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DIW Berlin
German Institute for Economic Research
Mohrenstr. 58
10117 Berlin

Tel. +49 (30) 897 89-0
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Looking for the missing rich: Tracing the top tail of the wealth distribution*

Stefan Bach[1], Andreas Thiemann[2] and Aline Zucco[3]

[1]DIW Berlin and University of Potsdam
[2]Joint Research Centre
[3]DIW Berlin

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Abstract

We analyze the top tail of the wealth distribution in Germany, France, and Spain based on the first and second wave of the Household Finance and Consumption Survey (HFCS). Since top wealth is likely to be underrepresented in household surveys, we integrate big fortunes from rich lists, estimate a Pareto distribution, and impute the missing rich. In addition to the *Forbes* list, we rely on national rich lists since they represent a broader base for the big fortunes in those countries. As a result, the top percentile share of household wealth in Germany jumps up from 24 percent to 31 percent in the first and from 24 to 33 percent in the second wave after top wealth imputation. For France and Spain, we find only a small effect of the imputation since rich households are better captured in the survey.

Keywords: Wealth distribution, missing rich, Pareto distribution, HFCS

JEL: D31, C46, C81.

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1 Introduction

Rising inequality in income and wealth is increasingly gaining attention, in both the public debates and academic research. The widespread discussion following the publication of Piketty's (2014) book, *Capital in the Twenty-First Century*, focuses on concentration at the top and the underlying trends in modern capitalism. Economists, policy makers and financial analysts are aware of increasing heterogeneity in income and wealth, along with the consequences for financial stability, savings and investment, employment, growth, and social cohesion. Against the backdrop of tax policy trends to reduce progressivity and high budget deficits following the 2008 financial crisis, tax increases on high capital income and top wealth were endorsed, if not implemented, in many countries (Förster et al., 2014). Proper information on the distribution of capital income and wealth, in particular at the top, is increasingly necessary. However, we still lack precise information about wealth concentration on the very end of the distribution.

This study aims to shed light on the top wealth distribution in Germany, France, and Spain. We integrate household survey data and rich lists of the big fortunes, estimate a Pareto distribution, and impute the missing rich.

Household surveys describe the wealth distribution by socio-demographic characteristics (Davies et al., 2011). The Eurosystem's Household Finance and Consumption Survey (HFCS) (European Central Bank, 2013), conducted in most Eurozone countries, provides comprehensive information on the wealth distribution in international comparison. For instance, the data reveal that Germany has one of the most unequal wealth distributions in Europe.

However, with respect to the top wealth distribution, household surveys have inherent, crucial drawbacks: non-response and under-reporting (Vermeulen, 2016, 2017). Personal wealth is typically much more concentrated than income and it is difficult to capture the top wealth distribution by using small-scale voluntary surveys. The potential non-observation bias, i.e. the lack of reliability due to small samples, can be partly reduced by oversampling rich households. Moreover, non-response bias is probable as response rates presumably decrease with high income and wealth, especially at the top (Vermeulen, 2017). The bias of under-reporting becomes visible when comparing survey data with national accounts (Vermeulen, 2016; Chakraborty et al., 2018).[1]

A viable solution to better capture the missing rich would be to estimate the top wealth

[1] Chakraborty and Waltl (2017) investigate the impact of the missing wealthy in the HFCS on the gap between wealth components based on the HFCS and national accounts for Germany and Austria.

concentration by relying on functional form assumptions on the shape of the top tail distribution. Traditionally, the Pareto distribution is used as it approximates well the top tail of income and wealth (Davies and Shorrocks, 2000). In addition, more complex functional forms might be used (Clauset et al., 2009; Burkhauser et al., 2012; Brzezinski, 2014). Yet, the problem of biased wealth concentration remains if top wealth households are substantially underrepresented in survey data.

The literature on top wealth distribution traditionally resorts to tax record data. Yet, few countries still levy a recurrent wealth tax. Estate tax records are used to infer top wealth by mortality multipliers (Kopczuk and Saez, 2004; Alvaredo et al., 2016) for which, however, researchers must address different mortality ('wealthier is healthier'). The capitalization of capital income tax records (Saez and Zucman, 2016) raises intricate issues to assess proper discount rates, in particular with respect to risk premia. In general, tax record data could be heavily flawed by explicit tax privileges, tax avoidance and evasion, as well as favorable valuation procedures that benefit real estate and business properties. Thus, tax records provide useful information on the top tail of the wealth distribution, but its consistency and reliability remains contentious.

