser *et al.*, 2001, or http://www.human.cornell.edu/pam/gsoep/equivfil.cfm).

[14]Because interviews in the PSID have been carried out at two-year intervals since 1997, there are no data for 1998.

[15]It should be noted that over the period from 1992 to 1996/97 the housing markets in all three countries developed similarly: average prices of houses actually sold in the U.S. went up by approximately 15 percent according to the U.S. census (http://economic-charts.com/em-cgi/data.exe/cenc25/c25p06, assessed 16 January 2003), constant quality nominal house prices in Great Britain moved up by about 23 percent (Hendershott *et al.*, 2002), and average nominal market rents in West Germany—which are the basis for the opportunity cost approach—increased by about 30 percent (Frick and Lahmann, 2000).

[16]Although Frick and Grabka (2001) provide empirical evidence for differentiating between tenants who pay rent and tenants who live in rent-free housing, we abstain from doing so for the sake of cross-national comparability.

Disposable income as of the previous year is turned into equivalent income by applying an equivalence scale with an elasticity of 0.5, given by the square root of the number of persons in the household.[17] Other than for cash income there is no such commonly used equivalence scale for non-cash income components.[18] Assuming that there are no economies of scale for non-cash income, Smeeding *et al*. (1993) express that income component in per-capita terms. However, we decided to use the exact same equivalence scale for cash and non-cash components, i.e., IR is also equivalized by the square root of household size.[19]

Comparing the results of our reference model *excluding* IR with results based on an income measure *including* IR gives a first glimpse of the importance of IR for the whole population as well as for the different subpopulations of interest.[20] We add information on the relative income position (compared to the total population) and on IR as a percentage of disposable income.

In order to measure the impact of IR on the overall personal income distribution, we apply some robust inequality indices. We analyze percentile ratios given by the income thresholds of the 10th, 50th and 90th percentiles, i.e., the decile ratios 90 : 10, 90 : 50, and 50 : 10, which allow a check of the degree of inequality in the top and bottom halves of the income distribution, respectively. A well-known inequality measure is the Gini coefficient

$$G = \left[\frac{1}{2n^2\mu}\right]\sum_{i=1}^{n}\sum_{j=1}^{n}|y_i - y_j| \tag{1}$$

in which y is individual income, n the number of individuals, and μ is mean income. The Gini coefficient is a Lorenz-based measure and is relatively insensitive to transfers at either end of the distribution. We also employ the mean logarithmic deviation (MLD), which belongs to the generalized entropy class I_c. All these indices satisfy the requirements of the Dalton–Pigou principle of transfers, and of population replication and mean independence (Shorrocks, 1980). I_0 is the mean logarithmic deviation (MLD):

$$I_0 = \left(\frac{1}{n}\right)\sum_{i=1}^{n}\log\left(\frac{\mu}{y_i}\right) \tag{2}$$

[17]This follows the recommendations by the "Canberra Group" for international comparisons. In order to reduce the effect of outliers (including measurement errors), we apply a bottom and top trimming at the 1st and the 99th percentile, respectively, to all three data sets.

[18]See Radner (1997) for the discussion of the "consistency problem" when including non-cash income in the measure of economic well-being as well as an exploratory analysis showing the positive impact of Medicare among the elderly.

[19]Sensitivity analyses for Germany using IR expressed in per-capita terms yield results qualitatively very similar to those expressed below. By definition, the level of IR is somewhat reduced due to the assumed economies.

[20]A theoretical problem in this respect appears if disposable income takes into account a possible tax deduction of mortgage interest by homeowners who are paying off their mortgage. However, this phenomenon can be ignored in our empirical analyses, because tax simulation models for all three datasets used here do not consider this issue. For detailed information on these simulation procedures and the derivation of disposable income see Butrica and Burkhauser (1997) for the PSID, Bardasi *et al.* (2001) for the BHPS, and Schwarze (1995) for the GSOEP.

where n is size of the population, y_i is individual income, and μ is mean disposable income of the population. In contrast to the median-oriented Gini coefficient, the MLD is a bottom-sensitive measure.

Given its statistical properties, the I_0 measure can be decomposed to show the effect of IR on the overall income inequality for subgroups.[21] In other words, we try to investigate the extent to which the change in overall income inequality is driven by the different impact of IR on owners on mortgage and owners who own outright, as compared to the population of renters. This effect can be studied using a special form of the decomposition of overall inequality by population subgroups. The I_0 measure can be decomposed such that:

$$I_0 = \sum_{g=1}^{G} p_g I_{0_g} + \sum_{g=1}^{G} p_g \log\left(\frac{p_g}{v_g}\right) \tag{3}$$

The first term describes inequality within each of the G population subgroups, e.g. owners and renters. The second term measures inequality between these subgroups, with v_g the share of total income in subgroup $g\left(\sum_{i=1}^{N_g} y_i \Big/ \sum_{j=1}^{N} y_j\right)$, and p_g the share of the total population in each subgroup (n_g/N). It is apparent from equation (3) that inequality depends on the mean income levels, population shares, and the extent of inequality within the population subgroups.

Finally, in order to check for the relevance of home ownership as a means of old-age provision we look at the distribution of IR over the life cycle and the relevance of IR for different age groups. Thus, we apply the decomposition analysis with respect to housing tenure status and age of household head, respectively.

4. Empirical Results on the Relevance of Imputed Rent by Housing Tenure Status

The distribution of housing status and housing costs among the population in private households serves as the starting point for evaluating the effects of IR in the three countries (see Figure 1). Over the observation period from 1993/94 to 1998/99, the share of the population living in owner-occupied housing increased slightly in all three countries by about 2–3 percentage points.

The results for Great Britain and the U.S. look very similar. The share of the population living in owner-occupied housing is about 70 percent in both countries. Roughly two thirds of all owner-occupiers, that is about 50 percent of the total population in both countries, are still paying off mortgages; the remaining households own their home outright.

