Teaching wealth inequality in the Eurozone: an outline based on HFCS data

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Abstract: This paper presents an outline for an undergraduate course on wealth inequality with nine learning goals. Based on empirical evidence from the Eurozone Household Finance and Consumption Survey 2010 (HFCS), wealth inequality is introduced as a distinct field of study. The outline concisely illustrates the challenges of empirical research when collecting wealth data and measuring wealth inequality. By reference to recent literature, particular attention is paid to intergenerational wealth transfers. Finally, the paper presents several tools for interactive teaching.

Keywords: wealth distribution; wealth inequality; inheritances; teaching inequality; interactive teaching; economics education; empirical economics; Household Finance and Consumption Survey; HFCS; wealth survey; Eurozone.

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1   Introduction

Inequality is a trending topic in contemporary economic research and public discourse. Recent efforts to go beyond GDP have acknowledged the importance of the distribution of income and wealth in order to understand and improve people's well-being. More research in both areas should qualify policy-makers and citizens alike to assess where, when, and for whom life is getting better or worse (OECD, 2013). Thus, inequality attracted the attention of the global scientific community particularly during the long

economic downturn beginning in 2007. During the 20th century, in contrast, questions concerning the distribution were often ignored, as Atkinson (1997) noted in a renowned article. Not least with the fulminant success of *Capital in the Twenty-First Century* (Piketty, 2014), the debate has gained such momentum that it is hard to keep pace with the literature (Wade, 2014; Boushey et al., 2017; King, 2017). A separate analysis of wealth inequality might appear superfluous if wealth distribution simply mirrored income distribution; however, this is not the case (Schneider, 2004). Accordingly, there is a whole new strand of literature emphasising wealth rather than income inequality; and novel data on private household wealth has been collected. Particularly, the first-time availability of harmonised wealth data for the Eurozone, namely the Household Finance and Consumption Survey (HFCS), is a milestone for research. Considering these recent developments, wealth inequality has become all the more important for economics education.

The bulk of existing literature on teaching inequality is located in the realm of sociology with no specific focus on wealth. Sociologists mainly concentrate on the outcomes of social inequalities, on power and privilege, and on racial and gender discrimination (Davis, 1992; Brezina, 1996; Groves et al., 1996; Bell and Bradburn, 1996). These articles also provide useful methods to raise student awareness for inequality, particularly when instructors are dealing with ignorance and disbelief. For instance, Davis (1992) describes three classroom climates often encountered when teaching inequality: resistance, paralysis, and rage. Brezina (1996) characterises students as highly resistant to sociological ideas about the nature of inequality. Similar teaching experiences, varying between opposition and overt hostility, are well-documented (McCammon, 1999; Bohmer and Briggs, 1991; Norris, 2013). It is beyond the scope of this paper to analyse how limited social mobility in tertiary education has conduced to the ignorance towards inequality; but the opening of academia for less privileged layers of society has very likely amplified student awareness of disparities.

However, the perception of these inequalities may differ depending on country specific cultural, social, and regional idiosyncrasies. For instance, Davis (1992) observes pervasive individualism in the USA and thus the tendency to affix individual credit or blame for wealth and poverty. In this respect, an important caveat is in order: My teaching experience is restricted to universities in Austria. While educational persistence is still a pressing issue (Fessler et al., 2012; Fessler and Schneebaum, 2012) Austria has experienced a vast educational expansion since the 1970s which improved the social mix at universities noticeably. Moreover, the lively public and political discourse about inequality has changed classroom climate in recent years. In my view, there is a wide consensus recognising inequality as a relevant object of study.

In sum, I find three main reasons why the circumstances for teaching wealth inequality have very much changed for the better. First, inequality is a generally trending topic; second, students are increasingly receptive to social disparities; third, there is a plethora of empirical research with newly available wealth data.

This paper discusses several questions that can form the nucleus of an undergraduate course on wealth inequality. How can we grasp wealth and what are the problems with its measurement? Why should we care about wealth inequality even if we already know much about the distribution of income? How is wealth inequality affecting long-term intergenerational mobility? These questions are addressed by reference to the HFCS wealth survey. The aim is to impart knowledge about the empirical assessment of wealth inequality and its challenges to students. Throughout the article, I formulate learning

goals to sum the most important statements that should ideally be remembered after the course.

I should emphasise one important caveat: This outline is aimed at instructors with little experience in teaching wealth inequality and students who are not very familiar with the basic concepts. In this setting, I can only touch on some of the relevant topics, while referring to further literature instead of undertaking an in-depth analysis, and making the reader aware of more voluminous and elaborated works (for instance, Davies and Shorrocks, 2000; Cowell and Van Kerm, 2015). However, I feel certain that, while seeming trivial for the experts, the learning goals presented here are important steps for students to understand the mechanisms behind wealth inequality. With this caveat in mind, the aim of this outline is a brief *tour d'horizon* through the topic of wealth inequality with references to further reading and some proposals for interactive teaching.

The paper is structured like a feasible syllabus for an undergraduate course from which parts may also be used in other courses like economic policy or empirical economics. I motivate wealth as a distinct subject for research and education in Section 2. By reference to novel empirical findings, students should become aware of the differences between wealth and income inequality. At the same time, these empirical studies should be examined carefully regarding data problems when measuring inequality. Section 3 therefore discusses challenges of collecting wealth data, while presenting possibilities to attenuate shortcomings. Section 4 discusses the crucial role of intergenerational wealth transfers for social mobility and inequality. Finally, Section 5 briefly suggests some helpful tools for teaching and innovative ideas for instructors before Section 6 concludes.

2   Wealth inequality as complementary field of study

Inequality has multiple dimensions ranging from social, cultural, and political through to economic. While a comprehensive perspective would consider all these facets and their interrelation, in-depth research requires a well-defined demarcation of the subject matter. To set the stage accordingly, this article deals with a subtopic of economic inequality: the distribution of private household wealth as distinct from income. Clearly, income as flow concept and wealth as stock concept are closely related, however, this link is complex, requiring a thorough joint analysis of income and wealth (Jäntti et al., 2012; Arrondel et al., 2014). Yet, the primary focus of this teaching outline is the distribution of private wealth.