A further alternative is the use additional information, especially for super-rich households. Business media provides wealth rankings for many countries. The most popular rich list is the *World's billionaires* list, published by the US business magazine Forbes (2014). For larger countries there are national wealth rankings covering households or families with large fortunes. Researchers use such lists to check top wealth estimates based on survey data or to augment survey data (see e.g., Davies (1993) for Canada, Bach et al. (2014) for Germany, and Eckerstorfer et al. (2016) for Austria).

In a similar vein, the World Wealth and Income Database (WID.world) provides information on income and wealth concentrations for several countries and regions. The database is compiled by combining data from national accounts, surveys, fiscal data, and wealth rankings to shed more light on the concentration of income and wealth (Alvaredo et al. (2016)).

Vermeulen (2017) provides a straightforward method to combine household survey data on wealth with rich lists of the big fortunes to jointly estimate a Pareto distribution for the top tail of wealth. He augments the US Survey of Consumer Finances (SCF) and the HFCS data with the *Forbes* list in order to show the potential under-representation of top wealth in the survey data for the USA and nine Eurozone countries. According to his results, differential non-response problems seem to be rather high in a number of Eurozone countries, especially in Germany. This leads to underestimation of the top wealth shares when only using survey data to estimate top wealth without extreme tail observations.

We extend Vermeulen (2017) along two dimensions. First, we use country specific rich lists in addition to the *Forbes* list. In particular, we construct an integrated database for Germany, France, and Spain that better represents the national top wealth concentration. In doing so, we use the HFCS survey data, combined with national lists of the richest persons or families of these countries, provided by the media. Based on these data, we refer to the approach of Vermeulen (2017) to jointly estimate a Pareto distribution for each country and impute the missing rich. Instead of the *Forbes* list we mainly rely on national rich lists since they represent a broader base for the big fortunes. This is especially important for France and Spain as the *Forbes* list contains only few observations. Second, we use the first and the second wave of the HFCS which allows analyzing wealth dynamics.

Our results are broadly in line with Vermeulen (2017). However, the inclusion of national rich lists in addition to the *Forbes* list slightly increases the top wealth concentration. We find that the top percentile share of household wealth in Germany jumps up from 24 percent based on the original HFCS to 31 percent and 24 to 33 percent due to the top wealth imputation in the first and the second wave, respectively. As a result, wealth inequality, measured by the Gini coefficient, increases from 0.74 to 0.77 in the first wave, and from 0.75 to 0.78 in the second wave. For France and Spain we find only a small effect of the wealth imputation since rich households are better represented in the survey. The wealth share of the French top 1 percent increases from 18 to 22 percent in first wave, and from 19 to 22 percent in the second wave. In Spain, the wealth share of the richest percent increases by 4 percentage points in both waves to 19 percent (first wave), and to 20 percent (second wave).

The remainder of the paper proceeds as follows: Section 2 describes the data used. The methodology of estimation and imputation of the top wealth distribution is presented in Section 3. Section 4 presents the results of the top wealth imputation on the wealth distribution, while section 5 concludes.

2 Data

This study on the wealth distribution in Germany, France, and Spain is based on multiple data sets: The Eurosystem's Household Finance and Consumption Survey (HFCS) and rich lists for these countries. In this section, we examine each of these data sets in turn.

2.1 Household Finance and Consumption Survey (HFCS)

The HFCS is a decentralized household survey for the Eurozone. It is conducted by national central banks of the Eurosystem. The goal of this survey is to collect information about the consumption behavior and the financial situations of households in the Eurozone countries. Our analysis uses the first and second waves, as collected between 2008 and 2011 (European Central Bank, 2013, p. 8) and between 2011 and 2015 (European Central Bank, 2016, p.4), respectively. While the HFCS over-samples wealthy households in order to address potential non-observation bias, the criteria for oversampling vary across countries (European Central Bank, 2013, p. 9).