The ownership rate in West Germany is recognizably lower than in the Anglo-Saxon countries at less than 50 percent of the total population, i.e. more than half of the West German population lives in rented accommodation. In contrast to Great Britain and the U.S. results, the share of German homeowners who are still paying off mortgages is considerably lower (about 55 percent of all owners).

[21]Details on inequality decomposition can be found, e.g. in Shorrocks (1984) and Jenkins (1995).

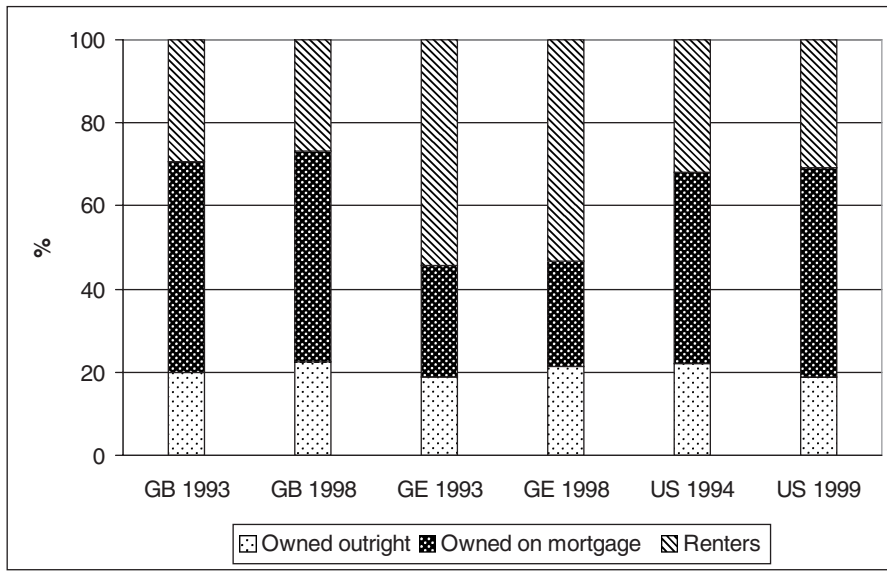

Figure 1. Population in Private Households in Great Britain, West Germany and the U.S. by Housing Tenure

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

In principle, the share of persons enjoying a positive value of IR is by definition less than or equal to the total share of owner-occupiers. However, due to high financing costs at the beginning of the repayment period, it must be assumed that a certain portion of owner-occupiers do not realize any gains from IR. According to our results, almost two thirds of the population in Great Britain and the U.S. (based on specification A) receive this fictitious income advantage, which is much higher than in Germany at about one third. Considering specification B for the U.S. the population share with a positive value of IR drops significantly to only 30 percent.[22] Obviously, these differences are caused in part by the different methods and specifications applied to determine IR in the underlying datasets. This is true for Germany with its all-inclusive consideration of owner-specific costs in the opportunity-cost approach as well as for the differential treatment of inflation in case of the U.S. results.

4.1. *Imputed Rent and Individual Income*

4.1.1. Results from the Reference Model without Imputed Rent

Not surprisingly, persons in homeowner households have a higher disposable income than those in tenant households; this is true for all three countries (see Table 1 and Appendix, Table A1). The relative income position of owner-occupiers in the reference model (i.e. *without* considering IR) in all three countries is

[22]That is in 1998/99, about 95 percent of U.S. homeowners enjoyed returns from owner-occupied housing using specification A, whereas this share is 86 percent in Great Britain, and 73 percent in West Germany. Using specification B for the U.S. this value is as low as 44 percent.

TABLE 1

RELATIVE INCOME POSITIONS AND THE RELEVANCE OF IMPUTED RENT IN GREAT BRITAIN, WEST GERMANY AND THE U.S.

	Great Britain				West Germany				U.S.					
									1994			1999		
	1993		1998		1993		1998			Disposable Income incl. IR			Disposable Income incl. IR	
	Reference Model	Disposable Income incl. IR	Reference Model	Disposable Income incl. IR	Reference Model	Disposable Income incl. IR	Reference Model	Disposable Income incl. IR	Reference Model	Specification A	Specification B	Reference Model	Specification A	Specification B
	Relative Income Position: Total Population = 100 *Imputed Rent as a % of Disposable Income*													
Total	100	100	100	100	100	100	100	100.0	100	100	100	100	100.0	100
	–	*9.0*	–	*9.5*	–	*2.9*	–	*4.1*	–	*6.9*	*1.8*	–	*6.5*	*1.7*
Owner-occupiers, total	113	116	111	113	111	114	113	117	113	116	114	114	117	115
	–	*12.7*	–	*13.0*	–	*6.3*	–	*8.7*	–	*10.2*	*2.7*	–	*9.7*	*2.4*
Owned outright	103	117	102	116	100	108	106	116	92	100	96	96	106	101
	–	*22.2*	–	*21.8*	–	*11.9*	–	*14.7*	–	*15.8*	*6.4*	–	*16.6*	*6.7*
On mortgage	117	115	114	112	119	118	119	118	123	123	122	121	121	120
	–	*9.0*	–	*9.1*	–	*2.2*	–	*3.7*	–	*7.5*	*0.9*	–	*7.2*	*0.8*
Renters, total	69	62	70	62	91	88	89	85	73	67	71	68	63	67
	–	*0*	–	*0*	–	*0*	–	*0*	–	*0*	*0*	–	*0*	*0*

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

stable at between 111 and 114 percent of the respective population average. The income position of owner-occupiers who are still paying off mortgages is considerably higher than for those who own outright. As an illustration, in West Germany 1993 the difference between owners with mortgages and those who own outright in the reference model is almost 20 points (100 and 119, respectively). The higher income position of owners with mortgages is the result of the underlying life cycle or age selectivity, given that these persons are by in large successfully integrated in the labor market, while the majority of outright owners are living on old-age pensions. This result is very pronounced for the U.S., where outright owners appear to live on below-average income. As a consequence of the high-income position of owners, renters clearly perform below the average. In contrast to the surprising cross-country similarity of owners' position in the income distribution, it seems remarkable that the incomes of homeowners—especially those with mortgages—and renters deviate much more in the Anglo-Saxon countries than they do in Germany. While in the latter country renters have a relative income position of almost 90, the financial status of this group in Great Britain and the U.S. is just about 70 percent of the population average. However, the smaller share of German homeowners contributes to this result.

