

Factors Driving Wealth Inequality in European Countries

The Effect of Inheritance and Gifts on
Household Net Wealth Distribution
Analysed by Applying the Shapley Value
Approach to Decomposition

Sebastian Leitner



Factors Driving Wealth Inequality in European Countries

The Effect of Inheritance and Gifts on Household Net Wealth Distribution Analysed by Applying the Shapley Value Approach to Decomposition

SEBASTIAN LEITNER

Sebastian Leitner is Economist at the Vienna Institute for International Economic Studies (wiiw).

Research was financed by the Austrian Chamber of Labour.

The author wishes to thank Stefan Jestl and many others for their helpful comments and assistance.

Abstract

This paper analyses how microeconomic factors drive inequality in household wealth across nine European countries when applying the Shapley value approach to decomposition. The research draws on micro data from the Eurosystem Household Finance and Consumption Survey 2014. Disparity in inheritance and gifts obtained by households are found to have a considerable effect on wealth inequality that is on average stronger than that of income differences and other factors. In Austria, Germany, France, Portugal and Spain, the contribution of real and financial assets received as bequests or inter vivos transfers attains more than 30% to explained wealth inequality. The distribution of household characteristics (age, education, size, number of adults and children in the household, marital status) within countries however also shapes the observed wealth dispersion. The results resemble those obtained in a similar study (Leitner, 2016) based on data from the first wave of the Eurosystem Household Finance and Consumption Survey (HFCS 2010).

Keywords: inequality, wealth distribution, decomposition analysis, inheritance, inter vivos transfers, income distribution, Europe

JEL classification: D31, D63, O52, O57

CONTENTS

Introduction	1
Data	3
Methodology	6
Empirical results	9
Comparison of results based on HFCS 2014 with HFCS 2010 outcome	15
Summary and conclusions	18
References	21
Appendix	23

TABLES AND FIGURES

Table 1 / Descriptive statistics of inheritance and gifts, gross and net wealth and household income	9
Table 2 / OLS estimations predicting IHS-transformed household net wealth	11
Figure 1 / Shapley value decomposition of Gini index – net wealth	12
Figure 2 / Shapley value decomposition of explained inequality – net wealth	13
Figure 3 / Scatter plot: Gross income versus net wealth, HFCS Austria	16
Figure 4 / Correlation coefficients between gross income and net wealth, HFCS Austria	17

Appendix

Table A.1 / OLS estimations predicting IHS-transformed household gross wealth	23
Table A.2 / Descriptive statistics: gross wealth, net wealth, inheritance & gifts, household income – HFCS 2010	25
Table A.3 / OLS estimations predicting IHS-transformed household net wealth, based on HFCS 2010	26
Figure A.1 / Shapley value decomposition of Gini index – gross wealth	24
Figure A.2 / Shapley value decomposition of explained inequality – gross wealth	24
Figure A.3 / Shapley value decomposition of explained inequality – net wealth, based on HFCS 2010	27

Introduction

In recent years the topic of household wealth holdings and their distribution has been discussed intensively in literature. An obvious reason for this is the increase of accumulated private wealth in relation to the national income in affluent industrialised economies from the late 1970s onwards, as analysed among many others by e.g. Piketty (2014). In addition to this development, most OECD countries experienced an increase in the inequality of income from the 1980s onwards (see, for example, OECD 2011). Another reason for the increased interest in research into household wealth is that micro data have become available in the past two decades for more and more countries, allowing us to study wealth holdings and inequality, not only at the level of individual countries but between them, too. This was first possible via the Luxembourg Wealth Study Database and then more recently based on data from the Eurosystem Household Finance and Consumption Survey (HFCS).

In a previous paper (Leitner, 2016) I applied the Shapley value approach to decomposition to wealth inequality based on HFCS 2010 data. The present paper replicates the analysis using data from the second wave of the survey (HFCS 2014). Thus, the aim is to test the robustness of the results obtained previously and to analyse potential differences. Similar to the previous research conducted in this area (Leitner, 2016), my assumption is that the accumulation of wealth stocks by households is facilitated by the receipt of bequests or gifts (mostly from ancestors). Therefore, the wealth inequality of one generation can be passed on to the following, which over longer periods of time may result in an increase in the inequality of wealth within a society. In principle, households build up wealth stocks in three ways. Either they save out from their income, be that from employment, self-employment or other financial sources. The second means, important for many households, is to receive bequests or gifts and to save them instead of using the assets for consumptive purposes. The third form, which however cannot be dealt with in this paper, is through the appreciation of a household's assets in real terms. In this paper I am interested in the process by which a household increases its wealth stocks via the first two means and the respective inequality in asset holdings that results therefrom. In order to detect the sources of wealth inequality across countries I apply (as in Leitner, 2016) a decomposition methodology based on the Shapley value approach to the inequality measure used most frequently in the literature: the Gini index. This decomposition method allows for an assessment of the relative importance of explanatory factors in inequality. While some authors (see literature review below) have already worked for some decades on measuring how much of the accumulated stock of household wealth can be attributed to inheritance and intergenerational inter vivos transfers (contrary to wealth built up over the life cycle via saving and investment), decomposition approaches to the distribution of wealth have been performed only recently. However, in the literature so far, there are only examples of decompositions by wealth source but not by subgroups. The latter analysis is performed in the following and should highlight the relative importance of inheritance, income and household characteristics in shaping wealth inequality in a cross-country manner, thus providing a novel contribution to the literature.

The paper is organised as follows: since the approach of this paper equals the one of previous research performed in Leitner (2016) I will not replicate or present a distinct literature review in this publication. Instead I refer the reader to the one presented there, covering the relevant publications on

developments of household wealth inequality, the effects of inheritance and inter vivos transfers and on decomposition methods used to analyse income and wealth inequality. Section 2 discusses the most relevant aspects of the data used (sources, measurement issues and definitions) and Section 3 introduces the concept of the Shapley value approach to decomposition, discussing the way I apply this method. Section 4 presents the empirical results of the analysis for inequality in net wealth stocks of households and Section 5 compares those with previous outcomes based on HFCS 2010 data as published in Leitner (2016). Section 6 concludes.

Data

The data for the analysis presented in this paper are drawn from the Household Finance and Consumption Survey wave 2 (HFCS 2014 – UDB 2.0). Furthermore, the results were compared to those published in Leitner (2016) where analysis was performed using data from the first wave of the survey (HFCS 2010 – UDB 1.1 published in February 2015). While the survey was conducted in 15 euro area countries¹ in the first wave, the second saw the participation not only of all euro area countries except for Lithuania, but also Hungary and Poland. Due to data issues, however, not all of these countries could be considered in the analysis presented in this paper. A detailed description of the methodology of the survey is presented by the European Central Bank (2016). The HFCS provides data on gross and net wealth holdings of households and their components and socioeconomic characteristics for the households and their individual members. Moreover, it covers data on inheritance and gifts received, as well as gross income. Interpreting results in cross-country comparisons of wealth inequality should be done cautiously. As discussed by, for example, Fessler and Schürz (2013) and Tiefensee and Grabka (2014) and more recently Fessler et al. (2016), although a lot of ex-ante harmonisation was conducted, there are several aspects of potential methodological constraints regarding cross-country comparability due to the non-harmonisation of sampling frames, sample sizes, survey modes, oversampling of top wealth households, reference periods, weighting or imputation methods applied and variations in initial response rates by countries. Nevertheless, as emphasised by Tiefensee and Grabka (2014:26), ‘the HFCS is still the best dataset for cross-country comparisons of wealth levels and inequality in the Euro area and it is definitely a first (big) step into the right direction’. The HFCS data offer five different multiple imputations in order to correct for item non-response. I take these imputations into account in my estimation analysis by using Rubin’s Rule. Moreover, unit non-response is accounted for in the HFCS data by providing 1000 replicate weights, which are all used in my estimations.

Similar to the analysis performed in Leitner (2016), in this paper I also decompose two different variables depicting wealth holdings of households: gross wealth (total household assets excluding public and occupational pension wealth) and net wealth (gross wealth minus total outstanding household liabilities). As explanatory variables I first apply total household gross income and five different types of inheritances and gifts (household main residence, further dwellings, land, business and the sum of other assets) received by all household members. Obviously, the net income of households would be a better measure of assessing the potential of households to save out from their income; moreover, present income may not be the best predictor of income flows accrued by individuals in their previous (working) life; however, this information is so far not available in the HFCS. In the HFCS 2014, the reference person is asked to provide information on whether the main household residence, if owned, was inherited or a gift. Furthermore, information is collected on up to three inheritances or substantial gifts from someone who is not a part of the current household. Since in the case of Finland no data were provided on inheritances and for the Netherlands, Cyprus and Greece, the share of households having provided information on inheritances (and gifts) received were considerably low, I had to exclude those three countries from the analysis. Malta could not be included in the analysis either, owing to multiple

¹ The HFCS 2010 was conducted in Austria, Belgium, Cyprus, Finland, France, Germany, Greece, Italy, Luxembourg, Malta, the Netherlands, Portugal, Spain, the Slovak Republic and Slovenia.

data problems. In general, inheritance data have to be interpreted cautiously as inheritances are notoriously underreported in wealth surveys. The rate of refusal to answer questions concerning inheritances especially rises in line with the wealth holdings of households (Fessler and Schürz, 2013). Most probably this results in an underestimation of wealth inequality.

It should be pointed out that bequests and gifts acquired in the past are not automatically part of the actual present wealth stock. In the period between acquisition and the time of the survey interview, assets may have been used not only for the accumulation of the wealth stock of the household, but, for example, also for consumption purposes or inter-household transfers. Thus, a regression of wealth stocks on wealth transfers received is not a means of explaining the total sum of wealth by its parts.

In addition to the value of the property at the time of acquisition (by way of inheritance or gift), information is collected on the date of acquisition. In order to make the assets inherited or acquired as gifts comparable with each other both within households and between households, we have to calculate the present value of the assets. This problem is dealt with in different ways in the literature; the resulting assumptions differ between a depreciation of the real value of assets (by leaving the nominal value of the acquired asset unchanged) and an appreciation of up to 3% annually. For the lack of information on actual appreciation I resort to the conservative method applied by, for example, Fessler et al. (2008a; 2008b) and Fessler and Schürz (2013), assuming the retention of the real value of the asset by appreciation, using the annual national consumer price index (CPI). The data were provided by the AMECO database from 1960 onwards for all euro area countries except for new Member States (NMS) of the European Union, i.e. Estonia, Latvia, the Slovak Republic and Slovenia. Data from 1960 onwards was available for Poland, but not for Hungary. Therefore, all NMS except Poland had to be excluded from the analysis as well. For assets acquired before 1960, I have to assume no increase in value up to 1960. Of those households having received inheritances and gifts, 1.8% acquired them before 1960 (unweighted average over shares of countries analysed). Concerning the application of the CPI for the calculation of the present value of the assets inherited or received as gifts, I do not differentiate between different kinds of assets since households could swap between asset types. However, in the regression analysis I use the information of asset types to construct different explanatory variables. In the case of dwellings, land, and businesses (including securities and shares) acquired, I assume that households have a higher incentive to keep those assets and further invest in them, and that those assets appreciate with an interest rate exceeding the CPI (the applied appreciation rate for bequests and gifts) resulting in higher wealth stocks of households having inherited those assets. The present values of the following groups of assets acquired via inheritance (or as gift) were thus used as separate explanatory variables: household main residence; dwellings apart from household main residence and use of dwellings; land; businesses (including farms), securities and shares; further assets inherited (or received as gifts). The latter group of assets also includes the values of those inheritances (or gifts) which comprise more than one specific asset, since in such cases the value of individual assets is not provided for in the HFCS data file.² Some information used as an additional explanatory variable was not collected in all euro area countries. This was the case for the question of expectations on the receipt of a substantial gift or inheritance in the future for Spain.