Table 1 shows that response rates vary substantially across countries and waves. The effective oversampling rate describes to what extent the ratio of the top 10 percent is over-sampled compared to its share in the population (European Central Bank, 2013, p. 36). To address item non-response, i.e. participants refusing or being unable to answer certain questions, the multiple imputation approach is chosen (European Central Bank, 2013, p. 39). Throughout the paper, results are calculated by taking all 5 implicates into account.

Even though the HFCS was compiled in a harmonized way, it still relies on decentralized country-specific surveys, which renders cross-country comparison more difficult. Comparing the survey methodology across our three countries of interest reveals methodological differences that should be taken into account when interpreting results. The response rate varies not only across both waves within countries (for instance, in Spain it decreases from 57 percent in the first wave to 48 percent in the second) but also across countries. Survey participation is compulsory in France, while sampled households can refuse to participate in the two other countries (European Central Bank, 2013, p. 41). Furthermore, Germany and Spain exclude homeless and the institutionalized population, while France only excludes the institutionalized population (European Central Bank, 2013, p. 33). For our purpose, however, differences in the effective oversampling rate of the top 10 percent seem to impose the biggest challenge. In Germany, oversampling is based on geographic information about taxable income, whereas the French oversampling relies on the individual information about taxable net wealth. Finally, the surveys markedly differ in time and in duration with respect to the reference period.[2] It is important to keep these differences in survey

[2]The first wave of the Spanish survey was conducted between November 2008 and July 2009, while the first French wave between October 2009 and February 2010. In Germany, however, the field period was from September 2010 to July 2011. These temporal differences persist also through the second wave of the HFCS. While the survey was then conducted between October 2011 and April 2012 in Spain, the interviews of German and French households were about two years later (in Germany between April and November of 2014 and in France between October 2014 and February 2015) (Tiefensee and Grabka,

Table 1: Response behavior in the first and second wave of the HFCS

Countries	First wave				Second wave			
	Gross sample size	Net sample size	Response rate, in percent	Over-sampling rate[a]	Gross sample size	Net sample size	Response rate[b], in percent	Over-sampling rate[a]
Austria	4,436	2,380	56	1	6,308	2,997	50	−7
Belgium[c]	11,376	2,364	22	47	7,265	2,238	38	59
Cyprus[c]	3,938	1,237	31	81	1,874	1,289	70	67
Estonia	-	-	-	-	3,594	2,220	64	31
Finland[c]	13,525	10,989	82	68	13,960	11,030	80	80
France	21,627	15,006	69	129	20,272	12,035	65	132
Germany[c]	20,501	3,565	19	117	16,221	4,461	29	141
Greece	6,354	2,971	47	−2	7,368	3,003	41	−2
Hungary	-	-	-	-	17,985	6,207	39	2
Ireland	-	-	-	-	10,522	5,419	60	10
Italy[c]	15,592	7,951	52	4	16,100	8,156	53	8
Latvia	-	-	-	-	2,405	1,202	53	53
Luxembourg	5,000	950	20	55	7,300	1,601	23	58
Malta[c]	3,000	843	30	−5	2,035	999	51	−4
Netherlands[c]	2,263	1,301	58	87	2,562	1,284	50	54
Poland	-	-	-	-	7,000	3,483	54	10
Portugal	8,000	4,404	64	16	8,000	6,207	84	51
Slovakia	n.a.	2,057	n.a	−11	4,202	2,136	53	5
Slovenia	965	343	36	22	6,519	2,553	41	21
Spain[c]	11,782	6,197	57	192	13,442	6,106	48	234

Note:

a) Effective over- sampling rate of the top 10 %, in percent.

b) Response rate including panel if available.

c) Countries with panel component.

Source: European Central Bank (2013, 2016).

methodology in mind when comparing the results of our three countries.

The HFCS collects households' assets and liabilities in detail. Net wealth is measured as the sum of real estate properties, business properties, financial assets, corporate shares and main household assets, such as cars, less liabilities. Claims to social security or occupational and private pensions and health care plans are not included in household net wealth. Net wealth is based on self-assessed property valuations of the survey respondents. We have no evidence of systematic biases in this respect.