4.1.2. The Impact of Imputed Rent on Individual Income

The methods of computing imputed rental values applied in the databases used in this paper do not allow for negative values. As a result, the income advantage of persons in owner-occupied housing increases by definition once IR is considered (see Table 1). However, due to the above-mentioned age selectivity, this increase in the income position mainly favors owners who own outright. On the other hand, owners on mortgage basically remain at the same relative income level as in the reference model without IR. Here the high proportion of carrying charges, i.e. mortgage interest payments, are the driving factors. In Great Britain, the population owning outright improves the income position due to IR by about 14 percentage points in both observation years; in West Germany and the U.S. (specification A) this gain is about 8–10 percentage points and only 4–5 percentage points if specification B is used for the U.S. These results for the U.S. are also related to the more pronounced income inequality, which—other things being equal—reduces the probability of improving the relative income position.[23]

As a consequence of the increasing relative income levels of owner-occupiers, the position of renters deteriorates when IR is taken into account. In line with the above-mentioned changes for homeowners, the population of tenants in Great Britain and the U.S. (specification A) loses about 5–8 index points, whereas in Germany this loss in relative well-being is only 3–4 index points. Using specification B for the U.S. reduces the income position of tenants by 1–2 percentage points.

A straightforward measure of relative importance of IR for the individual in its household context is given by "IR as a percent of disposable income" (refer to the information given in italics in Table 1). We find distinct cross-national differ-

[23]As a whole, the increase in IR measures in the three countries over the five-year period is in line with the change in disposable income without IR. As such, potential changes in the real estate market in the observed years do not seem to affect the scope of IR.

ences for the total population: while in Great Britain IR makes up as much as 9 percent of total income in both 1993 and 1998, this result is about 7 percent (specification A) for the U.S. and only 3–4 percent in West Germany. Clearly, this figure is influenced by Germany's proportion of homeowners being lowest among all countries, but also the underlying methods to determine IR affects the results. This is especially true if specification B is used for the U.S. where IR's contribution to disposable income is only 2 percent.

Renters by definition do not enjoy income advantages from IR. Thus, it is of interest to analyze separately the effect of IR on the income of *all* owner-occupiers as well as on the income of *subgroups* of owners. In line with our expectations, the relevance of IR for owners with mortgages is considerably lower than for those who own outright. For those who are still paying off mortgages, IR is about 7–9 percent in Great Britain and in the U.S. (specification A) while those who own outright, mostly elderly homeowners, "gain" about 16–22 percent. The corresponding numbers for Germany are substantially lower at about 2–4 percent and 12–15 percent, respectively. If specification B is applied to the U.S. data the relative improvement for the two subgroups is again remarkably lower.

Overall, these results are a clear indication of the importance of this income advantage for elderly owners based on the implicit relevance of full carrying charges for private real estate property.

4.2. *Results from the Analysis of Income Distribution*

We analyze the effects of IR on the income distribution by comparing the results of robust inequality measures for two income concepts: equivalent disposable income *excluding* IR (Reference Model) and *including* IR. Additionally, it should be kept in mind that our results are based on different approaches for determining IR.

It should be noted that the results for our reference model (see Table 2) are in line with the international literature on income distribution.[24] In short, inequality of equivalent disposable income is highest in the U.S., Great Britain is in an intermediate position, and Germany shows the lowest level of inequality among the three countries. Concerning the development over time we also observe the expected results: increasing inequality among the U.S. population and a slight decrease in inequality in Great Britain. The German figures for 1993 and 1998 indicate a rather stable distribution.

The inclusion of IR yields a slight decrease in income inequality for Germany and a somewhat more pronounced reduction for the U.S. when specification B is used, which is in line with the findings in the literature (see Section 1). For these two cases, according to almost all measures employed, the inequality of disposable income decreases once IR is taken into account. The Gini coefficient for 1993 in Germany, for example, falls from 0.2536 in the reference model to 0.2519. This effect is also true for 1998, where, for example, the MLD coefficient drops from 0.1184 by an amount of 0.0017 after including IR.

[24]See for the U.S. (Burkhauser *et al.*, 1999), for Great Britain (Bardasi *et al.*, 2000) and for Germany (Grabka *et al.*, 1999).

TABLE 2

INCOME INEQUALITY AND INEQUALITY DECOMPOSITION IN GREAT BRITAIN, WEST GERMANY AND THE U.S. BY HOUSING TENURE STATUS

	Great Britain				West Germany				U.S.					
	1993		1998		1993		1998		1994			1999		
		Disposable Income incl. IR		Disposable Income incl. IR		Disposable Income incl. IR		Disposable Income incl. IR		Disposable Income incl. IR			Disposable Income incl. IR	
	Reference Model		Reference Model		Reference Model		Reference Model		Reference Model	Specification A	Specification B	Reference Model	Specification A	Specification B
Gini coefficient	0.2934	0.2946	0.2887	0.2907	0.2536	0.2519	0.2525	0.2527	0.3457	0.3468	0.3433	0.3560	0.3597	0.3547
Decile ratios														
90 : 10	4.49	4.56	4.18	4.35	3.32	3.31	3.30	3.29	5.88	5.78	5.72	5.92	5.93	5.84
90 : 50	1.93	1.92	1.86	1.88	1.72	1.72	1.75	1.77	2.05	2.04	2.03	2.20	2.23	2.19
50 : 10	2.33	2.37	2.24	2.32	1.93	1.92	1.89	1.86	2.86	2.84	2.82	2.69	2.66	2.67
Mean log deviation (MLD)	0.1454	0.1488	0.1438	0.1465	0.1217	0.1174	0.1184	0.1167	0.2231	0.2239	0.2198	0.2261	0.2309	0.2242
Decomposition of MLD														
Housing tenure status														
Owned outright	0.1328	0.1023	0.1400	0.1125	0.1472	0.1199	0.1140	0.0868	0.2035	0.1841	0.1904	0.2311	0.2154	0.2199
On mortgage	0.1085	0.1026	0.1067	0.1011	0.1063	0.1031	0.0868	0.0837	0.1543	0.1496	0.1524	0.1655	0.1626	0.1634
Renters	0.1338	0.1338	0.1438	0.1438	0.1081	0.1081	0.1201	0.1201	0.2542	0.2542	0.2542	0.2227	0.2227	0.2227
Decomposition (in % of total)[a]														
Between-group	16.99	24.93	13.77	21.57	5.42	7.16	6.93	11.14	11.75	14.85	12.06	13.50	17.19	14.16
Within-group	83.01	75.07	86.23	78.43	94.58	92.84	93.07	88.86	88.25	85.15	87.94	86.50	82.81	85.84