² In the case of France, only 63 per cent of the present value of inheritances and gifts could be assigned to one of the five specific groups of assets described above (that is, the rest of the value had to be assigned to the category 'other assets'). For further countries analysed: LU: 71 per cent, PT: 79 per cent, AT: 84 per cent, DE: 84 per cent, ES: 85 per cent, IT and PL: 100 per cent.

Furthermore, I use socioeconomic characteristics as explanatory variables. For this I employed personal characteristics of the household members in order to construct variables for the household level. These are: the household level of educational attainment; the average age of adult household members (over 19 years of age); and the household size (the number of adults and children in the household). Moreover, I used dummies for the marital status of the household reference person (single, married, widowed, divorced or living in a consensual union on a legal basis). The reference person of the household provided in the HFCS – UDB 1.1 data file version (variableDHIDH1) is chosen according to the ‘Canberra’ definition.³ The household level of educational attainment is calculated as the average attainment level of all household members above the age of 16 and no longer in education and thus potentially available for the labour market (expressed in average years of schooling needed to attain the education level stated for the individual household members). The use of socioeconomic characteristics is particularly important in the case of cross-country comparisons since differences in household structures have a substantial effect on the measured summary statistics of wealth distribution in the euro area (see Fessler et al., 2014). For instance, I expect that households with more members, higher average education levels and members with a higher average age tend to possess higher stocks of household wealth.

³ The procedure of identification of the reference person is described in United Nations Economic Commission for Europe (2011: 65).

Methodology

The methodology of the Shapley value approach to decomposition applied in this paper has already been explained in detail in Leitner (2016). However, in order to make the analysis more user-friendly, I will repeat the explanation in the below. The advantage of a regression-based approach is that the relative importance of many variables and groups of them to explain inequality (socioeconomic characteristics of individuals or households such as age, gender, educational attainment, employment status, but also decisive monetary values such as income, etc.) is taken into account simultaneously. Thus, the regression approach (step 1) allows me to assess the importance of each of these explanatory variables conditional on all other variables for any dimension of inequality considered (in our case, stocks of household net and gross wealth). The Shapley value approach (step 2) then further allows me to calculate the contribution of each of these explanatory variables to the respective inequality measure.

The Shapley value approach can be illustrated by using a simple example with three explanatory variables. We first regress individual wealth levels y on these explanatory variables x_i ($i = 1, 2, 3$),

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon,$$

where ε denotes the error term. The predicted wealth level is then given by

$$\hat{y}_{123} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \hat{\beta}_3 x_3.$$

This predicted value is then used to calculate the Gini coefficient $\hat{G}_{\{123\}}^{(0)}$, where subscripts denote the variables included. In the first round we then eliminate one variable and calculate the predicted wealth levels $\hat{y}_{\{23\}}$, $\hat{y}_{\{13\}}$ and $\hat{y}_{\{12\}}$ for each household using the vectors of x_i and the original coefficients β_i from our wealth estimation (see step 1 of the approach). The corresponding Gini coefficients are then given by $\hat{G}_{\{23\}}^{(1)}$, $\hat{G}_{\{13\}}^{(1)}$ and $\hat{G}_{\{12\}}^{(1)}$ respectively. Analogously, in a second round we eliminate two variables, thus calculating $\hat{y}_{\{1\}}$, $\hat{y}_{\{2\}}$ and $\hat{y}_{\{3\}}$. The resulting Gini coefficients are $\hat{G}_{\{1\}}^{(2)}$, $\hat{G}_{\{2\}}^{(2)}$ and $\hat{G}_{\{3\}}^{(2)}$. The final round would then be to include the constant only; the resulting Gini coefficient would thus be $\hat{G}_{\{\}}^{(3)} = 0$.

The marginal contributions are then calculated using the Gini coefficients. The first round marginal contributions for each variable are

$$C_1^{(1)} = \hat{G}_{\{123\}}^{(0)} - \hat{G}_{\{23\}}^{(1)}, \quad C_2^{(1)} = \hat{G}_{\{123\}}^{(0)} - \hat{G}_{\{13\}}^{(1)} \quad \text{and} \quad C_3^{(1)} = \hat{G}_{\{123\}}^{(0)} - \hat{G}_{\{12\}}^{(1)}.$$

The marginal contributions in the second round of the first variable are given by

$$C_1^{(2,1)} = \hat{G}_{\{12\}}^{(1)} - \hat{G}_{\{2\}}^{(2)} \quad \text{and} \quad C_1^{(2,2)} = \hat{G}_{\{13\}}^{(1)} - \hat{G}_{\{3\}}^{(2)}$$

The average of these contributions is the marginal contribution of the first variable in the second round, i.e. $C_1^{(2)} = \frac{1}{2}(C_1^{(2,1)} + C_1^{(2,2)})$. Similarly, we calculate $C_2^{(2)}$ and $C_3^{(2)}$. The third round contribution is given by $C_1^{(3)} = \hat{G}_{\{1\}}^{(2)} - \hat{G}_{\{1\}}^{(3)} = \hat{G}_{\{1\}}^{(2)}$ as $\hat{G}_{\{1\}}^{(3)} = 0$ and analogously for $C_2^{(3)} = \hat{G}_{\{2\}}^{(2)}$ and $C_3^{(3)} = \hat{G}_{\{3\}}^{(2)}$.

Finally, averaging the marginal contributions of each variable over all rounds $j = 1,2,3$ results in the total marginal effect of each variable, i.e.

$$C_j = \frac{1}{3} \cdot (C_j^{(1)} + C_j^{(2)} + C_j^{(3)}).$$

The proportion of inequality not explained is then given by

$$C_R = G - \hat{G}_{\{123\}}^{(0)}.$$

The approach can easily be extended to any number of explanatory factors and to other inequality measures. However, since the number of combinations and thus Gini coefficients to be calculated grows exponentially with the number of variables, in practice is it necessary to combine the variables into seven or eight explanatory factors in order to keep the necessary computing time tolerable. In our case, we included in the explanatory factor inheritance the effect of the individual types of bequests and gifts and the effect of expected inheritance; the factor household age includes the variable household age and household age², household structure includes the effect of both the variables number of adults and number of children and the explanatory factor marital status comprises the effect of all three dummy variables for single, widowed and divorced reference persons of households (comparing their wealth holdings with those of reference persons being married or living in a consensual union).

Wan (2002) points to the fact that the presence of a negative constant in the regression equation may lead to negative predicted individual income levels. In that case, the calculation of a Gini coefficient and thus the contributions of individual variables to overall inequality would be impossible. To overcome this pitfall, he shows in Wan (2004) that different model specifications can be used for the underlying estimated income (in our case wealth) generating function, delivering moreover better log-likelihood values than the linear estimation model. Following his approach, we choose for the analysis in this paper a semi-log model:

$$\ln y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon. \quad (1)$$

Since the distribution of wealth data is not only highly skewed but net wealth data also comprise, due to outstanding debts of households, negative and zero values, we cannot apply a logarithmic transformation of the data. Instead, we must resort to a transformation often used in the literature on wealth stocks (see e.g. Burbidge et al., 1988; MacKinnon and Magee, 1990; Pence, 2006; Schneebaum et al., 2014) – the inverse hyperbolic sine transformation (IHS):

$$y_i = IHS(W_i) = \ln\left(W_i + \sqrt{W_i^2 + 1}\right). \quad (2)$$

This transformation is used not only for the wealth stocks but also the calculated sums of inheritances and gifts and the income of households since both can also feature zero and the latter for self-employed income also negative values. Thus our semi-log model takes the form:

$$\ln y = \ln\left(W + \sqrt{W^2 + 1}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon. \quad (3)$$

Since we are not interested in the decomposition of the log of wealth, but wealth in nominal terms, in the second step of the decomposition analysis we calculate the fitted values for the wealth levels of households after taking the antilog of the above model, resulting in:

$$e^{\ln \hat{y}_i} = e^{\hat{\beta}_0} * \left(e^{\hat{\beta}_1}\right)^{x_{1i}} * \left(e^{\hat{\beta}_2}\right)^{x_{2i}} * \left(e^{\hat{\beta}_3}\right)^{x_{3i}}, \quad (4)$$

where $\hat{\beta}_i$ denotes the coefficients of the estimated regression (3). In our case, after the above-described IHS transformation, this results in

$$\hat{y}_i = \hat{W}_i + \sqrt{\hat{W}_i^2 + 1} = e^{\hat{\beta}_0} * \left(e^{\hat{\beta}_1}\right)^{x_{1i}} * \left(e^{\hat{\beta}_2}\right)^{x_{2i}} * \left(e^{\hat{\beta}_3}\right)^{x_{3i}}. \quad (5)$$

The advantage of this model is that in this case the constant $e^{\hat{\beta}_0}$ becomes now a positive scalar which does not influence the magnitude of the calculated Gini coefficient. The elimination procedure as described above however remains unchanged. As one can see, we approximate wealth inequality with the transformed fitted values of the household wealth levels $\hat{W}_i + \sqrt{\hat{W}_i^2 + 1}$ stemming from $e^{\ln(\hat{W}_i + \sqrt{\hat{W}_i^2 + 1})}$ instead of \hat{W}_i . This would only be problematic if we had a large number of negative predicted values. However, since in our sample this is only the case in about 4% of the cases (with mostly low absolute values) the inequality levels calculated are almost the same based either on $\hat{W}_i + \sqrt{\hat{W}_i^2 + 1}$ or \hat{W}_i .

Empirical results

In order to describe the situation of wealth distribution in the analysed countries, we start by taking a look at the inequality of wealth and income across these countries. Table 1 presents the Gini indices of wealth of households. We can observe that both gross and net wealth are distributed much more unequally compared to household gross income. Moreover, the Gini indices for household wealth are much higher in Germany and Austria, while lowest in the group of countries analysed in this paper in Poland, Belgium and Spain. Bequests and gifts at present value are even more unequally distributed than net wealth. Taking into account the underreporting of inheritances, the inequality of bequests may be even higher. This is an effect of the relatively low rates of households having acquired an inheritance (or substantial gift) up to the date of the survey. In Italy only an estimated 20.1% of all households received bequests, while in Austria and France the share is 37.6% and 38.8%, respectively.