The definition of wealth itself is a subject of discussion, since some broader concepts partly include non-material resources like human, social, and cultural capital, while others do not. In the standard reference *Handbook of Income Distribution*, Davies and Shorrocks (2000) define wealth as non-human assets minus debts. In his book on the distribution of wealth, Schneider (2004) specifies wealth similarly but in other terminology as the value of tangible assets and financial assets net of liabilities. Following a much-noticed report by the so-called Canberra Group (2001) which developed conceptual standards for income statistics, the OECD has recently delivered a similar approach regarding private wealth (OECD, 2013). Wealth is therein defined as the monetary value of all tangible and financial assets owned by a household, less the value of all its liabilities at a particular point in time. Assets in turn are subject to property rights involving the right of transfer to others. This definition, for example, comes with

the limitation that it includes private pension accounts but excludes public pension claims, since they can neither be liquidated nor transferred. Davies and Shorrocks (2000) therefore refer to the terms *marketable wealth* and *augmented wealth* to distinguish between wealth excluding and including entitlements to future pension streams. According to the OECD, the above-mentioned non-material resources are difficult to measure and integrate in established concepts of wealth and consequently omitted. An exhaustive list of standard components of household wealth is provided by the OECD (2013, p.67) and includes real estate, consumer durables, valuables, deposits, bonds, shares, insurances, and loans.

The typical unit of analysis is the household. While wealth is eventually held by individuals, it is often shared in some way with other individuals living in the same household, such as owner occupied dwellings or vehicles (OECD, 2013). However, the household perspective entails some disadvantages, like complicating gender analysis because household members may not have equal access to wealth (Schneebaum et al., 2016; Sierminska et al., 2010). Another controversial question concerns the equivalisation of household wealth. Household income is commonly equivalised in order to account for economies of scale, however, this is mostly not done when studying household wealth (Cowell and Van Kerm, 2015; OECD, 2013). There is no consensus on whether the same scale is appropriate for both, income and wealth.

Learning goal 1   The OECD provides a standard definition of net wealth as the sum of all tangible and financial assets less all liabilities. Private wealth is typically analysed on the household level and can be transferred or converted into cash. However, this definition excludes assets such as human capital or public pension claims.

The rationale behind regarding wealth as particularly important is its attendant multiple functions (Cowell and Van Kerm, 2015). The functions of wealth might be visualised as a pyramid with basic functions at the bottom and more sophisticated functions at top. As wealth increases, the number of functions tends to increase accordingly. The most fundamental function of wealth is provision or precaution in order to use wealth for consumption when needed (Ando and Modigliani, 1963; Carroll and Samwick, 1997). For instance, even small assets can be liquidated in an emergency. Usage is another basic function of wealth, for example, real assets like dwellings can be used as residence, and vehicles for transportation. Furthermore, income generation is a more advanced function which requires a certain level of wealth to qualify for accumulation. Some assets generate significant incomes such as interest, dividends, distributed profits, and rents (Piketty, 2014).

Even bigger amounts of wealth entail a broader spectrum of functions, including the preservation of privileges or enhancement of social status (Arrondel and Grange, 2006; Schneider, 2004; Van Long and Shimomura, 2004). Wealth can thus be used to obtain societal prestige, partake in networks and enter elitist circles. Very large fortunes may also exert power by influencing political decision processes and public opinion (Gilens and Page, 2014; Rehm and Schnetzer, 2015). All the mentioned functions describe the nexus between private wealth and well-being in terms of a high quality of living and access to decent living conditions.

Learning goal 2   Wealth has multiple functions from precautionary saving to wielding power. The number of functions tends to rise with the level of wealth.

Studies of wealth as compared to income are clearly underrepresented in the literature. This is mainly due to better income data for many countries from administrative records and numerous surveys. Still, some income types like capital income or self-employment income are rarely available in administrative data and often underreported in surveys. In order to achieve cross-country comparability of income data, data has been ex-post harmonised, e.g., the Standardised World Income Inequality Database (Solt, 2016); the Luxembourg Income Study database (LIS) and the newly constructed Global Earnings Inequality Database (Hammar and Waldenström, 2017).

The wealth data is more inferior, since the number of countries with micro information on private wealth is rather small (Davies and Shorrocks, 2000; Piketty, 2014). Nonetheless, efforts have been made to construct cross-country harmonised wealth databases, e.g., the recently launched World Wealth and Income Database (Alvaredo et al., 2017); and the Luxembourg Wealth Study Database (LWS) which aims to harmonise existing micro data on household wealth for several countries including the USA, Canada, the UK, and various other European countries (Sierminska et al., 2006). Lately, a few studies used aggregate wealth data obtained from national accounts; however, distributional analysis of such data is still in its infancy (Piketty et al., 2016; Saez and Zucman, 2016; Piketty and Zucman, 2014). All in all, long-term information on private wealth is very scarce, even in the most thorough data collections.

The deficiency for studying wealth inequality has improved substantially with the introduction of a new European survey on private household wealth. In 2010, the European Central Bank (ECB) (2013a) carried out ex-ante harmonised wealth surveys across the Eurozone, HFCS. For several countries, information on household assets and liabilities were available for the first time. In the meantime, the second wave has been released in 2017; however, most of the external calculations and reports I use for teaching are only available for the first wave. Table 1 shows basic information and descriptive statistics of the HFCS 2010 wave. I will refer to this table and focus on the last three columns for now. In the HFCS survey, a sample of households was asked to disclose all their real and financial assets as well as liabilities at current (or market) value. Real assets in the HFCS comprise vehicles, real estate properties, valuables, and self-employment businesses. Financial assets include deposits, mutual funds, bonds, private pensions and life insurances [for an exhaustive list, see ECB, (2013b), p.35]. In the Eurozone countries, real assets represent 84% of total gross assets whereof the household's main residence is the major asset (ECB, 2013a; Cowell and Van Kerm, 2015). Net wealth, as shown in Table 1, is the sum of all assets less liabilities.