[a]Inequality "between" and "within" groups is given as a percentage share of inequality given by the MLD based on the total population.

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

However, the picture is different for Great Britain and specification A for the U.S., i.e. using the operationalization of the capital market approach according to Saunders *et al*. (1992). Here, a minor increase in inequality—if any—can be observed. For example, the Gini coefficient for Great Britain in 1993 moves up marginally by about 0.0012 when IR is brought in (in 1998 this difference is somewhat greater at 0.0020). Using decile ratios, we find for Great Britain that this effect relates mostly to increasing inequality in the lower half of the income distribution.

Summing up, it appears that using the very same approach for Great Britain and the U.S. (specification A) also yields similar results with respect to the impact of IR on income inequality. However, we do find contradicting results for the two specifications for the U.S. which may result from an overestimation of the income advantage of owner-occupied housing due to the different consideration of inflation on equity.

4.3. *Results from Income Inequality Decomposition*

The above-mentioned results for IR-induced changes in the overall income inequality are the result of various underlying factors. Differentiating the population by housing tenure status therefore provides more insight into these developments by controlling for income inequality *between* as well as *within* these groups.

Decomposition in the reference model without IR for all three countries shows the lowest degree of income inequality within the group of those homeowners who still are paying off their mortgage. This should not be too surprising given that this subpopulation predominantly encompasses households headed by individuals in their prime age and those with at least a minimum of the economic performance necessary to cope with the financial stress of paying back mortgage loans. On the other hand, both owners who own outright and renters differ very little in their within-group inequality (e.g. in Great Britain for 1993 the MLD is 0.1328 and 0.1338 for the respective subgroups).

Considering IR in the measure of disposable income changes the picture in several ways. Firstly, income inequality within the group of owners who own outright decreases in all three countries: in Great Britian and West Germany by as much as 20–30 percent; in the U.S. by about 10 percent. Secondly, in line with the less pronounced relevance of IR as a share of disposable income among owners on mortgage, inequality within this group is reduced to a much lower extent. Thirdly, and by definition, income inequality among renters remains at the same level. As a result of this, between-group income inequality increases explicitly in all countries, this effect being most distinct in Great Britain. Here, almost 25 percent of income inequality in 1993 is found between the subgroups considered in this analysis, 8 percentage points more than in the reference model.

In short, our decomposition results indicate the overall changes in income inequality to be the *net* effect of some conflicting changes: On the one hand there is increasing income inequality *between* the different groups of owner-occupiers as well as renters, respectively, and on the other hand we find inequality to be decreasing *within* the group of those owner-occupiers who own outright.

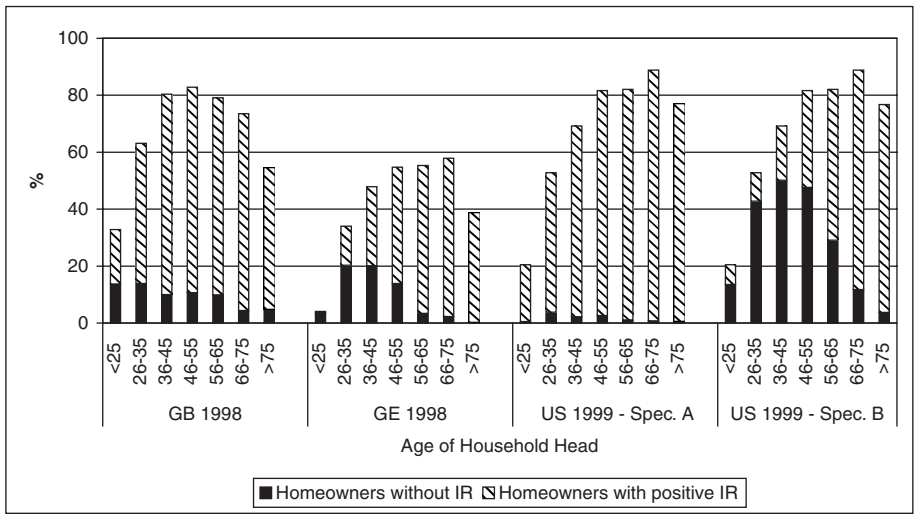

Figure 2. Homeownership and Imputed Rental Value in Great Britain, West Germany and the U.S. by Age of Household Head

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

5. Imputed Rent as a Means of Old-age Provision?

An important social policy issue in all three countries considered in this analysis is the "ageing society" phenomenon, exerting increasing pressure on the national old-age provision systems. This is especially true in the case of Germany with its traditionally strong public pension system. A popular means of encouraging individual provision for one's old age is to publicly subsidize private investment in owner-occupied housing. The following analysis offers some empirical cross-national evidence for this discussion by focussing on the relevance of IR (see Figure 2) and on IR-induced changes in the relative income position and poverty risk over the life cycle.[25]

As expected we find a positive correlation between the age of household head and homeownership in all three countries. While in Great Britain the highest share of homeowners is already found in the age group of 46 to 55, in Germany and in the U.S. the peak is in the age group of the 66 to 75 year-olds. Also common among all countries is that the oldest age group has a markedly lower share of owner-occupiers, which may be driven by elderly moving in with their children (after the death of the partner), or by old-age mobility into nursing homes.[26] Concerning the incidence of IR across the age distribution we principally find the expected positive correlation in all countries—however, Figure 2 reveals obvious differences across countries and across approaches used to determine IR. This is especially

[25]These analyses are carried out only for the most recent observation year (1998 for Great Britain and Germany and 1999 for the U.S.). A replication for 1993/94 in principle yields similar results to those depicted here.