Table 1 / Descriptive statistics of inheritance and gifts, gross and net wealth and household income

	AT	BE	DE	ES	FR	IT	LU	PL	PT
Number of households	2,997	2,238	4,461	6,106	12,035	8,156	1,601	3,455	6,207
received inheritance or gift	37.6	30.2	26.7	33.6	38.8	20.1	29.7	23	22.6
received inh. or gift before 1960	1.2	2.5	0.7	2.8	0.9	2.8	1.8	1.5	2.4
Gini coefficients ¹⁾									
	(0.654)	(0.528)	(0.711)	(0.528)	(0.627)	(0.574)	(0.569)	(0.562)	(0.597)
Gross wealth	0.709	0.547	0.728	0.550	0.646	0.589	0.601	0.573	0.613
	(0.764)	(0.566)	(0.746)	(0.573)	(0.665)	(0.605)	(0.633)	(0.585)	(0.630)
	(0.678)	(0.570)	(0.746)	(0.575)	(0.659)	(0.587)	(0.615)	(0.574)	(0.663)
Net wealth	0.731	0.589	0.762	0.599	0.676	0.603	0.646	0.587	0.678
	(0.784)	(0.607)	(0.777)	(0.623)	(0.694)	(0.619)	(0.677)	(0.600)	(0.693)
	(0.869)	(0.861)	(0.897)	(0.898)	(0.885)	(0.930)	(0.877)	(0.993)	(0.942)
Inheritance – present value	0.897	0.874	0.917	0.929	0.907	0.940	0.898	0.997	0.956
	(0.925)	(0.886)	(0.937)	(0.96)	(0.928)	(0.950)	(0.919)	(1.000)	(0.970)
	(0.336)	(0.368)	(0.429)	(0.419)	(0.365)	(0.402)	(0.404)	(0.389)	(0.418)
Gross household income	0.349	0.392	0.449	0.437	0.374	0.416	0.417	0.401	0.437
	(0.362)	(0.416)	(0.468)	(0.454)	(0.383)	(0.430)	(0.430)	(0.414)	(0.456)

Note: 1) Lower and upper bounds of 95% confidence interval in parentheses.

Source: HFCS 2014 – UDB 2.0, wiiw calculations.

REGRESSION ANALYSIS

The Shapley value decomposition approach described above requires first to regress the IHS-transformed net wealth level of the households on the explanatory variables. In our case, these are first the IHS-transformed (calculated) present values of five different groups of specific asset types inherited or acquired as gifts. Further explanatory variables are a dummy for the expectation of future

substantial bequests or gifts, gross household income and a set of socioeconomic characteristics⁴: the average age of the household members (and the square of this variable), the average education level of household members and the number of adults and children in the household. Moreover, we apply dummies for the marital stat of the reference person of the household. We expect wealth of households to increase conditionally on amounts of inheritances (and substantial gifts) acquired and household gross income respectively.

The results presented in Table 2 below show that in general the coefficients have the expected signs and are significant for a large part of the explanatory variables in most countries. The explained part of the variance amounts to 20% on average (unweighted over countries) as shown by the R^2 . For household main residence, land and further dwellings (the three most important asset types of inherited wealth in value terms) the positive conditional correlation with net wealth is highest for Germany and Austria. All inherited asset types are positively correlated with net wealth if coefficients are significant. Almost all results are significant, with the only exceptions of inherited money in the case of Spain, land in the case of Belgium and Luxembourg, businesses securities and shares also in the of Belgium, Luxembourg and Italy; furthermore, in the case of Poland, the coefficient for asset types not specifically classified ('Other assets') is not significant. The expectation of a substantial gift or inheritance is a robust conditional predictor of higher net wealth values only in five out of the nine countries analysed. For income the regression results are obviously very robust. Households with higher earnings tend to be wealthier.

The higher the average age of the household, the more the members had time to accumulate wealth. Coefficients for age and age² show that household net wealth rises with increasing average age of the (adult) household members; however no significant results concerning age could be found for Austria. For most countries on average the peak of wealth is reached between 55 and 65 years (average age of adult household members). Households with higher average education levels hold conditionally higher net wealth, a robust result in all countries but Luxembourg. In general, larger households seem to have the possibility to accumulate higher wealth. More children in the household in general correlate with lower levels of net wealth. However, only in the case of Austria and Portugal are the coefficients significant. As expected, households where the reference person is married or lives in a consensual union have conditionally higher wealth compared to all other households. For completeness we should also mention here that in an earlier version of the regression model we included also the gender of the reference person as an explanatory variable and the share of female members in households. However, the results were non-significant.

In addition to net wealth of households we also regress gross wealth levels on the above-described explanatory variables. The results are presented in Table A.1 in the appendix and are not discussed in detail here. However, described in brief they are similar to those with respect to household net wealth. Coefficient signs remain in general the same, whilst the share of the explained variance increases to an R^2 of some 35%. This is no surprise since the underlying decisions of households to borrow money for

⁴ Obviously one could apply different explanatory variables particularly for detecting the influence of household characteristics. In a robust check we also used alternatively the household type dummies applied by Fessler et al. (2014). The results concerning the contributions of inheritance and gifts, income and education remained robust. The advantage of our set of explanatory variables is that we can identify the individual effects of age, number of adults and children and marital status of reference persons, which are, in the case of the above mentioned household type dummies, intermingled.

private or business purposes are influenced by reasons more difficult to be described with the information available from the HFCS, thus the individual amounts of net wealth are more difficult to be estimated compared to gross wealth. Regression results in general show (see Table A.1), that the signs of the coefficients do not change and are significant in more cases compared to the regression results based on net wealth. The size of the coefficients decline for most variables unsurprisingly, since the values of individual household gross wealth are obviously higher than the ones of net wealth.

Table 2 / OLS estimations predicting IHS-transformed household net wealth

Independent variables	AT	BE	DE	ES	FR	IT	LU	PL	PT
Inheritance by asset types									
Household main residence	0.201***	0.115***	0.176***	0.093***	0.070***	0.072***	0.138***	0.058***	0.166***
- (IHS)	(0.013)	(0.027)	(0.024)	(0.014)	(0.016)	(0.009)	(0.021)	(0.015)	(0.019)
Money - (IHS)	0.045*	0.055**	0.100***	0.067	0.046***	0.034*	0.079**	0.088***	0.059*
	(0.026)	(0.023)	(0.033)	(0.052)	(0.009)	(0.019)	(0.031)	(0.025)	(0.033)
Dwellings excl. HH main res.	0.097***	0.085***	0.138***	0.086***	0.071***	0.092***	0.051*	0.086***	0.078**
- (IHS)	(0.023)	(0.019)	(0.020)	(0.011)	(0.008)	(0.006)	(0.026)	(0.015)	(0.031)
Land - (IHS)	0.129***	0.007	0.144*	0.061***	0.093***	0.062***	0.004	0.120***	0.103***
	(0.035)	(0.030)	(0.079)	(0.016)	(0.010)	(0.010)	(0.077)	(0.017)	(0.022)
Business, securities and shares - (IHS)	0.088***	0.048	0.186***	0.131***	0.114***	0.039	0.056	0.178***	0.172***
	(0.029)	(0.044)	(0.048)	(0.020)	(0.022)	(0.037)	(0.048)	(0.027)	(0.042)
Other assets - (IHS)	0.059*	0.088***	0.151***	0.073***	0.082***	0.093***	0.064**	-0.016	0.081***
	(0.034)	(0.018)	(0.042)	(0.019)	(0.010)	(0.035)	(0.026)	(0.114)	(0.028)
Expectation of substantial gift or inheritance	0.145	0.630***	0.994**		0.729***	0.429**	0.515	-0.211	1.095***
	(0.389)	(0.190)	(0.392)		(0.108)	(0.167)	(0.401)	(0.334)	(0.233)
Gross income - (IHS)	2.319***	1.237***	0.483***	0.325***	0.304***	0.510***	1.071***	0.682***	0.543***
	(0.258)	(0.260)	(0.165)	(0.084)	(0.049)	(0.062)	(0.270)	(0.136)	(0.142)
Household age (average of adults)	0.065	0.096**	0.105*	0.331***	0.094***	0.181***	0.127*	0.211***	0.170***
	(0.045)	(0.047)	(0.057)	(0.077)	(0.019)	(0.033)	(0.073)	(0.036)	(0.052)
Household age ²	-0.000	-0.000	-0.000	-0.002***	-0.000*	-0.001***	-0.001	-0.002***	-0.001**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Household education (average of years of adults)	0.228***	0.193***	0.449***	0.115***	0.132***	0.179***	0.055	0.278***	0.193***
	(0.052)	(0.038)	(0.052)	(0.025)	(0.013)	(0.017)	(0.054)	(0.029)	(0.030)
Number of adults	0.087	0.446**	1.081***	0.101	0.584***	0.370***	0.670***	0.383***	0.351**
	(0.195)	(0.186)	(0.222)	(0.167)	(0.105)	(0.071)	(0.156)	(0.119)	(0.159)
Number of children	-0.353**	-0.118	-0.339	-0.145	-0.084	0.027	-0.293	-0.157	-0.293*
	(0.164)	(0.166)	(0.217)	(0.204)	(0.053)	(0.069)	(0.192)	(0.136)	(0.163)
Reference person: single	-0.766*	-0.454	-0.132	-1.413***	-0.518***	-0.036	-0.130	-0.959***	-1.399***
	(0.393)	(0.285)	(0.437)	(0.444)	(0.154)	(0.170)	(0.401)	(0.258)	(0.355)
Reference person: widowed	-0.273	0.258	-0.236	-0.181	-0.011	-0.167	0.760	-0.189	0.193
	(0.303)	(0.392)	(0.443)	(0.254)	(0.171)	(0.142)	(0.480)	(0.250)	(0.312)
Reference person: divorced	-0.882**	-1.866***	-2.019***	-1.236***	-0.919***	-0.866***	-0.691	-1.369***	-1.828***
	(0.352)	(0.534)	(0.490)	(0.427)	(0.196)	(0.250)	(0.536)	(0.312)	(0.466)
Constant	-21.77***	-9.302***	-7.801***	-3.202	1.377*	-3.139***	-7.024**	-6.828***	-3.729*
	(2.792)	(2.749)	(2.144)	(2.679)	(0.741)	(0.986)	(3.044)	(1.673)	(1.906)
R ²⁺)	0.223	0.228	0.215	0.199	0.239	0.195	0.145	0.188	0.136
Observations	2,945	2,177	4,370	6,097	11,143	8,143	1,597	3,267	5,763

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; +) R2 using Fisher's z over imputed data