There is a considerable variance in the median and mean net wealth across European countries. This dispersion can be explained by a complex interplay of many factors, including household structure, home ownership rates, house prices, public pensions, intergenerational transfers, taxation, and cultural aspects. A large part of these substantial differences are also determined by the comprehensiveness and generosity of welfare state arrangements (Fessler and Schürz, 2015). For instance, universal public pension systems reduce the necessity for private savings in order to balance out life cycle income. While private pensions and savings are defined as wealth in the HFCS, future payouts from public pension schemes are not included. This may explain part of the country-specific differences in asset holdings. Furthermore, since the ownership of the household main residence is a sizeable component of total wealth, public housing policies are pivotal for
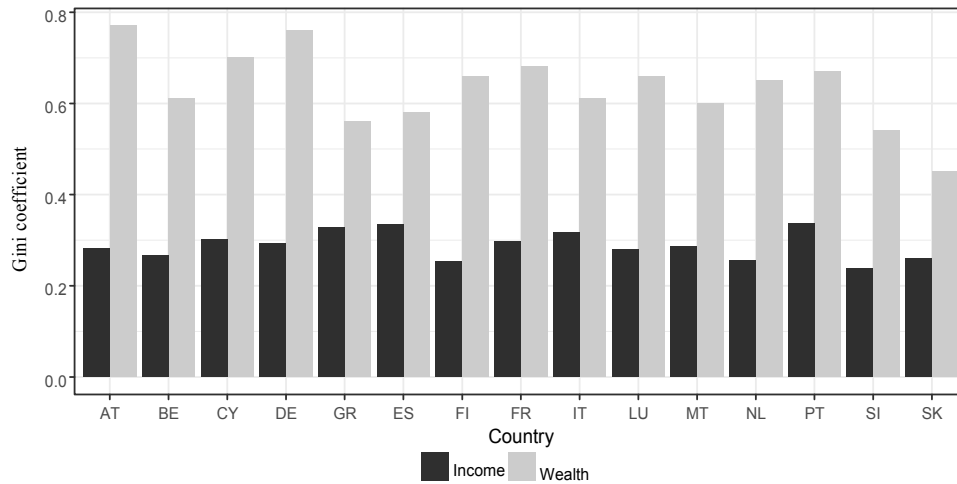
private wealth accumulation. While in Austria and Germany less than 50% of the households own their main residence, it is more than 80% in Spain. Another reason could be the different point of data collection which is shown in the second column of Table 1. The interviews in Spain, Greece, and Cyprus were conducted almost at the peak of residential property prices, before house prices began decreasing according to Eurostat data [see also Tiefensee and Grabka, (2016), p.126]. Survey responses based on self-estimation of housing wealth might not fully reflect the trends of house price indices which use transaction prices. However, knowledge about actual transaction prices can affect the self-valuation of housing wealth.

Table 1   Key information on HFCS 2010 data

Country	Fieldwork period	Oversampling	Net wealth (EUR 1,000)		Net wealth Gini	p80/p20 ratio
			Median	Mean		
Euro area	–	–	108.3	230.1	0.68	40.1
Austria	2010/11	No	76.4	265.0	0.76	51.2
Belgium	2010	Yes	206.2	338.6	0.61	26.9
Cyprus	2010	Yes	266.9	670.9	0.70	12.9
Finland	2010	Yes	96.5	168.8	0.64	58.6
France	2009/10	Yes	115.7	233.3	0.68	58.2
Germany	2010/11	Yes	51.4	195.2	0.76	74.9
Greece	2009	Yes	101.9	147.8	0.56	14.7
Italy	2010	No	173.4	274.7	0.61	20.9
Luxembourg	2010/11	Yes	397.8	710.1	0.66	25.7
Malta	2010/11	No	201.2	322.0	0.57	6.9
Netherlands	2010	No	78.8	154.0	0.70	62.8
Portugal	2010	Yes	78.7	157.9	0.66	16.6
Slovakia	2010	No	61.2	79.7	0.45	3.6
Slovenia	2010	No	100.7	148.7	0.54	–
Spain	2008/09	Yes	182.7	291.4	0.58	7.0

Source: European Central Bank (2013a, 2013b)

While there must be a note of caution regarding cross-country comparisons of absolute wealth levels, wealth inequality might provide a better understanding of the household living conditions. The first-time publication of the HFCS inequality measures gained massive public attention. Until then, the perception of inequality in the general public was shaped by well-known indicators for income disparities. According to Eurostat, the Gini coefficients for equivalised disposable household income ranged between roughly 0.24 in Slovenia and 0.34 in Portugal in 2010. As can be seen in Figure 1, the Gini coefficients for net wealth exceeded the corresponding values for disposable income. World Bank data shows that even countries considered most unequal on a global scale, like Namibia or South Africa, display lower income Gini coefficients than several European countries with respect to wealth.

Figure 1   Gini coefficients for equivalised disposable income and net wealth, 2010

These findings from the HFCS – wealth being much more unequally distributed than disposable household income – comport with the stylised facts formulated by Davies and Shorrocks (2000). In fact, the correlation between household income and wealth in empirical research is rather moderate, though positive, and varies a lot between countries (Schneider, 2004; Wolff and Zacharias, 2009; Arrondel et al., 2014; Jäntti et al., 2012). Yet, wealth and income are certainly related, as income generates wealth and vice versa. Various assets yield cash income including interest, dividends, and rents or non-cash income like imputed rents from owner-occupied dwellings (OECD, 2013). The feedback effects from these returns on the wealth distribution are of great interest. Some findings indicate that heterogeneous returns on assets fortify wealth concentration at the top, since the returns tend to increase with the size of endowment – according to the biblical quotation "for he that hath, to him shall be given" (Piketty, 2014; Benhabib et al., 2011; Schneider, 2004). For instance, findings from Swedish administrative data document high heterogeneity in returns to wealth: households in the top 1% of the wealth distribution receive 4.1% more than median wealth households (Bach et al., 2016; Benhabib and Bisin, 2016).

In general, wealth accumulation is a complex process not only dependent on market income and wealth returns but also on public transfer systems, intergenerational transmissions, taxing policies, savings and consumption preferences, borrowing constraints, and many more of which income might not be the most important (De Nardi and Fella, 2017; Benhabib and Bisin, 2016; Fessler and Schürz, 2015; Semyonov and Lewin-Epstein, 2013). The main message here is that the well-being of households is also affected by their wealth independently from disposable income. This argument has been put forth in the renowned Stiglitz-Sen-Fitoussi report where wealth is accounted jointly with income and consumption to assess living standards (Stiglitz et al., 2009).

Learning goal 3   Albeit related, wealth and income inequality are very different. The HFCS data shows that wealth inequality exceeds income disparities by far in every Euro area country.

3 Measuring wealth inequality

Kuznets (1955, p.1) once characterised issues of inequality as "plagued by looseness in definitions, unusual scarcity of data, and pressures of strongly held opinions." This is all the more true for wealth inequality. When measuring the distribution of net wealth, Cowell and Van Kerm (2015) exhort three particularities: The range of asset types included might affect the extent of wealth inequality; and the prices and the valuation of assets respectively; finally, net wealth may be negative or zero for a substantial fraction of households. Another challenge is data coverage. While the HFCS undoubtedly is a treasure for researchers, the survey is only able to capture a part of the wealth distribution. Especially both tails of the distribution are not well covered by the HFCS. At the bottom end, homeless people were not sample (ECB, 2013a). However, the missing top of the distribution is even more serious given that wealth is known to be concentrated at the upper tail. It may be insightful for students to discuss the idiosyncrasies of surveys compared to administrative data together with the problems of collecting wealth information.