[26]At least for Germany, this effect is partly driven by the donation of formerly owned property to children ("early inheritance") with the lifelong usufructuary right to the housing as a rent-free tenant.

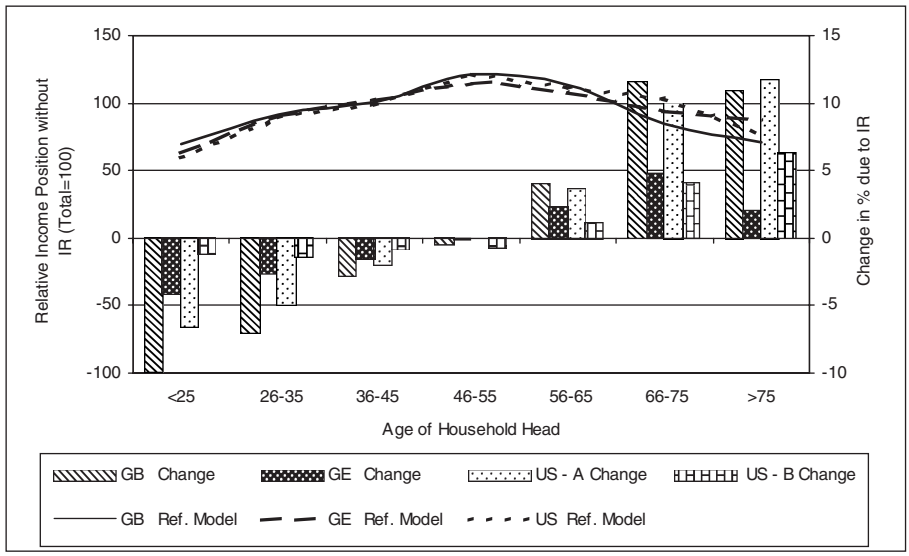

Figure 3. The Impact of Imputed Rent on Relative Income Position in Great Britain, West Germany and the U.S. by Age of Household Head, 1998/99

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

true when comparing the results for the two specifications used for the U.S., with version B showing a much more pronounced age-dependency of IR which is similar to that observed for West Germany. On the other hand, we find IR to be more equally distributed over British age cohorts.

As a starting point for the analysis of IR-induced changes on income, Figure 3 shows similar age-specific relative income positions in the reference model for all three countries. The corresponding changes in the relative income position are depicted after considering IR. Again, the trend for all three countries looks similar. The younger the head of the household, the bigger the relative loss in the income position after IR is taken into account. Households with middle-aged heads (age 46 to 55) mark a turning point; towards the upper end of the age distribution, relative gains increase when IR is taken into consideration. Due to the much lower share of owner-occupiers in Germany, the group-specific changes appear less distinct. On the other side, the remarkably large changes among the elderly in Great Britain are in line with previous results on the relevance of IR as a share of those household's disposable income. Again, the results for the two U.S. specifications are qualitatively similar; however, IR-induced changes in the income position of the elderly in specification A are much stronger and resemble the British picture. Overall we can conclude that IR appears to be an important, inherent part of the disposable income for the elderly in all countries considered in this analysis.

Decomposing our income inequality results with respect to the age of the household head we find cross-national differences in the age-specific trends in income inequality (see Table 3). For the reference model excluding IR, we find a U-shaped age inequality profile for Great Britain and Germany whereas the U.S. is characterized by clearly increasing income inequality over the life cycle.

TABLE 3

INCOME INEQUALITY DECOMPOSITION (USING MLD) IN GREAT BRITAIN, WEST GERMANY AND THE U.S. BY AGE OF HEAD OF HOUSEHOLD

	Great Britain 1998		West Germany 1998		U.S. 1999		
						Disposable Income incl. IR	
	Reference Model	Disposable Income incl. IR	Reference Model	Disposable Income incl. IR	Reference Model	Specification A	Specification B
	Mean Log Deviation						
Total population	0.1438	0.1465	0.1184	0.1167	0.2261	0.2309	0.2242
Age group							
<25	0.1843	0.1859	0.2066	0.2071	0.1864	0.1870	0.1861
26–35	0.1553	0.1566	0.1230	0.1200	0.1993	0.2041	0.1991
36–45	0.1309	0.1276	0.1136	0.1147	0.1990	0.2050	0.1982
46–55	0.1108	0.1134	0.0964	0.0894	0.2215	0.2252	0.2205
56–65	0.1306	0.1263	0.0979	0.0956	0.2354	0.2315	0.2338
66–75	0.1131	0.1250	0.1065	0.1002	0.2374	0.2312	0.2317
>75	0.1222	0.1501	0.1191	0.1233	0.2499	0.2282	0.2350
Decomposition (in % of total)[a]							
Between-group	9.32	9.01	5.57	6.43	6.12	7.34	6.18
Within-group	90.68	90.99	94.43	93.57	93.88	92.66	93.82

[a]Inequality "between" and "within" groups is given as a percentage share of inequality given by the MLD based on the total population.