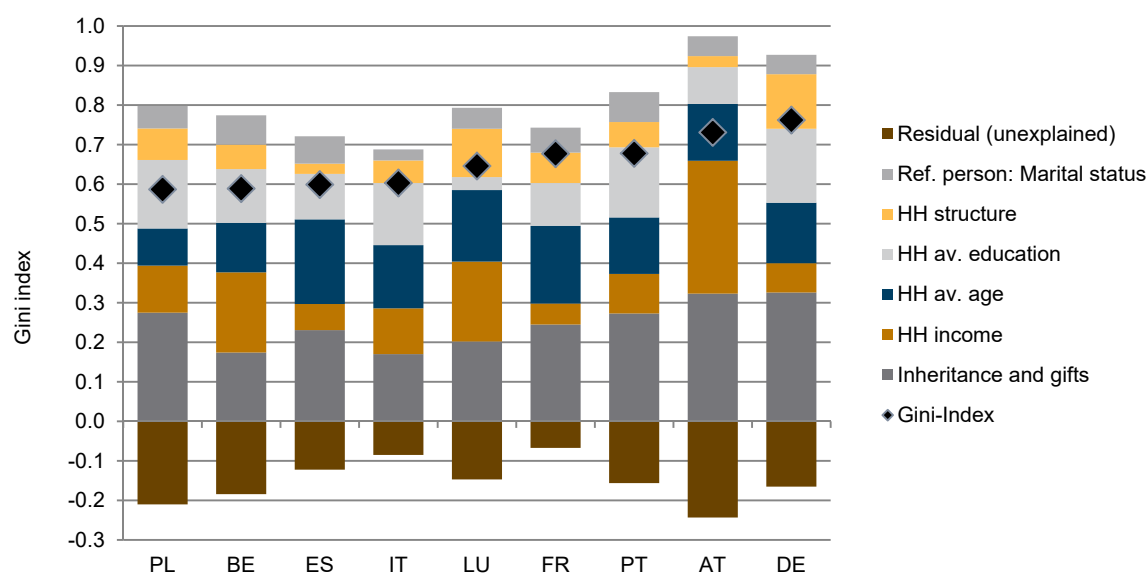
Source: HFCS 2014 - UDB 2.0, own calculations.

SHAPLEY VALUE DECOMPOSITION

Now we turn from the explanation of wealth levels of household to the explanation of wealth inequality levels in individual countries by applying the Shapley value approach to inequality decomposition. Figure 1 presents the decomposition results for net household wealth. First, we see that the Gini index calculated from the predicted values of the wealth generating function is somewhat higher to the one based on the original wealth data on households. In the case of France, wealth inequality is overestimated by about 10%, for Poland by about 35%. Looking into the detailed results for net wealth by quantiles, we can detect that the highest relative differences between predicted and original values are between the 40th and 60th percentile for most countries. Here we tend to underestimate the levels of net wealth. Thus the cross-country comparisons of absolute contributions of explanatory variables to the Gini coefficient have to be interpreted with care, while the comparison of the shares in the explained (calculated) inequality (see Figure 2) is less problematic.

Figure 1 / Shapley value decomposition of Gini index – net wealth

Contribution of groups of explanatory variables to Gini index



Source: HFCS 2014 – UDB 2.0, wiiw calculations.

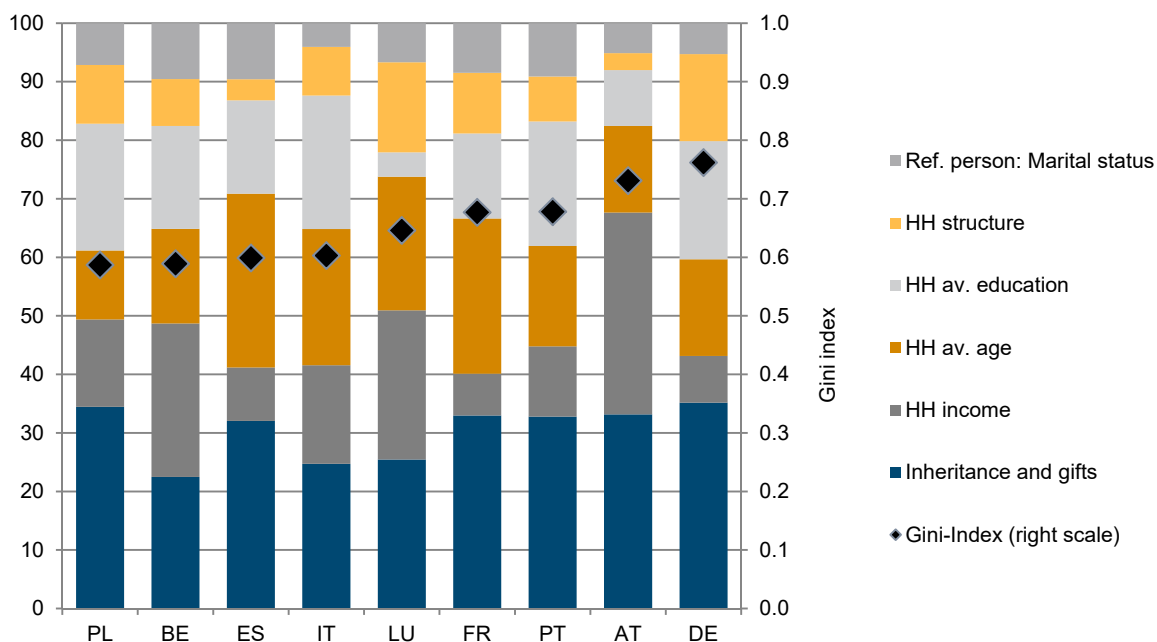
From the explanation of the methodology above one can derive that the extent to which an explanatory factor or variable contributes to the Gini coefficient depends, first, on the dispersion of wealth between the household subgroups being defined by the characteristics described by the variables and, second, on the shares of the subgroups in the total population. In our case, in order to keep the computing time of the Shapley value analysis tolerable we collapsed the effects of the individual types of bequests and gifts and the effect of expected inheritance to the explanatory factor inheritance and gifts; the factor household age includes the variables household age and household age²; household structure includes the effect of both the variables number of adults and number of children and the explanatory factor marital status comprises the effect of all three dummy variables for single, widowed and divorced reference persons of households.

In the case of the decomposition of net wealth we can observe that for the countries analysed on average almost 47% of the wealth inequality can be explained by the variation of gross income and acquired bequests and gifts (see Figure 2). Thus the differences in the accumulation of wealth are also significantly driven by the variations in household characteristics. However, the results differ strongly between countries. In the majority of countries and particularly those with the highest levels of inequality of net wealth the inequality of inheritances is the most important driver of overall wealth dispersion. In Germany and Austria (see Figure 1) more or almost 0.3 of the Gini index stems therefrom. However, in relative terms (as a share of the overall explained inequality) also in the case of Portugal, France, Spain and Poland, the latter country featuring the lowest level of dispersion in net wealth, more than 30% of the Gini coefficient can be explained by the inequality of inheritances. In the rest of the countries analysed, inheritances explain between 20% and 25% of the Gini index.

A noticeable divergence between Austria, Belgium and Luxembourg on the one hand and all other countries analysed can be observed in the case of the contribution of household gross income. In Austria household income explains even 35% of the inequality level, in both Belgium and Luxembourg 26%. The average contribution for all other EU members analysed amounts to only 11%.

Figure 2 / Shapley value decomposition of explained inequality – net wealth

Contribution of groups of explanatory variables to explained inequality, in %



Source: HFCS 2014 – UDB 2.0, wiiw calculations.

Smaller differences can be detected according to the contributions of the average education level of households. In general the relative contributions fit well to the differences in dispersion of household education levels across countries. Within the European Union, Portugal features the highest level of inequality in educational attainment rates (see e.g. Leitner and Stehrer, 2014), while particularly low dispersion according to this characteristic is to be found in Austria. In addition, the ranking of the other

countries in the Shapley decomposition corresponds with the one according to educational inequality between households, with the exception two countries. In Portugal, Poland and Italy the dispersion in education explains somewhat above 20% of the Gini index, in France, Belgium and Spain between 15% and 18%, in Austria only 10%. Luxembourg and Germany are exceptions concerning the contributions of household education. In the former it is with only 4% surprisingly low, while in latter with 20% rather high, although the dispersion of average household education levels is very low in Germany. That means that in Luxembourg households with relative low educational background possess relatively high levels of net wealth and vice versa, while in Germany the distribution of average household education levels overlaps very well with the distribution of net wealth values among households.

In the case of the average age of the household members, one can see that the contribution to total inequality does not only depend on the conditional effect age has according to the regression analysis on wealth levels. The differences between countries in the actual age structure of the population and thus the relative size of the age groups also influence the decomposition results. In France and Spain the contribution of age is quite high, adding between 25% and 30% to the Gini index, while in Luxembourg and Italy it is still above 20%. In all other countries variation by average age of adult household members contributes less strongly to overall wealth inequality, between 12% and 17%. As we could already expect from the underlying regression analysis, net wealth does not significantly differ conditional on all other explanatory variables between households of different size in Austria and Portugal. Hence, the size of the contribution amounts to 2.9% and 3.6% in those two countries. In Poland, France, Germany and Luxembourg differences in the structure of households are more important in explaining wealth inequality, the contribution ranges between 10% and 15% of the explained inequality. Wealth differences due to the marital status of the reference person are relatively low in Italy, Austria and Germany (ranging between 4% and 5%). In all other countries the contribution ranges between 7% and 10%.

A subsequent step in the analysis is the decomposition of the gross wealth of households. A glance at Figure A.1 in the appendix shows that the results look quite similar to the decomposition of net wealth. However, our wealth generating functions stemming from the regressions by country presented in Table A.1 in the appendix lead to a better estimation of inequality in household gross wealth compared to net wealth in all countries analysed. The detailed results of the Shapley decomposition are presented in Figure A.1 in the appendix and the contribution of groups of explanatory variables to explained inequality in Figure A.2 thereafter. They will not be discussed in detail here. However, described in brief the outcome of the Shapley decomposition of gross wealth inequality is very similar to those with respect to household net wealth. However, inheritance is on average still the most important factor explaining wealth inequality, while the significance of household income and household education level both increase considerably (see Table A.2). Simultaneously, the impact of the average age of adult household members declines. Taken together these changes show that households with higher incomes tend to take up credit during the working ages to invest. Thus gross wealth is less skewed by age, but more by income.

The importance of marital status and household structure remains almost unchanged.