3.1 Survey and administrative data

Wealth surveys have several advantages over administrative tax records. First, they are not subject to tax exemptions and designed to capture all wealth components at market value. Only a few European countries levy general wealth taxes at all and many have significant exemptions like savings accounts. For tax purposes, the values of some assets like dwellings might even be based on a previous census, not reflecting current market prices. On the other hand, administrative tax data are subject to audit, and thus might be more accurate (Bricker et al., 2016). Alternatively, estate taxes are a more common source for administrative wealth records; however, intra-family transfers are often tax-free or at least tax-privileged. Moreover, estate tax records comprise a non-random sample of the population, for instance, their age distribution differs from that of the total population (Davies and Shorrocks, 2000). Second, while tax records often provide only a small number of additional variables, surveys typically come with a variety of demographic and socio-economic information. These variables are collected partly on the household (household size, location, etc.) and partly on the individual (age, sex, qualification, occupation, etc.), allowing a better understanding of wealth inequality (OECD, 2013). All in all, wealth surveys can achieve a more comprehensive picture of private household wealth.

Nonetheless, there are also substantial drawbacks of surveys. A serious deficit is the trade-off between the costs and coverage of the inquiry. An appropriate sample design is essential for the accuracy of statistical analysis and the proximity to the target population. In particular, a critical point for wealth surveys is the efficiency with which information from the richest households is collected (ECB, 2013a; Cowell and Van Kerm, 2015). Despite efforts towards a better coverage of the very rich population, this is still the biggest vulnerability of voluntary wealth surveys such as the HFCS. The chances for drawing very rich households into a small sample is very low, and in the event, the probability of non-response is documented to be higher for wealthy households than for the average (Kennickell et al., 1997). The OECD (2013) remarks that the amount of wealth is inversely proportional to a household's propensity to participate in surveys. Thus, refusal rates are not randomly distributed across the distribution but we rather find

differential non-response. In general, non-response rates tend to be larger in wealth surveys than in other household surveys (Davies and Shorrocks, 2000; Osier, 2016). In the following, we distinguish between unit (no interview at all) and item (no value for a specific variable) non-response (Frick et al., 2007).

Learning goal 4   Both survey and administrative data have their merits and drawbacks. Survey data provide a variety of socio-demographic information and offer a more comprehensive picture of wealth inequality, but suffer differential non-response. Administrative data cover the whole population including the very rich, but are often subject to exemptions and unlikely to provide a wide range of additional information.

3.2   Unit non-response

Table 2 displays information on the response behaviour in the HFCS 2010. As can be seen, there is a substantial loss from gross to net sample. There may be various reasons why households drawn from address registers cannot be interviewed. The sensitivity of the wealth information may lead some households to be less likely to cooperate in the survey, and cultural differences across countries may cause variation in response rates (ECB, 2013a). Weighting procedures are an essential tool for mitigating the problems caused by unit non-response. Thus, the HFCS includes survey weights accounting for the unit's probability of selection, coverage issues, unit non-response and an adjustment of weights to external data [see ECB, (2013a), p.42]. Nevertheless, active refusal in the voluntary inquiry is an important reason for being in the HFCS net sample. Table 2 shows that refusal rates vary significantly between countries, reaching almost 70% in Germany.

Table 2   Response behaviour in the HFCS 2010 survey

Country	Gross sample	Response rate (%)	Refusal rate (%)	Net sample
Austria	4,436	55.7	39.6	2,380
Belgium	11,376	21.8	57.6	2,364
Cyprus	3,938	31.4	56.6	1,237
Finland	13,525	82.2	11.1	10,989
France	24,289	69.0	30.0	15,006
Germany	20,501	18.7	69.7	3,565
Greece	6,354	47.2	46.4	2,971
Italy	15,592	52.1	37.8	7,951
Luxembourg	5,000	20.0	63.7	950
Malta	3,000	29.9	34.1	843
Netherlands	2,263	57.5	42.5	1,301
Portugal	8,000	64.1	10.3	4,404
Slovakia	2,000	n.a.	n.a.	2,057
Slovenia	965	36.4	45.9	343
Spain	11,782	56.7	34.8	6,197

Source: European Central Bank (2013a)

If all households along the wealth distribution had equal probabilities of refusal to participate in the survey, there would be no bias regarding the representation of the target population. However, non-response positively correlates with household wealth and is highest at the top (Vermeulen, 2017). There is one ex-ante and one ex-post approach to remedy the problems associated with under coverage of the top. The ex-ante method is to oversample the rich which means that a larger number of wealthy households are drawn into the gross sample in order to obtain a more reliable measure of the upper tail of the wealth distribution (Bricker et al., 2016). Table 1 shows the use of oversampling in the HFCS. This method requires that information on household finances is available before sampling. In practice, mainly tax registers are used to construct a sampling frame that allows oversampling of the richer population. Some countries also use information on location or consumption to oversample households with higher probabilities of non-response (ECB, 2013a).

Recently, there are a growing number of empirical applications using an ex-post method for estimating the missing top in wealth distributions where coverage is not complete (Vermeulen, 2017; Eckerstorfer et al., 2016; Jones, 2015). This approach is based on the well-documented assumption that wealth displays a fat right tail and follows a power law above a certain cut-off point (Cowell, 2008; Davies and Shorrocks, 2000; Gabaix, 2016; Benhabib and Bisin, 2016). The common empirical approach is to fit a Pareto distribution on the empirical data and estimate the missing wealth at the top. The density of a Pareto distribution is given by

$$f(x) = \frac{\alpha x_{min}^{\alpha}}{x^{\alpha+1}} \tag{1}$$

where x_{min} is the cut-off value and α is the Pareto parameter. The graphic expression of this idea is a log-log plot with population on one axis and wealth on the other. Above a certain level of wealth x_{min}, the observations in such a plot are a straight line. The slope of this line corresponds to the Pareto parameter α. Typically, the Pareto exponent is around 1.5 for wealth, whereby a lower value means a higher degree of inequality (Gabaix, 2016).

Table 3   Net wealth shares of the Top 1% raw and augmented HFCS data

Country	Raw data	Estimate	Difference
Austria	23	31–34	+8 to +11
Belgium	12	18–20	+6 to +8
Finland	12	15–16	+3 to +4
France	18	20–22	+2 to +4
Germany	24	30–31	+6 to +7
Italy	14	21–21	+7 to +7
Netherlands	9	14-17	+5 to +8
Spain	15	16-18	+1 to +3

Source: Vermeulen (2016)

Vermeulen (2016) applies the Pareto method to the HFCS 2010 data in order to obtain an estimate for the upper tail. In addition, he adjusts the data in two ways. First and before the Pareto estimation, extreme wealth observations from the Forbes world's billionaires

list are pooled with the HFCS data. Second, the gaps between the survey aggregates and national accounts are corrected. Table 3 shows results for selected European countries. As can be seen, the net wealth share of the top 1% increases significantly for some countries after statistically adjusting for the missing tail. The variation in the estimates origins from three different cut-off points used by Vermeulen: 500,000, 1,000,000, and 2,000,000 Euros.