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

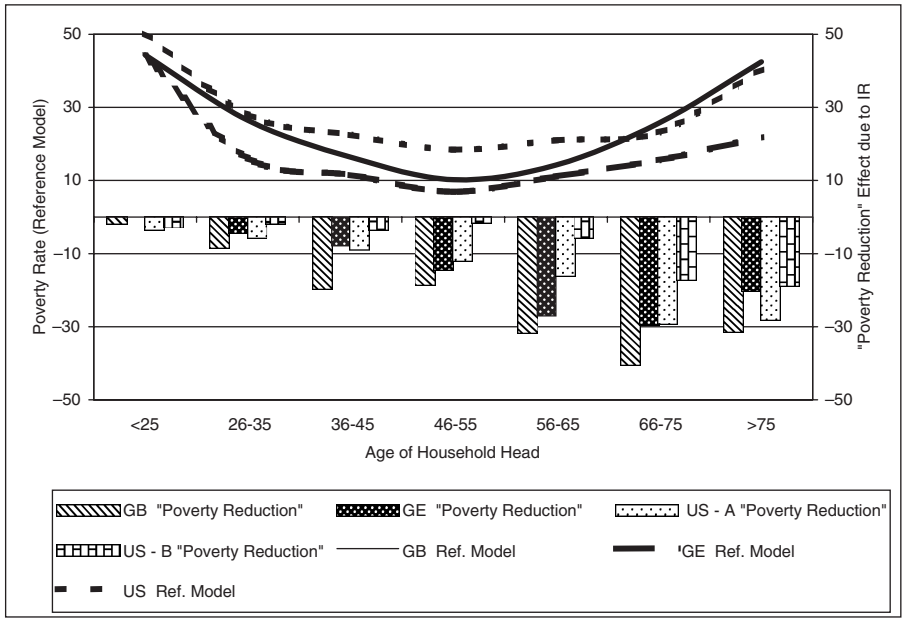

Figure 4. The Impact of Imputed Rent on Relative Income Poverty in Great Britain, West Germany and the U.S. by Age of Household Head, 1998/99

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

However, introducing IR generally affects the income inequality measures for the elderly in all three countries in a contradictory manner. In Great Britain income inequality increases in the population of those living in households with elderly heads (above 65 years), which also yields a slight decrease in total between-group inequality. The additional consideration of IR in Germany (at best) tends to result in slightly decreasing inequality with increasing age of head except for the eldest group. Here, between-group inequality increases by about 15 percent. Finally, in the U.S. a distinct change in age group-specific inequality can be noted for both specifications. While in specification A inequality increases for younger households and decreases for households with a head aged 56 and over, between-group inequality rises by about 20 percent. In specification B inequality decreases across all age groups and between group inequality therefore remains stable.

Social policy-oriented evaluation of the impact of IR on the level and structure of income inequality profits from additional knowledge about poverty among the elderly. That is, inequality itself is not necessarily a matter of concern; equally important is to know whether IR helps people escape from poverty. Figure 4 shows simple poverty head-count ratios based on a poverty line given at 60 percent of median income excluding IR. As expected, in all countries the age profile of poverty is U-shaped with poverty rates being highest in the U.S. and lowest in Germany, which is especially true for the elderly.

In a static approach we keep the poverty line constant and compare poverty rates based on an income measure including IR. The percentage change of these age-group-specific poverty rates can be interpreted as the "poverty reduction"

effect caused by IR. While we found the change in income position due to inclusion of IR to be highest for the elderly in the U.S. and Great Britain, the poverty reduction effect of adding IR appears to be highest in Great Britain only. This effect crucially depends on the ratio of IR and the poverty gap, i.e. given the assumption of a constant poverty line in our micro-simulation any owner-occupier whose value of IR exceeds the individual poverty gap "escapes" from poverty. Consequently, in Great Britain, where the value of IR as a percent of the poverty gap is highest across the three countries considered, the poverty reduction effect is also highest among the elderly.[27]

As such, our empirical findings support the hypothesis of owner-occupied housing as an effective means of old-age provision in all countries, not only in terms of raising the relative income position of the elderly, but even more in terms of poverty alleviation—in this respect the concept of local authority housing for low income households in Great Britain appears to be a successful policy.

6. Summary and Recommendations

The aim of this analysis is to measure the magnitude of income advantages from owner-occupied housing (IR) in Great Britain, West Germany and the U.S. as well as the extent to which IR influences the income distribution, given the respective approaches applied to calculate IR.

Empirical results for the three countries show that IR is a prevalent component of non-monetary income and represent a significant share of the disposable income of owner-occupiers. These results vary considerably by housing tenure and mortgage repayment status[28] and obviously, outright owners—overwhelmingly households with elderly heads—profit most from IR.

Concerning the impact of IR on the personal income distribution, our results for West Germany and in part for the U.S. indicate a decrease in income inequality which is in line with the international literature.[29] Results from inequality decomposition analyses by housing tenure show this overall impact to be the net effect of two conflicting changes in all three countries: on the one hand, there is increasing income inequality *between* the groups of owner-occupiers and renters, respectively, and, on the other hand, we find inequality to decrease *within* the group of those owner-occupiers who own outright.

From a life cycle perspective, the inclusion of IR yields a distinct poverty-reducing effect with increasing age of head for all three countries, which is espe-

[27]The average ratio of IR to poverty gap is 1.7 for Great Britain, 1.0 for Germany and 0.2 for the U.S. Using the same specification of IR as in Great Britain, the value for the U.S. increases to 0.8.

[28]Within this context, it would be worthwhile to include IR for all property for persons with more than one home for their own use. This study has generated income advantages only for the primary residence.

[29]One might also include the idea of defining IR for tenants in rent-free housing. This would seem to be useful for life cycle analyses, and especially for longitudinal analysis of income mobility. The income advantages for owners who have handed over the deeds of their property to their children and for other beneficiaries of rent-free housing are lost, *ceteris paribus*, if IR is not calculated for tenants in rent-free housing. Frick and Grabka (2001) show for West Germany that an alternative specification of the opportunity-cost approach, which also assigns IR to rent-free tenants, further reduces the Gini coefficient from 0.2785 to 0.2773.

cially true for Great Britain with its high "IR to poverty gap" ratio. As such, these findings lend clear support to the proposition of IR as a means of old-age provision.