Comparison of results based on HFCS 2014 with HFCS 2010 outcome

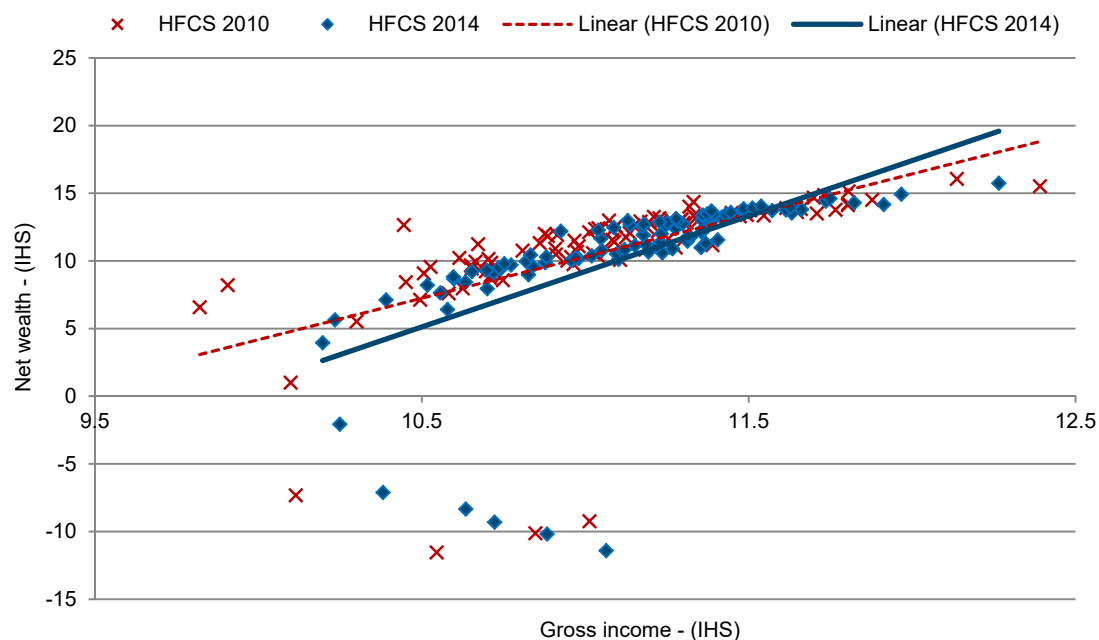
In a previous paper (Leitner, 2016) the Shapley value approach to decomposition was already applied to wealth inequality drawing on data from the first wave of the Household finance and consumption survey (HFCS 2010). Thus we can test the robustness of the results, comparing the outcome in the case of those countries that were analysed both in the previous paper and in this one. In the appendix we replicate the results of Leitner (2016) for those countries also analysed in this paper (Austria, Belgium, Germany, Spain, Luxembourg and Portugal) for the decomposition of inequality in household net wealth. Comparing the figures in Table A.2 with our descriptive statistics based on HFCS 2014 in Table 1 above, we can see that most countries chose to increase the sample size, which should enhance the accuracy of the results. The share of households having inherited or received a substantial gift in total households remains stable in all countries, except for Germany, where it fell from 34 per cent based on HFCS 2010 data to 27 per cent based on HFCS 2014 data. In the case of Portugal, the share also declined somewhat, but only from 27 per cent to 23 per cent. Inequality in gross and net wealth holdings declined slightly from HFCS 2010 data to HFCS 2014 data in Austria, Belgium and Luxembourg, while in Portugal only in the case of gross wealth. In Germany and Spain there was almost no change in the Gini index of gross and net wealth. Particularly in the case of Austria, the standard deviation of the estimated Gini indices fell both for gross and net household wealth indicating more accurate results. The Gini index describing household income inequality declined remarkably for Austria and Belgium, slightly for Portugal and increased somewhat for Germany and Spain. In order to understand the shift in income inequality a first consideration was, that changes in the survey methodology from the first to the second wave of the HFCS might have had an influence. In the case of Austria, the interviewers used in the fieldwork of the HFCS 2014 new predefined ranges in euro amounts to collect information on gross income from respondents that were unable to state specific amounts (see Albacete et al., 2016). Looking into the HFCS 2014 dataset, we can see that the average income of the 10th decile surveyed is about 20 per cent lower compared to the upper decile in the HFCS 2010 resulting in a decline of the Gini coefficient describing income inequality from 0.42 (HFCS 2010) to 0.35 (HFCS 2014).

The regression results for the IHS-transformed household net wealth based on HFCS 2014 data (see Table 2 above) remain very stable in comparison to the analysis performed with HFCS 2010 data (see Table A.3 in the appendix below). The coefficients are very similar for almost all inheritance asset types, education and household structure for most countries. In the case of household income a very strong increase of the coefficient can be observed for Austria, Belgium and Luxembourg, a somewhat lower rise for Spain and Portugal and a substantial decline for Germany.

Describing the changes between HFCS 2010 data and HFCS 2014 data for Austria, a similar picture can also be seen when drawing the unconditional relationships between gross income and net wealth. In Figure 3 we plot the percentiles of the IHS-transformed data of the 2010 and 2014 waves of the survey. Higher income levels result, based on the population of the HFCS 2014, in disproportionately higher net wealth levels compared to the data in the HFCS 2010.

Figure 3 / Scatter plot: Gross income versus net wealth, HFCS Austria

percentiles of survey data – transformed by the inverse hyperbolic sine function (IHS)



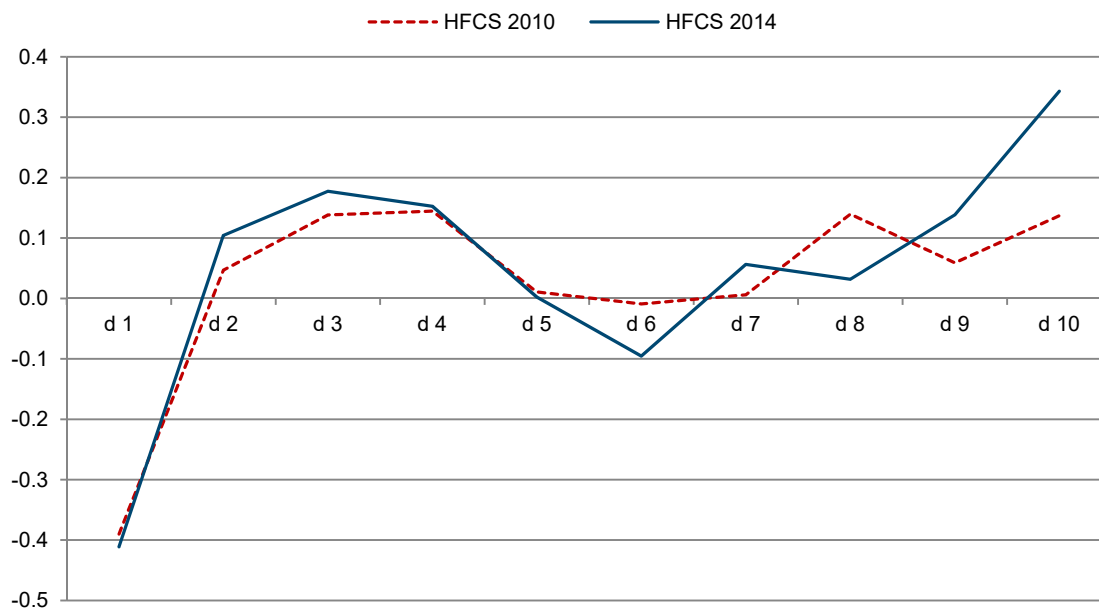
Source: HFCS 2010 – UDB 1.1, HFCS 2014 – UDB 2.0, wiiw calculations.

Looking at the final Shapley value decomposition, an implication of the above described changes in the regressions results is the rise in the contribution of household gross income to net wealth inequality when comparing Figure 2 above with Figure A.3 in the appendix. This is particularly the case for Austria, Belgium and Luxembourg, while only for Germany a decline of the contribution can be observed. Referring once again to Figure 3 we can see that in the HFCS 2014 net wealth levels are more driven by gross income levels in the case of Austria. Thus the contribution of the latter variable rises in relation to other explanatory variables.

The result that in the case of Austria income differences explain a larger part of net wealth inequality in the analysis based on HFCS 2014 data compared to HFCS 2010 data, although the Gini index of household income fell, may sound counterintuitive to the reader. However, Figure 4 below explains the main reason for the outcome quite well. Not only on average, but particularly in the upper two deciles of households, the correlation between income and net wealth levels is much higher in the HFCS 2014 data compared to HFCS 2010 data. This results in gross income levels describing levels of wealth holdings better in the Shapley value decomposition based on HFCS 2014 data than in data from the first wave of the survey (HFCS 2010).

Figure 4 / Correlation coefficients between gross income and net wealth, HFCS Austria

by deciles in net wealth



Source: HFCS 2010 – UDB 1.1, HFCS 2014 – UDB 2.0, wiiw calculations.

Simultaneously with the rise in the magnitude of the coefficient of gross income, the significance and magnitude of the coefficient of age declines in the regression results (see Table 2 above and Table A.3 in the appendix) in the case of Austria and Belgium, since it is correlated substantially with gross income. In the case of Germany and Portugal, the changes in the coefficient of income are coupled with a change of those of the household education variable. In all other countries the significance and magnitude of the coefficient remain almost unchanged. The regression results for the variables describing household structure and marital status are also robust. The share of explained variance in the regression analysis based on HFCS 2014 data is more or less the same compared to the one based on HFCS 2010.

The main result however, that inheritance is the most important driver of wealth inequality, remains unchanged compared to Leitner (2016). In the case of Austria, the variable describing the household income level becomes as important as inheritance. On average over all countries the second most important explanatory variable after inheritance and gifts remains the average age of adult household members. The third most important variable is household income followed by average education level of adult household members. In the analysis based on HFCS 2010 the ranking of the latter two variables concerning explanatory power is vice versa. The ranking of the variables household structure and marital status remain the same.

Summary and conclusions

In this paper I have analysed wealth inequality of households in selected European countries (Austria, Belgium, France, Germany, Italy, Luxembourg, Poland, Portugal and Spain) in comparison. The analysis is based on micro data from the Household Finance and Consumption Survey 2014 (HFCS 2014 – UDB 2.0). Other countries also covered in the HFCS 2014 unfortunately had to be skipped mostly due to incomplete coverage of data on inheritance or a lack of long CPI time series like in the case of most new EU Member States. In order to detect the sources and drivers of wealth inequality, I apply the Shapley value approach to decomposition analysis.

Wealth inequality measured by the Gini coefficient is much higher compared to inequality in income. The comparison of the European countries shows that inequality levels of wealth are highest in Germany and Austria, whilst relatively low in the South European countries Spain and Italy but also in Belgium and, as expected, in Poland. The accumulation of household wealth takes place via saving and investment from two sources in particular. First, households save from their current income from paid and self-employment as well as from financial income. Second, bequests and inter vivos gifts are important transfers of assets that are likely to be used for wealth accumulation, particularly by those households that are in no need to use those funds for consumptive purposes.

The decomposition analysis focuses on the extent to which those two types of sources of wealth accumulation shape the levels of wealth inequality in the European countries in comparison and, in addition, to what extent the inequality can be attributed to differences in household characteristics. First, I regress wealth holdings of households on the values of different types of assets acquired by households as substantial bequests or gifts and on current gross household incomes. Thereafter, I apply variables describing socioeconomic characteristics averaged over household members, that is to say the average age of adult household members, the average of highest education level attained by those household members being potentially available for the labour market, and the number of adults and children in the household. I also use dummy variables for the marital status of the reference person of the household. In order to make bequests and gifts acquired at different points in time comparable with each other and between households, I make the conservative assumption that the real values of the items do not change over time. Thus I inflate the nominal values of bequests and gifts at time of acquisition with the national consumer price indices. For the analysis of how much the income of a household has influenced the wealth stock built up, it would be preferable to have information on the previous flow of income over the whole life cycle for all household members. However, this information is not available in the HFCS 2014 and I have to apply the current gross household income as a proxy for lifetime income. Moreover, the household age captures the cohort effect, that is to say older individuals/households have had the chance to accumulate more wealth compared to younger ones. For my regressions I apply an inverse hyperbolic sine transformation to all monetary variables, which approximates the logarithmic transformation in order to raise the fit without, however, losing negative and zero values which are numerous in wealth data.