It is worth noting that France and Spain used administrative wealth tax data for an accurate oversampling which clearly corresponds with less need for ex-post adjustments at the top. Others, like Austria, Belgium, and the Netherlands experience a substantial increase in wealth inequality when estimating the missing rich. Nevertheless, the ex-post method only deals with one variable – net wealth, and thus cannot solve the problem of under coverage in general.

Learning goal 5   Wealth surveys mostly lack information about the very top of the distribution. Oversampling and ex-post adjustments, like the Pareto estimation, are common methods to include rich households into the analysis. The inequality measures tend to increase substantially with these adjustments.

3.3   Item non-response

Another obstacle in wealth surveys is item non-response for single or even all wealth components. Wealth surveys request sensitive information on personal finances which respondents may be uncomfortable with (Campbell, 2006). Since wealthy households are more likely to hold a greater variety of assets and liabilities than other households, they also have higher chances to report missing information (Kennickell, 2017). In order to reduce blank spaces in the collected data, missing values are typically singly imputed with regard to a variety of household characteristics. Most often, regression techniques or hot deck methods are used to fill in the lacking information. The former method replaces missing values with predicted values from a regression plus a residual; while the latter closes gaps with an observed response from a similar unit (Andridge and Little, 2010). Such single imputation methods invite considerable statistical uncertainty.

Similar to the US Survey of Consumer Finances (SCF), an important methodological aspect of the HFCS is using multiple imputations to tackle the issue of item non-response (Kennickell, 2017). To account for the inherent uncertainty of the imputation procedure, the HFCS does not choose one single value to replace the missing information, but five values based on different random draws from the joint distribution of the collected data. The applied models are run iteratively several times with a high number of covariates, and imputed values from each of the previous rounds are treated as observed values in the subsequent iterations [see ECB, (2013a), p.47]. This approach combines the advantage of providing a distribution of imputed values with the possibility to reflect the uncertainty of the estimation. Multiple imputations in the HFCS closely follow the guidelines of Little and Rubin (2002).

Table 4 shows the shares of imputed values for gross real and financial wealth. Values are imputed whenever respondents refused to answer, did not know the requested information, provided a range of values, or reported unreliable information. This information is captured in the flag variables in HFCS. For instance, 75% of the

imputations for the value of the household's main residence were originally collected in brackets and thus based on information provided by the respondents.

Table 4   Share of imputations in HFCS 2010 wealth variables in %

Country	Gross real wealth		Gross financial wealth	
	Affected obs.	*Share in total*	*Affected obs.*	*Share in total*
Austria	13.7	28.6	27.2	29.8
Belgium	11.4	5.5	26.0	31.2
Cyprus	44.5	24.5	49.6	28.3
Finland	0.0	0.0	0.0	0.0
France	18.9	13.5	9.7	4.7
Germany	10.8	6.6	13.5	16.8
Greece	9.0	4.8	16.5	25.1
Italy	0.8	0.2	9.9	4.5
Luxembourg	13.0	5.5	31.1	16.7
Malta	4.7	10.5	36.0	24.4
Netherlands	17.0	11.1	43.0	43.4
Portugal	11.0	8.0	16.4	20.5
Slovakia	10.2	5.3	17.4	20.9
Slovenia	17.2	16.2	20.1	18.2
Spain	17.2	6.2	16.6	10.9

Note: Affected obs.: share of households for which at least one component of the aggregate variable was imputed. Share in total: imputed value's share in total aggregate.

   Source: European Central Bank (2013a)

Figure 2   The concept of multiple imputation in HFCS 2010
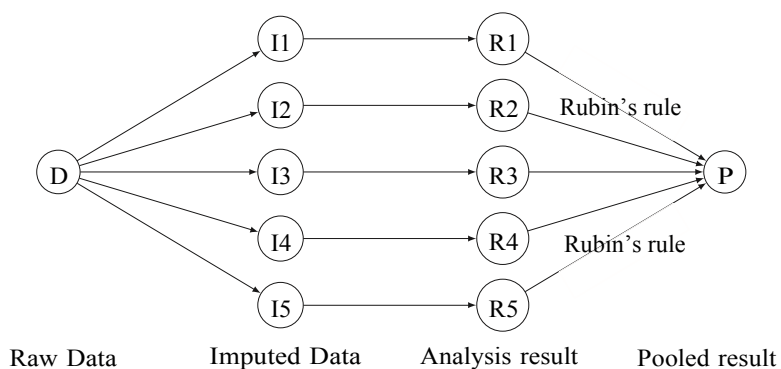
The first indicator in Table 4 measures the share of households for which at least one component of the aggregate was imputed. Remember that real (vehicles, real estate, etc.) and financial (deposits, bonds, etc.) wealth comprise several components. In most countries, the share of imputations is higher for financial assets than for real assets, meaning that households faced difficulties or rejected to provide values for financial

rather than for real assets. The second indicator shows how much the imputed values contribute to the aggregate wealth category. It is simply the weighted sum of all components of the aggregate that were imputed divided by the weighted sum of the aggregate variable (ECB, 2013a). Thus in Austria and Cyprus, more than 20% of reported gross real wealth has been imputed. Again, the figures for financial wealth are generally much higher. Imputation of wealth in the HFCS therefore plays a significant role when analysing inequality.

In practice, the HFCS data comes with five different datasets, one for each imputation. Every calculation, like the mean and median in Table 1, should incorporate the complexity of the survey design, as illustrated in Figure 2. The key for combining the analysis for each imputation is Rubin's rule (Little and Rubin, 2002). Let θ be the parameter of interest, $\hat{\theta}_i$ the estimator for dataset $i \in [1, m]$ and U_i the variance of $\hat{\theta}_i$, then Rubin's rule yields:

$$\bar{\theta} = \frac{1}{m} \sum_{i=1}^{m} \hat{\theta}_i \tag{2}$$

with the variance

$$U = \underbrace{\frac{1}{m} \sum_{i=1}^{m} U_i}_{\text{within-imputation variance}} + \frac{m+1}{m} \underbrace{\left(\frac{1}{m-1} \sum_{i=1}^{m} \left(\hat{\theta}_i - \bar{\theta} \right)^2 \right)}_{\text{between-imputation variance}} \tag{3}$$

The application of multiple imputations is more complex than the imputation of only one value, as in benchmark income surveys like EU-SILC. This may be a significant hurdle for students to use the HFCS; nevertheless, it is crucial to consider the uncertainty that these estimated values entail.