Although our empirical results for the three countries by in large are qualitatively similar we must concede that some of the still observable differences are at least partly attributed to methodological differences in the measurement of IR. Using the capital market approach specified according to the suggestions by Saunders *et al.* (1992) yields similar results for Great Britain and the U.S. However, an alternative consideration of inflation in the capital market approach produces results similar to those represented here for Germany on the basis of the opportunity cost approach. As such, our results for the U.S. based on two different specifications of the same approach using the same micro-data serve as an indication for the sensitivity of empirical analyses to the underlying assumptions. Comparing all these results one may conclude that the capital market approach as specified here for Great Britain bears a risk of overestimating IR and thus confounding IR's impact on the income distribution.

A standardized method for calculating and measuring IR should therefore be of major concern to producers and analysts of cross-nationally comparative income data.[30] Our empirical findings clearly reinforce the Canberra Group's recommendation, according to which, "if net imputed rent is included in income, one must be careful that it is measured in a way that leads to greater international standardization instead of nation-specific measures of its value" (Smeeding and Weinberg, 2001, p. 12).

[30]However, given the rather small share of tenant households in the private housing market for countries like the U.K. (i.e. leaving aside the publicly subsidized housing market), it is deemed impossible to apply the opportunity-cost approach for all countries in a sensible manner.

APPENDIX TABLE A1

EQUIVALENT DISPOSABLE INCOME AND IMPUTED RENT IN GREAT BRITAIN, WEST GERMANY AND THE U.S.

	Great Britain				West Germany				U.S.					
	1993		1998		1993		1998		1994			1999		
										Disposable Income incl. IR			Disposable Income incl. IR	
	Reference Model	Disposable Income incl. IR	Reference Model	Disposable Income incl. IR	Reference Model	Disposable Income incl. IR	Reference Model	Disposable Income incl. IR	Reference Model	Specification A	Specification B	Reference Model	Specification A	Specification B
	(Mean Imputed Rent in Current GBP)				(Mean Imputed Rent in Current DEM)				(Mean Imputed Rent in Current USD)					
Total	9,491	10,575	11,488	12,894	30,787	31,646	33,409	34,892	20,465	22,210	20,854	25,237	27,442	25,736
	(0)	(1,084)	(0)	(1,406)	(0)	(858)	(0)	(1,483)	(0)	(1,706)	(351)	(0)	(2,111)	(412)
Owner-occupiers, total	10,717	12,256	12,744	14,667	34,114	35,985	37,721	40,883	23,086	25,679	23,685	28,843	32,118	29,640
	(0)	(1,539)	(0)	(1,923)	(0)	(1,870)	(0)	(3,162)	(0)	(2,509)	(516)	(0)	(3,027)	(600)
Owned outright	9,754	12,404	11,807	15,055	30,696	34,127	35,253	40,495	18,741	22,296	19,991	24,106	29,229	26,016
	(0)	(2,650)	(0)	(3,248)	(0)	(3,430)	(0)	(5,242)	(0)	(3,458)	(1,152)	(0)	(4,819)	(1,606)
On mortgage	11,096	12,197	13,155	14,497	36,538	37,303	39,759	41,203	25,169	27,276	25,430	30,631	33,192	30,988
	(0)	(1,101)	(0)	(1,342)	(0)	(764)	(0)	(1,443)	(0)	(2,061)	(216)	(0)	(2,422)	(225)
Renters, total	6,563		8,079		27,966		29,602			14,839			17,159	
	(0)		(0)		(0)		(0)			(0)			(0)	
Population share receiving IR (%)	*61.4*		*63.1*		*28.8*		*34.2*			*65.7*			*66.8*	
N	*12,212*		*11,865*		*11,710*		*11,156*			*14,565*			*11,659*	

Source: BHPS, SOEP, PSID, CNEF; authors' calculations.

References

Atkinson, A. B., *The Economics of Inequality*, 2nd edition, Oxford, 1983.

Atkinson, A. B., L. Rainwater, and T. M. Smeeding, *Income Distribution in OECD Countries*, OECD, Paris, 1995.

Bardasi, E., S. P. Jenkins, and J. A. Rigg, *Retirement and the Economic Well-being of the Elderly: A British Perspective*, ISER-Working Paper 2000-33, University of Essex, 2000.

———, *Documentation of Derived Current and Annual Net Household Income Variables, BHPS waves 1–9*, unpublished paper, Institute for Social and Economic Research, University of Essex, Colchester, August 2001.

Bourassa S. C. and W. G. Grigsby, "Income Tax Concessions for Owner-occupied Housing," *Housing Policy Debate*, 11(3), 521–46, 2000.

Butrica, B. and R. V. Burkhauser, *Estimating Federal Income Tax Burdens for Panel Study Income of Dynamics (PSID) Families Using the National Bureau of Economic Research TAXSIM Model*, Aging Studies Program Series Paper No. 12, Center for Policy Research, The Maxwell School, Syracuse University, Syracuse, NY, December 1997.

Burkhauser, R. V., J. S. Buttler, and A. J. Houtenville, "Changes in Permanent Income Inequality in the United States and Germany in the 1990s," *Vierteljahrshefte zur Wirtschaftsforschung*, 68(2), 284–9, 1999.

Burkhauser, R. V., B. Butrica, M. C. Daly, and D. R. Lillard, "The Cross-National Equivalent File: A Product of Cross-National Research," in I. Becker, N. Ott, and G. Rolf (eds), *Soziale Sicherung in einer dynamischen Gesellschaft. Festschrift für Richard Hauser zum 65. Geburtstag*, Campus, Frankfurt, 354–76, 2001.

Canberra Group, *Expert Group on Household Income Statistics: Final Report and Recommendations*, Ottawa, 2001.