The regressions deliver the expected results with respect to the signs of the coefficients and are significant for most of the variables in the majority of countries. Households with higher amounts of bequests and inter vivos transfers acquired over the previous lifetime feature conditionally higher levels of wealth stocks. Those with higher current household income obviously have more funds available for non-consumptive purposes and have thus accumulated relatively high wealth holdings. The cumulative process of building wealth stocks results in households with higher average age having conditionally higher wealth stocks. The effect declines over the life cycle and household gross wealth peaks in most of the countries in the HFCS 2014 at a mean household age of between 55 and 65 years. Average household education levels correlate conditionally positively with wealth stocks. The variable might also capture some of the longer-term income differences between households, which are not embodied in the differences of current household income. Households with more adults in general hold conditionally more wealth assets. The motive of accumulating wealth for later transfers to the offspring seems to be strong as reported in the literature. Thus households with more children might have conditionally higher wealth holdings. The coefficients for the number of children however, when significant, show the opposing trend. More children in the household thus constrain the accumulation of the given funds due to current needs. Households with reference persons who are single, widowed or divorced have conditionally lower wealth holdings. Based on the wealth-generating functions stemming from my regressions, I applied the Shapley decomposition analysis. Gini coefficients were calculated for predicted values of wealth holdings of individual households stemming from all combinations of explanatory variables. The average differences between those Gini indices resulted in the estimation of the marginal contribution of each explanatory variable to the overall Gini of wealth stocks. In order to keep the necessary computing time tolerable, I collapsed the effect of a couple of variables to explanatory factors. These were the individual types of bequests and gifts and the effect of expected inheritance to the explanatory factor inheritance and gifts; the variables 'household age' and 'household age squared' to the factor 'household age'; the factor 'household structure' includes the effect of both the variables 'number of adults' and 'number of children', and the explanatory factor 'marital status' comprises the effect of all three dummy variables for single, widowed and divorced reference persons of households (comparing their wealth holdings with those of reference persons married or living in a consensual union).

Based on the Shapley value decomposition on average over the countries analysed, bequests and gifts contribute about 30 per cent to the predicted inequality of net wealth holdings. The contribution of gross household income is lower, at 17 per cent. However, the results vary somewhat between countries. Germany, with 35 per cent, shows the highest share, but is closely followed by Poland, Austria, France, Portugal and Spain (all between 30 per cent and 35 per cent, while the figures for Belgium, Italy and Luxembourg are somewhat lower (23 per cent and 26 per cent, respectively)). The contribution of income to net wealth inequality is relatively high in Austria (35 per cent), Belgium and Luxembourg (both 26 per cent). In the other countries the share amounts on average to only 11 per cent in the case of net wealth inequality. The results of the decomposition analysis show that differences in household characteristics are an important source of wealth inequality. Average age contributes about 20 per cent to the overall Gini index of net wealth, while in the case of education level it is a bit less, at 16 per cent. Differences in the size of households make a contribution of 9 per cent to net wealth inequality. The fact that the reference person of a household is not married or living in a consensual union has an effect that contributes, on average over countries, 7 per cent to the inequality of net wealth stocks.

The analysis in this paper reveals that differences in the amount of bequests and inter vivos gifts received by households strongly drive the observed wealth inequality in a number of European countries. In Austria, Germany, France, Portugal, Poland and Spain, those differences contribute about a third or more to the

explained inequality of net wealth. On average across the countries analysed, differences in household characteristics, that is, age, number of adults and children, marital status and education level, account for slightly more than half of wealth inequality. However, in the case of education we have to take into account that the literature points to a strong correlation between attainment levels acquired by ancestors and their offspring, thus part of the inequality is the outcome of an inter vivos transfer in kind. The result of the analysis is that only a part of wealth inequality can be explained by the life cycle hypothesis (which argues that a major source of wealth inequality is to be found in age variations between households), differences in the abilities of households to accrue and accumulate out of income, and further variations in household characteristics. Whether or not a person is born into a wealthy and educated family and thus inherits assets determines to a considerable extent whether he or she will make a fortune. The research presented emphasises this obvious fact.

References

- Albacete, N., P. Lindner and K. Wagner (2016). 'Eurosystem Household Finance and Consumption Survey 2014: Methodological notes for Austria (second wave), Monetary Policy & the Economy Q2/16 – Addendum, OeNB.
- Burbidge, J.B., L. Magee and A.L. Robb (1988). 'Alternative Transformations to Handle Extreme Values of the Dependent Variable', *Journal of the American Statistical Association*, 83(401), 123–127.
- European Central Bank (2016). 'The Eurosystem Household Finance and Consumption Survey – methodological report for the second wave', *Statistics Paper Series*, No. 17.
- Fei, J.C.H., G. Ranis and S.W.Y. Kuo (1978). 'Growth and the family distribution of income by factor components', *Quarterly Journal of Economics*, 92, 17-53.
- Fessler, P., P. Lindner and M. Schürz (2016). 'In focus: Eurosystem Household Finance and Consumption Survey 2014: first results for Austria (second wave)', *OeNB Monetary Policy & the Economy*, No. Q2/16.
- Fessler, P., P. Lindner and E. Segalla (2014). 'Net wealth across the euro area: Why household structure matters and how to control for it', *ECB Working paper series*, No. 1663.
- Fessler, P., P. Mooslechner and M. Schürz (2008a). 'Reich bleiben in Österreich', *Wirtschaft und Gesellschaft*, 39. Jahrgang (2013), Heft 3, Vienna.
- Fessler, P., P. Mooslechner and M. Schürz (2008b). 'How inheritances relate to wealth distribution? Theoretical reasoning and empirical evidence on the basis of LWS data', *Luxembourg Wealth Study Working Paper No. 6*.
- Fessler, P. and M. Schürz (2013). 'Cross-Country Comparability of the Eurosystem Household Finance and Consumption Survey', *OeNB Monetary Policy & the Economy*, No. Q2/13.
- Leitner, S. and R. Stehrer (2014). 'Drivers of Inequality and Poverty in the CEE and other EU Member States – A Shapley Value Decomposition Analysis', *wiiw Research Report 398*, The Vienna Institute for International Economic Studies (wiiw), Vienna.
- Leitner, S. (2016). 'Drivers of wealth inequality in euro area countries: the effect of inheritance and gifts on household gross and net wealth distribution analysed by applying the Shapley value approach to decomposition', *European Journal of Economics and Economic Policies: Intervention*, Vol. 13 No. 1, pp. 114–136.
- MacKinnon, J.G. and L. Magee (1990). 'Transforming the Dependent Variable in Regression Models', *International Economic Review*, 31, 2, 315–39.
- Morduch, J. and T. Sicular (2002). 'Rethinking inequality decomposition, with evidence from rural China', *Economic Journal*, 112, 93–106.
- Pence, K.M. (2006). 'The Role of Wealth Transformations: An Application to Estimating the Effect of Tax Incentives on Saving', *The B.E. Journal of Economic Analysis & Policy*, 5(1), 1–26.
- Piketty, T. (2014). *Capital in the Twenty-First Century*, Harvard University Press.
- Schneebaum, A., M. Rehm, K. Mader, P. Klopf and K. Hollan (2014). 'The Gender Wealth Gap in Europe', Department of Economics, Vienna University of Economics and Business (WU), Working Paper No. 186.
- Sierminska, E., J. Frick and M. Grabka (2010), 'Examining the Gender Wealth Gap', *Oxford Economic Papers*, vol. 62, issue 4, Oxford University Press, Oxford.

Sierminska, E. and K. Doorly (2012). 'Decomposing household wealth portfolios across countries: An age-old question?', CEPS/INSTEAD Working Paper No 2012-32, Luxembourg.

Theil, H. (1972). 'Statistical Decomposition Analysis with Applications in the Social and Administrative Sciences', North Holland Publishing, Amsterdam.

Tiefensee, A. and M.M. Grabka (2014). 'Comparing Wealth – Data Quality of the HFCS', DIW Discussion Papers 1427, German Institute for Economic Research (DIW), Berlin.

United Nations Economic Commission for Europe (2011). 'Canberra Group Handbook on Household Income Statistics', Geneva, p. 65.

Wan, G. (2002). 'Regression-based Inequality Decomposition: Pitfalls and a Solution Procedure', UNU-WIDER, Discussion Paper No. 2002/101.

Wan, G. (2004). 'Accounting for income inequality in rural China: A regression-based approach', *Journal of Comparative Economics* 32, 348–363.