Learning goal 6   When households do not (fully) disclose their assets, multiple imputation efficiently provides proper information while incorporating the statistical uncertainty of the imputation process. Imputations account for a relevant share of the wealth figures in the HFCS 2010.

3.4   Inequality measures

A large literature concerns the ideal inequality measure [for an overview, see Cowell (2008)]. The choice of specific inequality measures is often due to the subjective preferences of the researcher. However, many common inequality indicators involve logarithms are defined only for positive values, e.g., the Theil index, the mean log deviation, and the Atkinson index. Negative values for net wealth, i.e., those outstanding liabilities exceed gross wealth, occur for approximately 5% of all Eurozone households, and for 1% to 12% of households in single Eurozone countries (ECB, 2013b; Cowell and Van Kerm, 2015). Such negative numbers are also challenging for the well-known Gini index and the attendant the Lorenz curve. While the Lorenz curve will initially pass below the horizontal axis, the Gini coefficient is not bound between zero and one anymore, but can exceed one (Raffinetti et al., 2015; Schneider, 2004).

Another issue for standard statistical measures are the characteristic heavy right tails of wealth distributions (Benhabib and Bisin, 2016). Specific inequality measures are

sensitive to changes at different parts of the distribution, for instance, the Gini coefficient in the middle and the coefficient of variation at the upper range of distribution (Schneider, 2004). In general, most inequality measures are known to be sensitive to extreme values which make inequality estimates also vulnerable to measurement error at the tails (Cowell and Van Kerm, 2015). The skewness in the wealth distribution often leads researchers to apply data transformations in order to achieve normal distributions, which is a basic assumption for many common statistical procedures. For instance, the natural log transformation is applied to truncate values from a skewed distribution and pull them closer to the mean. However as mentioned, logarithms cannot deal with zeros and negative values leading researchers typically to set all non-positive values to one before applying the natural log transformation (Friedline et al., 2015).

A possibility to simultaneously deal with skewness and accounting for non-positive values is the inverse hyperbolic sine (IHS) transformation (Pence, 2006). The IHS transformation can be expressed as

$$IHS(x) = \log\left(x + \sqrt{x^2 + 1}\right) \tag{4}$$

where x equals net household wealth. A scaling parameter θ can be added to the IHS equation in order to approximate either the level or logarithm of wealth. The scale parameter adjusts the proportion to which the transformed values mimic the natural logarithm, however, the parameter has to be estimated to fit best to the data (Pence, 2006). The IHS transformation is most often applied when net wealth is used in econometric exercises.

Due to the above-mentioned challenges, many researchers prefer simple and robust ranking tools such as quantile ratios to analyse wealth inequality. Table 1 therefore provides the net wealth ratio between the 80th and the 20th percentile as alternative measure of wealth dispersion. In the Euro area, the household at the 80th percentile owns 40 times the assets of the household at the 20th percentile. For many students, this figure will be much more vivid than a Gini coefficient of 0.68.

Learning goal 7   Wealth distributions commonly comprise a fraction of non-positive values and show fat tails. These characteristics make some traditional inequality measures inadequate. It is more convenient to use robust measures like quantile ratios to describe net wealth inequality.

4   Intergenerational wealth transfers

Given the observation of high wealth inequality in the HFCS 2010 data, the future development of wealth disparities is of great interest for policy makers. If inequalities are transmitted from generation to generation, this may endanger social cohesion and undermine the principles of meritocracy. Piketty (2014), for instance, sees inheritances and gifts as a major reason for the concentration of wealth. His proclamation of 'patrimonial capitalism' is based on the observation that inheritances are increasingly important for the development of wealth inequality and social mobility. In the empirical literature, intergenerational social mobility or persistence is typically measured for income, occupation, and education, and less often for wealth (Black and Devereux, 2011; Charles and Hurst, 2003). While inheritances between generations are an evident channel for social mobility, there are various influencing factors that are hard to operationalise

like social and cultural capital. On a related note, Davies and Shorrocks (2000) recommend studying the evolution of marriage patterns, fertility, estate division, bequest motives, and taxation, since they affect intergenerational wealth transfers.

Recent multiple generation studies reveal strong intergenerational wealth correlation. Adermon et al. (2016) observe a strong association of wealth between two generations and a weakly positive correlation with another preceding generation in Sweden. Strikingly, inheritances and gifts account for some 50% of the parent-child wealth correlation while earnings and education only explain 25%. Boserup et al. (2014) analyse population-wide administrative wealth data for three generations in Denmark. They observe robust wealth correlations for both the parental and the grandparental generation. Arrondel and Grange (2006) find a strong relationship between the wealth of fathers and their children in France from 1800 to 1938. These results imply that inheritances seem to play a major role, albeit Charles and Hurst (2003) assert high intergenerational wealth correlation in the USA even before such transfers.

Recently, a new literature on long-term social mobility has attracted attention. These articles investigate wealth correlation over centuries based on surname information. For instance, Clark and Cummins (2015a) analyse English and Welsh probate registers between 1858 and 2012 to measure intergenerational elasticities for wealth over five generations. The authors collect almost 19,000 observations with 634 rare surnames to trace family connections for this period. The persistence of wealth is remarkably high: families with the highest average wealth in the initial generation remain significantly wealthier than the average family in today's generation. Barone and Mocetti (2016) come to similar results with an even longer time period but with a more regional focus. The authors analyse roughly 800 surnames in the Italian city of Florence from tax records between 1427 and 2011 and find a statistically significant relationship between the real wealth of generations that lived 600 years apart. Thus, families more or less tend to remain in their position in the wealth distribution over very long periods. Clearly, such surname studies underlie a potential selectivity bias when family survival rates and their wealth correlate. The authors control for this issue and conclude that their results are robust.

Learning goal 8   Recent literature shows that intergenerational wealth mobility is limited in the very long run. Particularly at the top, the position of households persists for several generations.

Since inheritances are key for private wealth accumulation, a large literature exists concerning the relative contribution of inheritances and gifts to the distribution of wealth (Kotlikoff, 1988; Modigliani, 1988; Kessler and Masson, 1989; Gale and Scholz, 1994; Piketty et al., 2014; Clark and Cummins, 2015b). The importance of so-called transfer wealth versus life-cycle wealth is empirically disputed. While Kotlikoff and Summers (1981) estimate that life-cycle wealth only accounts for 20%, and transfer wealth for 80% of total wealth in the USA in 1974, Modigliani (1988) obtained the exact opposite result. This raises questions about the concept of inheritances used. First, it is not decided whether returns to inherited wealth are associated with transfer or life-cycle wealth. Second, inheritances and gifts typically do not include implicit gifts like appointing an offspring as partner in a lucrative family business or paying a college education. Third, meeting the costs for food and clothing is not considered a gift but provisioning for the family. Thus, the definition of transfer wealth is subject to interpretation.