Cowell, F. A., "Measurement of Inequality," in A. B. Atkinson and F. Bourguignon (eds), *Handbook of Income Distribution*, Elsevier, Amsterdam, 87–150, 2000.

Eurostat, *Recommendations on Social Exclusion and Poverty Statistics*, 31st Meeting of the Statistical Programme Committee, Luxembourg, 26–27 November 1998, CPS 98/31/2, Luxembourg, 1998.

Follain, J. R., D. C. Ling, and G. A. McGill, "Preferential Income Tax Treatment of Owner-Occupied Housing: Who Really Benefits?" *Housing Policy Debate,* 4(1), 1–24, 1993.

Frick, J. R. and M. M. Grabka, "Der Einfluß von *Imputed Rent* auf die personelle Einkommensverteilung," *Jahrbücher für Nationalökonomie und Statistik*, 221(3), 285–308, 2001.

Frick, J. R. and H. Lahmann, "Weitere Angleichung der Wohnverhältnisse in West und Ostdeutschland—Ergebnisse des Sozio-oekonomischen Panels," *DIW-Wochenbericht*, 67(51–52), 875–83, 2000.

Gottschalk, P. and T. M. Smeeding, "Cross-National Comparisons of Earnings and Income Inequality," *Journal of Economic Literature*, XXXV, 633–87, 1997.

Grabka, M. M., J. Schwarze, and G. G. Wagner, "How Unification and Immigration Affected the German Income Distribution," *European Economic Review*, 43, 867–78, 1999.

Hartmann, N., "Berechnung der Wohnungsmieten in den Volkswirtschaftlichen Gesamtrechnungen," *Wirtschaft und Statistik*, 2, 65–72, 1992.

Hendershott, P. H. and M. White, "Taxing and Subsidizing Housing Investment: The Rise and Fall of Housing's Favored Status," *NBER Working paper*, 7928, October 2000.

Hendershott, P. H., G. Pryce, and M. White, "Household Leverage and the Deductibility of Home Mortgage Interest: Evidence from UK House Purchasers," *NBER Working Paper*, 9207, September 2002.

Henley, A., *Housing Equity Data Computed from Waves 1 to 8 of the British Household Panel Survey*, ISER Working paper, University of Essex, 2000.

Hill, M. S., *The Panel Study of Income Dynamics: A User's Guide*, Guides to Major Social Science Data Bases, Vol. 2, Sage Publications, Newbury Park, CA, 1992.

Jenkins, S. P., "Accounting for Inequality Trends: Decomposition Analyses for the UK, 1971–86," *Economica*, 62, 29–63, 1995.

Kiel, K. A. and J. E. Zabel, "The Assuracy of Owner-Provided House Values: The 1978–1991 American Housing Survey," *Real Estate Economics*, 27(2) 263–98, 1999.

Lillard, D. R., *Codebook for the Cross-National Equivalent File 1980–2000. BHPS–GSOEP–PSID–SLID*, Cornell University, Ithaca, NY, 2001.

Meulemans, B. and B. Cantillon, "De geriusloze kering: De nivellering van de intergenerationele welvaartsverschillen (Levelling of Intergenerational Inequality)," *Economisch en Social Tijschrift*, 3, 421–48, 1993.

Perozek, M. G. and M. B. Reinsdorf, "Alternative Measures of Personal Saving," *Survey of Current Business*, 82(4), 13–27, April 2002.

Radner, D. B., "Noncash Income, Equivalence Scales, and the Measurement of Eceonomic Well-Being", *The Review of Income and Wealth*, 43(1), 71–88, 1997.
Saunders, P. *et al.*, *Non-cash Income, Living Standards, Inequality and Poverty: Evidence from the Luxembourg Income Study*, Discussion Papers No. 35, Social Policy Research Centre (SPRC), The University of New South Wales, Australia, 1992.
Schwarze, J., *Simulating German Income and Social Security Tax Payments Using the GSOEP*, Cross-National Studies in Ageing Project Paper No. 19, Syracuse University, Syracuse, NY, 1995.
Shorrocks, A. F., "The Class of Additively Decomposable Inequality Measures," *Econometrica*, 48, 613–25, 1980.
———, "Inequality Decomposition by Population Subgroups," *Econometrica*, 52, 1369–88, 1984.
Smeeding, T. M. and D. H. Weinberg, "Toward a Uniform Definition of Household Income," *The Review of Income and Wealth*, 47(1), 1–24, 2001.
Smeeding, T. M., P. Saunders, J. Coder, S. Jenkins, J. Fritzell, A. J. M Hagenaars, R. Hauser, and M. Wolfson, "Poverty, Inequality, and Family Living Standards Impacts across Seven Nations: The Effect of Non-cash Subsidies for Health, Education, and Housing," *The Review of Income and Wealth*, 39(3), 229–56, 1993.
SOEP Group, "The German Socio-Economic Panel (GSOEP) After More Than 15 Years—Overview," *Vierteljahrshefte zur Wirtschaftsforschung*, 70(1), 7–14, 2001.
Taylor, M. F. *et al*. (eds), *British Household Panel Survey User Manual. Introduction, Technical Reports and Appendices*, University of Essex, ESRC, Colchester, 1998.
United Nations, *Provisional Guidelines on Statistics of the Distribution of Income, Consumption and Accumulation of Households*, Studies in Methods, Series M. No. 61, New York, 1977.
Van de Donk, P. L., "Huurwaarde als inkomen in natura: een ramingsmethode [= Imputed rent as income in kind: an estimation procedure]," *Supplement bij de Sociaal-economische maandstatistiek*, 5–13, 1994.
Wolfe, B. and R. Moffitt, "A New Index to Value In-kind Benefits," *The Review of Income and Wealth*, 37(4), 387–408, 1991.
Wolff, E. N., "Wealth Holdings and Poverty Status in the U.S.," *The Review of Income and Wealth*, 36(2), 143–65, 1990.
Yates, J., "Imputed Rent and Income Distribution," *The Review of Income and Wealth*, 40(1), 43–66, 1994.