Appendix

Table A.1 / OLS estimations predicting IHS-transformed household gross wealth

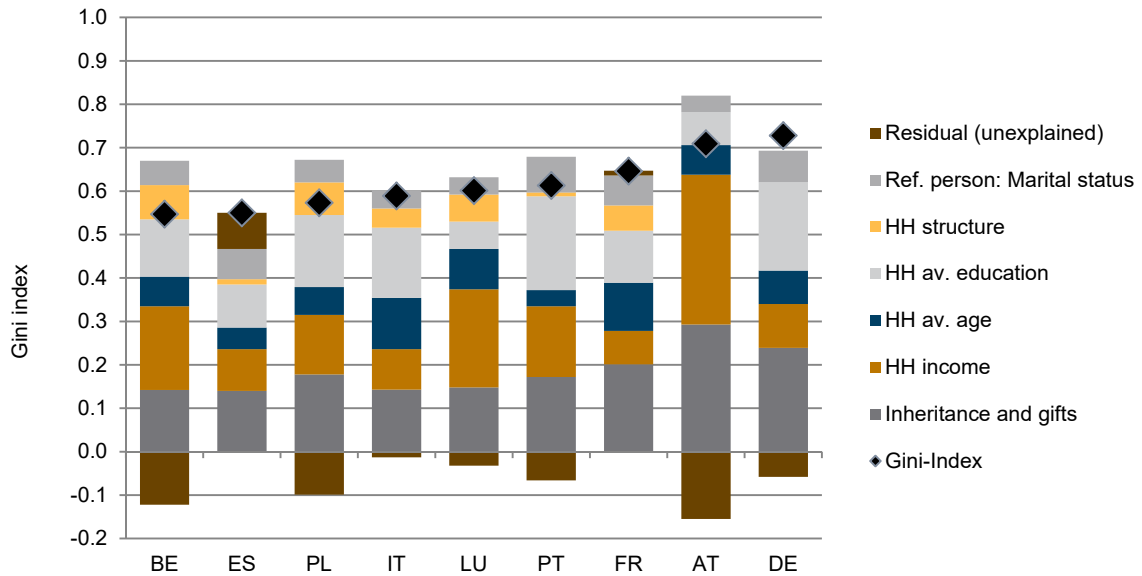
Independent variables	AT	BE	DE	ES	FR	IT	LU	PL	PT
Inheritance by asset types									
Household main residence	0.134***	0.084***	0.127***	0.044***	0.058***	0.057***	0.092***	0.042***	0.093***
- (IHS)	(0.006)	(0.020)	(0.009)	(0.008)	(0.009)	(0.007)	(0.014)	(0.013)	(0.014)
Money - (IHS)	0.043***	0.056***	0.072***	0.054***	0.039***	0.028**	0.063***	0.070***	0.038***
	(0.011)	(0.009)	(0.012)	(0.014)	(0.004)	(0.014)	(0.011)	(0.017)	(0.014)
Dwellings excl. HH main res.	0.078***	0.069***	0.078***	0.054***	0.052***	0.077***	0.048***	0.059***	0.058***
- (IHS)	(0.011)	(0.012)	(0.014)	(0.007)	(0.004)	(0.005)	(0.013)	(0.012)	(0.010)
Land - (IHS)	0.089***	0.002	0.097***	0.047***	0.069***	0.050***	0.005	0.083***	0.060***
	(0.019)	(0.023)	(0.024)	(0.007)	(0.009)	(0.009)	(0.057)	(0.014)	(0.014)
Business - (IHS)	0.050**	0.021	0.109***	0.069***	0.086***	0.034	0.033	0.143***	0.116***
	(0.019)	(0.032)	(0.026)	(0.010)	(0.018)	(0.031)	(0.028)	(0.022)	(0.033)
Other assets - (IHS)	0.054***	0.065***	0.086***	0.056***	0.065***	0.068***	0.051***	-0.000	0.059***
	(0.015)	(0.014)	(0.022)	(0.009)	(0.004)	(0.025)	(0.014)	(0.076)	(0.015)
Expectation of substantial gift or inheritance	0.272**	0.415***	0.468***		0.481***	0.401***	0.119	-0.108	0.579***
	(0.117)	(0.124)	(0.154)		(0.045)	(0.089)	(0.153)	(0.189)	(0.102)
Gross income - (IHS)	1.606***	0.939***	0.459***	0.341***	0.364***	0.359***	0.912***	0.661***	0.610***
	(0.126)	(0.147)	(0.116)	(0.058)	(0.044)	(0.036)	(0.184)	(0.109)	(0.109)
Household age (average of adults)	0.066***	0.089***	0.099***	0.074***	0.066***	0.148***	-0.007	0.172***	0.099***
	(0.019)	(0.031)	(0.029)	(0.019)	(0.009)	(0.022)	(0.033)	(0.027)	(0.028)
Household age ²	-0.000*	-0.001*	-0.001**	-0.001***	-0.000***	-0.001***	0.000	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household education (average of years of adults)	0.146***	0.159***	0.325***	0.075***	0.120***	0.167***	0.077***	0.238***	0.152***
	(0.023)	(0.024)	(0.028)	(0.010)	(0.007)	(0.011)	(0.025)	(0.023)	(0.015)
Number of adults	0.255***	0.472***	0.643***	0.022	0.395***	0.265***	0.372***	0.326***	-0.058
	(0.075)	(0.099)	(0.111)	(0.061)	(0.062)	(0.051)	(0.101)	(0.065)	(0.076)
Number of children	-0.002	0.003	-0.003	-0.083	0.053**	0.043	0.077	-0.019	-0.143*
	(0.060)	(0.145)	(0.069)	(0.063)	(0.024)	(0.051)	(0.067)	(0.075)	(0.085)
Reference person: single	-0.380**	-0.404**	-0.425**	-0.882***	-0.589***	-0.205*	-0.295	-0.876***	-1.335***
	(0.164)	(0.192)	(0.185)	(0.142)	(0.068)	(0.115)	(0.195)	(0.189)	(0.189)
Reference person: widowed	-0.226	0.329	-0.378	-0.342***	-0.068	-0.404***	0.326	-0.040	-0.229
	(0.180)	(0.218)	(0.265)	(0.131)	(0.091)	(0.124)	(0.306)	(0.187)	(0.201)
Reference person: divorced	-0.464***	-0.837***	-1.338***	-0.833***	-0.648***	-0.737***	-0.366	-1.037***	-1.071***
	(0.148)	(0.230)	(0.233)	(0.160)	(0.091)	(0.140)	(0.243)	(0.202)	(0.200)
Constant	-11.43***	-4.374***	-2.412**	5.822***	3.205***	0.570	0.110	-4.264***	1.184
	(1.256)	(1.687)	(1.226)	(0.760)	(0.454)	(0.662)	(1.822)	(1.247)	(1.124)
R ²⁺)	0.401	0.386	0.407	0.360	0.499	0.262	0.349	0.261	0.237
Observations	2,945	2,177	4,370	6,098	11,219	8,143	1,597	3,267	5,763

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; +) R2 using Fisher's z over imputed data.

Source: HFCS 2014 – UDB 2.0, own calculations.

Figure A.1 / Shapley value decomposition of Gini index – gross wealth

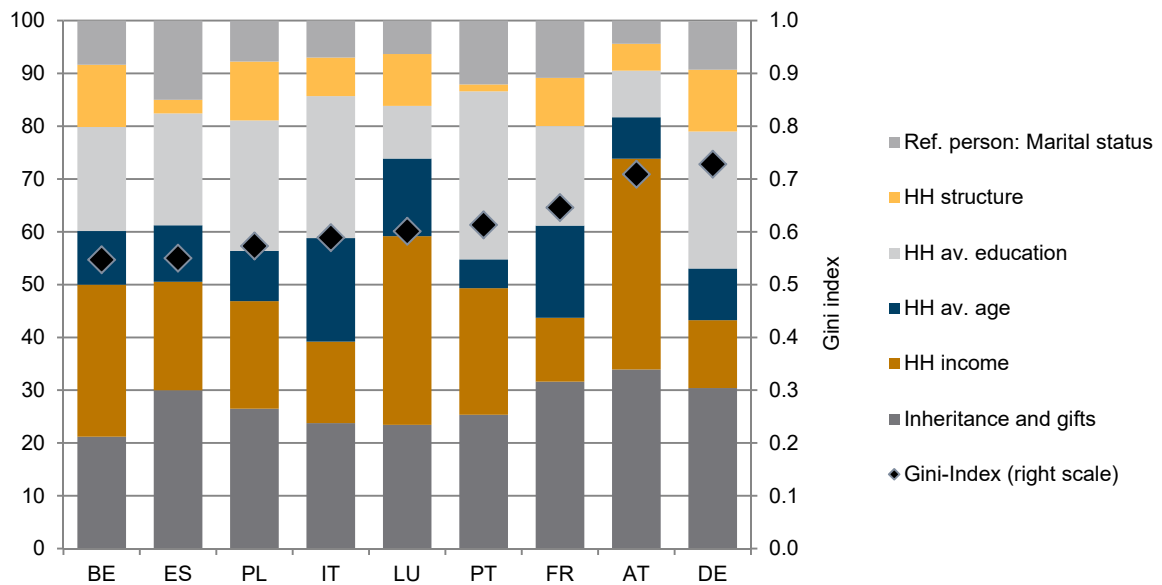
Contribution of groups of explanatory variables to Gini index



Source: HFCS 2014 – UDB 2.0, wiiw calculations.

Figure A.2 / Shapley value decomposition of explained inequality – gross wealth

Contribution of groups of explanatory variables to explained inequality, in %



Source: HFCS 2014 – UDB 2.0, wiiw calculations.

Table A.2 / Descriptive statistics: gross wealth, net wealth, inheritance & gifts, household income – HFCS 2010

	AT	BE	DE	ES	LU	PT
Number of households	2,380	2,327	3,565	6,197	950	4,404
received inheritance or gift	35.2	31.5	33.5	30.1	28.9	26.5
received inheritance or gift before 1960	2.0	3.0	1.1	3.3	2.6	3.5
Gini coefficients ¹⁾						
	(0.663)	(0.557)	(0.697)	(0.524)	(0.566)	(0.62)
Gross wealth	0.734	0.573	0.725	0.542	0.614	0.635
	(0.806)	(0.589)	(0.753)	(0.56)	(0.663)	(0.651)
	(0.682)	(0.592)	(0.733)	(0.56)	(0.619)	(0.656)
Net wealth	0.762	0.608	0.758	0.580	0.661	0.670
	(0.841)	(0.625)	(0.783)	(0.601)	(0.703)	(0.684)
	(0.864)	(0.884)	(0.869)	(0.905)	(0.869)	(0.937)
Inheritance and gifts - present value	0.885	0.910	0.892	0.922	0.894	0.948
	(0.907)	(0.936)	(0.916)	(0.943)	(0.918)	(0.961)
	(0.362)	(0.448)	(0.413)	(0.392)	(0.387)	(0.436)
Gross household income	0.420	0.484	0.428	0.413	0.420	0.450
	(0.477)	(0.52)	(0.443)	(0.435)	(0.453)	(0.463)

Note: 1) Lower and upper bounds of 95% confidence interval in parentheses.

Source: HFCS 2010 – UDB 1.1, wiiw calculations.

Table A.3 / OLS estimations predicting IHS-transformed household net wealth, based on HFCS 2010