Another disputed question is whether inheritances have an equalising or disequalising effect on wealth distribution (Cowell et al., 2016). Some find that inheritances constitute a substantial source of wealth heterogeneity even among households with similar lifetime earnings (De Nardi and Yang, 2014). Others suggest that inheritances might in fact reduce overall wealth inequality due to the greater relative importance of inheritances at the lower end of the distribution (Karagiannaki, 2017; Elinder et al., 2016; Boserup et al., 2016; Wolff, 2002). In empirical research based on survey data, however, inheritances seem to be substantially underreported. Findings from countries with exhaustive administrative data on bequests and gifts, like France and to some extent Germany, show that survey-based, self-reported flows amount to less than 50% of fiscal flows (Piketty and Zucman, 2015).

For most countries in the HFCS 2010, information on inheritances and gifts is available (except for Finland and Italy). The questionnaire considers the three most important wealth transfers requesting the types of assets received, the date of receipt, the value at that time, and from whom the assets were received. Due to the different dates of receipt, it is important to assess all past inheritances at their present value. In a simple approach, wealth transfers can be multiplied with cumulated inflation derived from the consumer price index. It has to be noted, that the HFCS survey is only able to capture inheritances and gifts that have already been received at the time of the interview. Even though there is a question about expected bequests in the future, there is no feasible information on actual life-cycle inheritances. Despite these problems, the HFCS offers a unique opportunity since it provides harmonised information on inheritances apart from national tax statistics.

Recently, several papers have used HFCS data to assess the role of inheritances versus income for private wealth accumulation (Fessler and Schürz, 2015; Korom, 2018; Humer et al., 2016). The common result is that households have to climb significantly in the income distribution to compensate the effect of inheritances on the relative position in the wealth distribution. Having received an inheritance lifts a household by about 14 net wealth percentiles, an additional percentile in the income distribution is associated with only 0.4 net wealth percentiles (Fessler and Schürz, 2015). Leitner (2016) sheds light on the question how much inheritances contribute to wealth inequality. By means of a Shapley value decomposition, the author assesses the relative importance of several explanatory variables for inequality. The distribution of wealth could be the result of the dispersion in income and inheritances, different educational levels, household sizes, and age structures but also explained by migration and family status. The Shapley decomposition is based on a regression of these factors on a measure of wealth inequality, which is the Gini coefficient in this case. The method measures the explanatory power of each regressor under consideration of the potential correlation between them.

Figure 3 shows the results of the Shapley decomposition for gross wealth inequality. In most countries, inheritances and gifts are the most important factor explaining wealth dispersion. In Austria, Germany, and Cyprus, the relative contribution reaches almost 40%. The impact of income inequality is by contrast significantly lower. The author concludes that among the included factors, inheritances are the most important driver of wealth inequality. The statement that wealth inequality can largely be traced back to unequal accumulation possibilities due to earnings inequality is contested by these HFCS 2010 findings.

Learning goal 9   Empirical evidence from HFCS 2010 shows that unequal inheritances
                   are an even more important driver of wealth inequality than income
                   inequality. Nonetheless, studies on the US and Scandinavian countries
                   find inequality–reducing effects of inheritances due to their greater
                   relative importance at the bottom of the wealth distribution.

Figure 3   Shapley value decomposition of gross wealth inequality, 2010
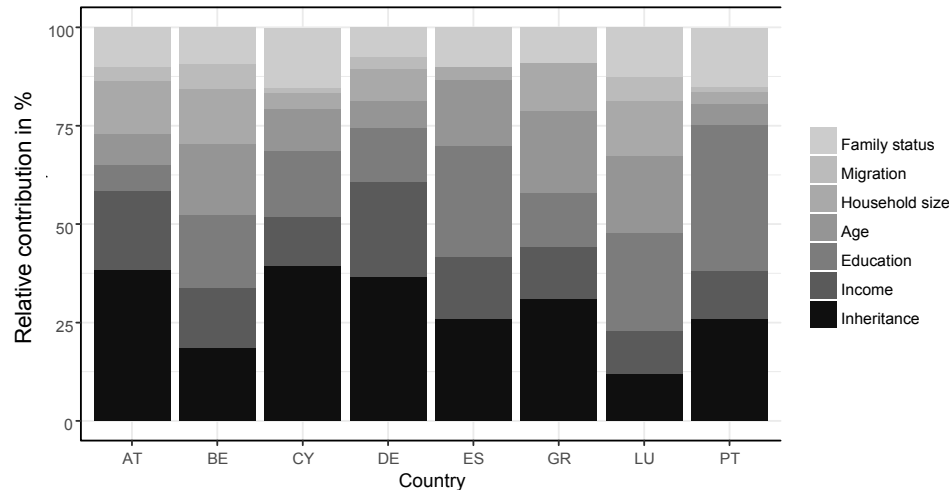
Source: Leitner (2016)

5   Proposals for applied teaching

Many of the proposed learning goals might involve some teacher-centred instruction. In
my experience, students are more responsive to questions of wealth inequality if
interactive elements are used besides typical slide presentations. The sociological
literature suggests simulation games encouraging students to consider the relative roles of
individual and structural forces in shaping inequality (Brezina, 1996; Groves et al., 1996).
The immediacy of the experience in simulation games contrasts a more passive type of
learning in which students read about a theory and then try to apply it. I thus briefly want
to introduce a few tools that may support teaching and enhance learning outcomes. With
the aid of the HFCS data, it is possible to enrich the theoretical concepts with illustrative
empirical evidence and incite discussions within class.

   One possibility is to visualise the skewness of the wealth distribution with toy blocks.
Organise students into small groups and hand each group 20 toy blocks which represent
total wealth, thus each block accounts for 5% of aggregate wealth. The task is to allocate
the blocks to deciles after a discussion within the groups. According to the wealth shares
of the top 10%, provided in Table 5, the richest decile gets between seven (Slovenia,
Slovakia) to 12 blocks (Austria, Germany). Note that these shares are again based on the
HFCS 2010 raw data without the above-mentioned Pareto adjustment for the top. For my
students, the results for Austria are an eye-opener: one block for the lowest five deciles

together, one block each for the next two deciles, two blocks for the 8th, three for the 9th, and 12 blocks for the richest decile.

This enlightening exercise can be complemented with other illustrative examples found on the internet. Increased technical possibilities have paved the way for modern and innovative teaching and likewise provide opportunities to include the student perspective. I briefly introduce three online tools that may invite vivid and collective studying in class. Unfortunately, only one of them is purely focused on wealth inequality, while the other two deal with income inequality.

Table 5   Decile shares of net wealth in HFCS 2010, in %

| | *Deciles* | | | | | | | | | |
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Austria	–0.7	0.1	0.4	0.9	2.0	4.1	6.7	9.8	15.5	61.2
Belgium	–0.1	0.2	1.3	3.3	5.3	7.0	9.3	12.3	17.2	44.1
Cyprus	–0.2	0.5	1.3	2.4	3.3	4.6	6.3	9.3	15.4	57.1
Finland	–0.7	0.1	0.6	2.2	4.5	7.0	9.7	13.5	19.3	43.8
France	–0.2	0.1	0.5	1.4	3.6	6.2	8.9	12.0	17.5	50.0
Germany	–0.6	0.1	0.4	1.0	1.9	3.7	6.4	10.8	17.1	59.3
Greece	–0.2	0.5	2.0	4.1	6.0	7.7	10.1	13.0	17.9	38.9
Italy	0.0	0.4	1.3	3.2	5.4	7.2	9.2	11.8	16.7	44.9
Luxembourg	–0.2	0.2	0.9	2.8	4.7	6.3	7.9	10.5	15.4	51.4
Malta	0.1	1.1	2.6	4.2	5.5	7.1	8.6	11.2	15.9	43.7
Netherlands	–4.7	0.0	0.6	1.7	3.9	6.7	10.7	15.5	22.0	43.4
Portugal	–0.2	0.4	1.4	2.9	4.2	5.8	7.8	10.8	15.5	51.5
Slovakia	0.4	2.8	4.6	5.7	7.0	8.3	10.0	12.3	15.9	33.0
Slovenia	–0.1	1.0	2.7	4.2	5.7	7.5	10.5	13.7	18.2	36.7
Spain	–0.3	0.9	2.7	4.1	5.5	7.0	8.8	11.4	16.3	43.6

Wealthometer (http://wealthometer.org) is a simple multilingual tool to assess a household's position in the wealth distribution for the USA, Germany, Austria, Italy, Spain, and Greece. The underlying data is the Survey of Consumer Finances (SCF) 2010 for the USA, and the HFCS 2014 for the European countries. The calculator starts with an estimate of one's own position in the distribution of net wealth in terms of percentiles. In a second step, users have to fill in a very rough household balance sheet consisting of real assets, financial assets, and liabilities. After providing the household size, the result shows the difference between the estimated and the actual position in the net wealth distribution. Finally, users can simulate different wealth tax designs by choosing a tax exempt amount and a tax rate.

Instructors may conduct this exercise in front of the class. The tool allows students to choose between actively participating with providing personal information and creating hypothetic households. It is helpful to think of a plausible household balance sheet together in a lively debate. What asset does our household own? How much worth is each of the assets? To support the discussion, Table 6 shows participation rates of households for selected wealth components in the countries included in the calculator. These

numbers may help create household balance sheets and picture the assets of a typical household.

The OECD provides a similar tool for household income at http://compareyourincome.org. In several languages, users can estimate their position in the income distribution in OECD countries. The calculator compares the given information with the actual figures and illustrate the differences between expected, preferred, and real income distributions. This provides a great opportunity for discussion. Moreover, the results of the income inequality tool can be compared with the outcome of the wealth inequality tool to discuss the differences between income and wealth. Finally, the US-based think tank Economic Policy Institute (EPI) has created http://inequality.is which is a political webpage with US data only. Users can compare incomes by gender, ethnicity, age groups and education levels. In contrast to the other calculators, this webpage provides policy suggestions for redistribution, ranging from labour standards to financial regulation.

Table 6   Participation rates in selected wealth components, in %

Asset	US	DE	AT	IT	ES	GR
Vehicles	86.7	70.9	74.9	83.3	77.3	73.0
Main residence	67.3	44.2	47.7	68.7	82.7	72.4
Other real estate	14.4	17.8	13.4	24.9	36.2	37.9
Business wealth	13.3	9.1	9.4	18.0	14.2	9.8
Deposits	92.5	99.0	99.4	91.8	98.1	73.4
Stocks/shares	15.1	10.6	5.3	4.6	10.4	2.7
Investment funds	8.7	16.9	10.0	6.3	5.6	1.2
Any debt	74.9	47.4	35.6	25.2	50.0	36.6
Mortgage debt (main residence)	47.0	18.0	16.6	9.6	26.8	13.9

Note: Note that there may be small differences in the variable definitions between SCF and HFCS.

6   Conclusions

Wealth inequality has recently attracted broader public attention, not least because of the widely read bestseller *Capital in the Twenty-First Century* (Piketty, 2014). Acknowledging the longstanding achievements of many tireless scholars, research on the topic has gained even more momentum, encouraged by the general interest and enabled by the improved data availability. New insights into wealth disparities have found their way into many lecture rooms where students intensively debate about the origins, dimensions, and consequences of rising inequality from different viewpoints. The fact that schools of thought provide varying perspectives on distributional questions might also encourage more pluralism in the economics curriculum. In this article, I confine myself to a fairly empirical access to wealth inequality with reference to the novel Eurozone data from the HFCS mainly for two reasons:

1   A solid empirical foundation facilitates policy-related debates and raises awareness for the issue among students.

2   Some specifics of wealth inequality, like the proper measurement of net wealth or the unwillingness of the rich to disclose their assets, can be discussed best with data at hand.

I have presented a nucleus of a syllabus for an undergraduate course on wealth inequality.[1] Needless to say, this is a limited perspective that involves further related questions. I have refrained, for instance, from a detailed discussion about the sociological and psychological consequences of a polarisation between the rich and the poor. From my experience, illustrative empirical evidence was the most promising approach to gain student interest. After setting the stage with empirical data, instructors choose which topics should be studied in more detail or which policies they want to discuss. The interrelation between economic wealth and political power, for instance, is an interesting question. While unable to discuss all relevant topics in depth, I have provided references for further reading and delving deeper into the subject matter.

In this paper, I have translated the main findings into learning goals which may serve as cornerstones of the course. Even though some might seem trivial for the experts, the empirical foundation for these arguments is comparatively new. As mentioned throughout the paper, the lack of reliable wealth data has often aggravated fact-based statements beyond anecdotal evidence. Thus, one intention of this paper is to encourage instructors and students to work with HFCS or any other complex wealth survey. Although the number of scientific publications on wealth inequality is rapidly increasing, there are still many research gaps to address in the future.

Acknowledgements

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Notes

1 Complementary material and related literature for a full syllabus are available from the author upon request.