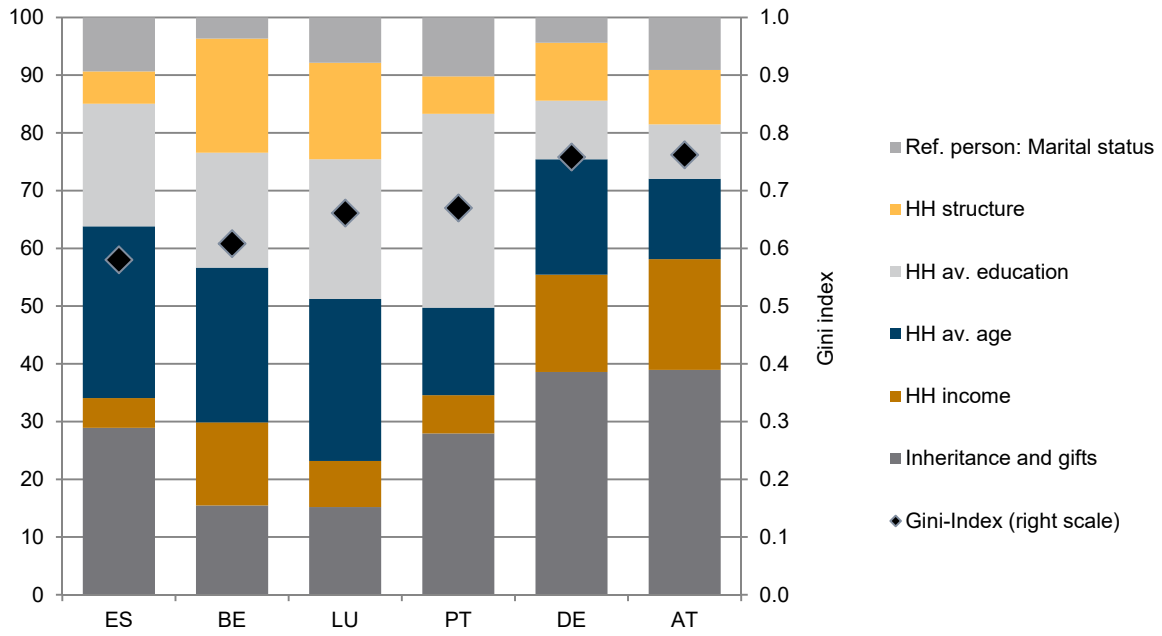
Independent variables	AT	BE	DE	ES	LU	PT
Inheritance by asset types						
Household main residence	0.211***	0.086***	0.173***	0.084***	0.136***	0.098***
- (IHS)	(0.021)	(0.021)	(0.020)	(0.013)	(0.035)	(0.014)
Money - (IHS)	0.058*	0.030	0.133***	0.064***	0.080***	0.071**
	(0.031)	(0.026)	(0.022)	(0.022)	(0.025)	(0.029)
Dwellings excl. HH main res.	0.087***	0.056**	0.102***	0.073***	0.004	0.061***
- (IHS)	(0.033)	(0.025)	(0.025)	(0.014)	(0.047)	(0.016)
Land - (IHS)	0.169***	0.076***	0.153***	0.087***	0.090**	0.129***
	(0.026)	(0.024)	(0.041)	(0.015)	(0.035)	(0.016)
Business, securities and shares - (IHS)	-0.152	0.105***	0.177***	0.102***	0.243**	0.111
	(0.180)	(0.026)	(0.040)	(0.017)	(0.099)	(0.081)
Other assets - (IHS)	0.124***	0.058	0.098**	0.087***	0.054**	0.122***
	(0.033)	(0.052)	(0.045)	(0.016)	(0.022)	(0.025)
Expectation of substantial gift or inheritance	0.859**	0.277	1.429***	.	0.239	0.859***
	(0.425)	(0.270)	(0.286)	.	(0.427)	(0.188)
Gross income - (IHS)	0.993**	0.446***	1.215***	0.217**	0.421	0.243***
	(0.437)	(0.097)	(0.240)	(0.088)	(0.258)	(0.062)
Household age (average of adults)	0.130**	0.196***	0.021	0.349***	0.146	0.200***
	(0.053)	(0.051)	(0.068)	(0.060)	(0.091)	(0.041)
Household age ²	-0.001	-0.001***	0.001	-0.003***	-0.001	-0.001***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Household education (average of years of adults)	0.226***	0.162***	0.279***	0.160***	0.261***	0.223***
	(0.067)	(0.028)	(0.059)	(0.025)	(0.049)	(0.021)
Number of adults	0.412*	0.638***	0.714**	0.198	0.669***	0.302***
	(0.213)	(0.140)	(0.304)	(0.163)	(0.238)	(0.113)
Number of children	-0.506**	-0.252	0.119	-0.168	-0.367	-0.202*
	(0.254)	(0.171)	(0.209)	(0.240)	(0.246)	(0.120)
Reference person: single	-0.389	-0.220	0.009	-0.863**	-0.899*	-1.488***
	(0.476)	(0.335)	(0.519)	(0.343)	(0.541)	(0.323)
Reference person: widowed	-0.536	-0.058	-0.353	0.414*	0.227	-0.657***
	(0.375)	(0.338)	(0.507)	(0.236)	(0.735)	(0.226)
Reference person: divorced	-1.772***	-0.420	-2.159***	-1.716**	-0.216	-1.733***
	(0.575)	(0.356)	(0.654)	(0.731)	(0.624)	(0.394)
Constant	-8.722*	-2.645	-11.71***	-2.853	-2.305	-0.407
	(5.036)	(1.740)	(2.974)	(2.010)	(3.173)	(1.389)
R ²⁺)	0.194	0.186	0.243	0.203	0.208	0.159
Observations	2,350	2,270	3,495	6,192	950	4,304

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; +) R2 using Fisher's z over imputed data.

Source: HFCS 2010 – UDB 1.1, own calculations.

Figure A.3 / Shapley value decomposition of explained inequality – net wealth, based on HFCS 2010

Contribution of groups of explanatory variables to explained inequality, in %



Source: HFCS 2010 – UDB 1.1, wiiw calculations.

WIIW WORKING PAPERS PUBLISHED SINCE 2016

For current updates and summaries see also wiiw's website at www.wiiw.ac.at

- No. 155 Sebastian Leitner: Factors Driving Wealth Inequality in European Countries, November 2018
- No. 154 Stefan Jestl, Sandra M. Leitner and Sebastian Leitner: The Relative Impact of Different Forces of Globalisation on Wage Inequality: A Fresh Look at the EU Experience, November 2018
- No. 153 Mahdi Ghodsi and Robert Stehrer: Avoiding and Escaping the 'Commodity Trap' in Development, November 2018
- No. 152 Stefan Jestl: Inheritance Tax Regimes: A Comparison, November 2018
- No. 151 Mahdi Ghodsi: Is Austria's Economy Locked-in in the CESEE Region? Austria's Competitiveness at the Micro-level, October 2018
- No. 150 Amat Adarov: Eurasian Economic Integration: Impact Evaluation Using the Gravity Model and the Synthetic Control Methods, September 2018
- No. 149 Philipp Heimberger: What Explains Austria's Export Market Performance? Evidence Based on Estimating an Export Model over 1997-2016, September 2018
- No. 148 Oliver Reiter and Robert Stehrer: Trade Policies and Integration of the Western Balkans, May 2018
- No. 147 Philipp Heimberger: The Dynamic Effects of Fiscal Consolidation Episodes on Income Inequality: Evidence for 17 OECD Countries over 1978-2013, April 2018
- No. 146 Mahdi Ghodsi: The Impact of Chinese Technical Barriers to Trade on its Manufacturing Imports, March 2018
- No. 145 Amat Adarov: Financial Cycles Around the World, March 2018
- No. 144 Mario Holzner: Corporatism and the Labour Income Share. Econometric Investigation into the Impact of Institutions on the Wage Share of Industrialised Nations, March 2018
- No. 143 Claudius Gräbner, Philipp Heimberger, Jakob Kapeller, Bernhard Schütz: Structural Change in Times of Increasing Openness: Assessing Path Dependency in European Economic Integration, March 2018
- No. 142 Loredana Fattorini, Mahdi Ghodsi and Armando Rungi: Cohesion Policy Meets Heterogeneous Firms, March 2018
- No. 141 Neil Foster-McGregor, Michael Landesmann and Isilda Mara: Migration and FDI Flows, March 2018
- No. 140 Amat Adarov: Financial Cycles in Credit, Housing and Capital Markets: Evidence from Systemic Economies, December 2017
- No. 139 Eddy Bekkers, Michael Landesmann and Indre Macskasi: Trade in Services versus Trade in Manufactures: The Relation between the Role of Tacit Knowledge, the Scope for Catch-up, and Income Elasticity, December 2017
- No. 138 Roman Stöllinger: Global Value Chains and Structural Upgrading, September 2017
- No. 137 Stefan Jestl, Mathias Moser and Anna K. Raggl: Can't Keep Up with the Joneses: How Relative Deprivation Pushes Internal Migration in Austria, September 2017
- No. 136 Claudius Gräbner, Philipp Heimberger, Jakob Kapeller and Bernhard Schütz: Is Europe Disintegrating? Macroeconomic Divergence, Structural Polarisation, Trade and Fragility, September 2017
- No. 135 Mahdi Ghodsi and Robert Stehrer: EU Trade Regulations and Imports of Hygienic Poultry, April 2017
- No. 134 Roman Stöllinger: Tradability of Output and the Current Account: An Empirical Investigation for Europe, January 2017
- No. 133 Tomislav Globan: Financial Supply Index and Financial Supply Cycles in New EU Member States, December 2016
- No. 132 Mahdi Ghodsi, Julia Grübler and Robert Stehrer: Import Demand Elasticities Revisited, November 2016
- No. 131 Leon Podkaminer: Has Trade Been Driving Global Economic Growth?, October 2016
- No. 130 Philipp Heimberger: Did Fiscal Consolidation Cause the Double-Dip Recession in the Euro Area?, October 2016
- No. 129 Julia Grübler, Mahdi Ghodsi and Robert Stehrer: Estimating Importer-Specific Ad Valorem Equivalents of Non-Tariff Measures, September 2016
- No. 128 Sebastian Leitner and Robert Stehrer: Development of Public Spending Structures in the EU Member States: Social Investment and its Impact on Social Outcomes, August 2016
- No. 127 Roman Stöllinger: Structural Change and Global Value Chains in the EU, July 2016
- No. 126 Jakob Kapeller, Michael Landesmann, Franz X. Mohr and Bernhard Schütz: Government Policies and Financial Crises: Mitigation, Postponement or Prevention?, May 2016
- No. 125 Sandra M. Leitner and Robert Stehrer: The Role of Financial Constraints for Different Innovation Strategies: Evidence for CESEE and FSU Countries, April 2016
- No. 124 Sandra M. Leitner: Choosing the Right Partner: R&D Cooperations and Innovation Success, February 2016
- No. 123 Michael Landesmann, Sandra M. Leitner and Robert Stehrer: Changing Patterns in M&E-Investment-Based Innovation Strategies in CESEE and FSU Countries: From Financial Normalcy to the Global Financial Crisis, February 2016
- No. 122 Sebastian Leitner: Drivers of Wealth Inequality in Euro-Area Countries. The Effect of Inheritance and Gifts on Household Gross and Net Wealth Distribution Analysed by Applying the Shapley Value Approach to Decomposition, January 2016

IMPRESSUM

Herausgeber, Verleger, Eigentümer und Hersteller:

Verein „Wiener Institut für Internationale Wirtschaftsvergleiche“ (wiiw),
Wien 6, Rahlgasse 3

ZVR-Zahl: 329995655

Postanschrift: A 1060 Wien, Rahlgasse 3, Tel: [+431] 533 66 10, Telefax: [+431] 533 66 10 50
Internet Homepage: www.wiiw.ac.at

Nachdruck nur auszugsweise und mit genauer Quellenangabe gestattet.

Offenlegung nach § 25 Mediengesetz: Medieninhaber (Verleger): Verein "Wiener Institut für Internationale Wirtschaftsvergleiche", A 1060 Wien, Rahlgasse 3. Vereinszweck: Analyse der wirtschaftlichen Entwicklung der zentral- und osteuropäischen Länder sowie anderer Transformationswirtschaften sowohl mittels empirischer als auch theoretischer Studien und ihre Veröffentlichung; Erbringung von Beratungsleistungen für Regierungs- und Verwaltungsstellen, Firmen und Institutionen.



wiiw.ac.at