2.2 Rich lists

Since the 1980s, business media and researchers have provided rankings of the big fortunes held by the super-rich. We use the *World's billionaires* of Forbes (2014) and national lists of the richest persons or families of the selected countries, as provided by the media. We refer to the annual issue of the rich lists for the year in which the national HFCS survey was conducted (Table 2).[3]

The reliability of these lists is contentious since the data are not surveyed relying on a consistent method but collected from different sources and compiled using a variety of methods. Information is gathered from public registers, financial markets, business media, and through interviews of wealthy individuals themselves. The completeness of these lists is unclear, especially with regard to smaller fortunes, which are often dominated by non-quoted corporate shares, making it more difficult to assess their precise value. Further, some persons have claimed for removal from the German rich list according to its editor. Hence, the selectivity of the rankings might strongly increase with lower ranks. "Heaping effect", i.e. many observations at round numbers, underline this presumption.

In many cases, wealth is reported for "families", for instance entrepreneurial families that actually might consist of many households. In particular, in Germany there are many successful "*German Mittelstand*" firms, if not major enterprises, that are family-owned and have been for generations. Likewise, in other countries wealthy families consisting of many members. Insofar, the top wealth concentration could be over-represented in wealth rankings as they may not represent one household but an entire family. We correct the German national list by using publically available information on the number of shareholders of the respective family-owned firms (see below). Moreover, we remove households from the list that are obviously living abroad. For the French and Spanish rich lists, we neglect this issue as we do not have the necessary

2014; European Central Bank, 2016).

[3] If the survey was conducted during a two-year period, we referred to the later year.

information to perform this adjustment.

Apart from corporate wealth, these rankings presumably ignore private assets and liabilities. Typically, many top-wealth households have real estate properties and financial portfolios, thus leading to an underestimation of the top wealth concentration. In some cases, however, corporate investments might be leveraged by private debt, even though this would have unfavorable tax consequences. The German *manager magazin* includes valuables and real estate, while the Spanish *El Mundo* list does not. These methodological differences might influence the results in the respective countries and should be kept in mind when comparing results across countries.

Evaluations with administrative data from wealth taxation are rare since most OECD countries have eliminated recurrent taxes on personal net wealth. However, both France and Spain, two of the countries we investigate, still raise a recurrent wealth tax.[4] Inheritance, gift and estate taxes, which still exist in the main OECD countries, only capture inter-generational transfers. Hence, concentration of inheritance may deviate from personal top wealth concentration due to different numbers of heirs and anticipated inheritance by gifts and legacies. The literature often uses estate tax records to infer top wealth by applying mortality multipliers (Kopczuk and Saez, 2004; Alvaredo et al., 2016). The problem is, however, to find the appropriate mortality rates for the wealthy population. Generally, wealth information from tax files can be strongly flawed because of explicit tax privileges; in particular for small and medium sized firms or donations to non-profit organizations, tax avoidance, tax evasion, or favorable valuation procedures for real estate and business properties that systematically underestimate the market value.[5]

manager magazin (Germany)

The *manager magazin* publishes each year a wealth ranking of the richest persons or families in Germany. From 2000 to 2009 the magazine ranked the 300 wealthiest Germans (and their wealth); since 2010 the 500 richest.

Presumably, the incompleteness and selectivity of the list increases with lower ranks since there is scarce information for households holding non-quoted firms or other assets. “Heaping effects” underline this presumption. Therefore, we only use the top

[4] Zucman (2008) uses tabulations of the French wealth tax base 1995 to analyze top wealth distribution. Alvaredo and Saez (2009) use tabulations of the Spanish wealth tax base from 1933 up to 2005 to estimate top wealth shares.

[5] When comparing estate tax files and the *Forbes* list, US Internal Revenue Service (IRS) researchers find that the list overestimates net worth by approximately 50 percent (Raub et al., 2010). This is primarily due to valuation difficulties and tax exemptions as well as family relations (individuals vs. couples) and other structural differences.

Table 2: Summary statistics of the national rich lists in Germany, France and Spain

Country	Rich list	Count	Mean	Std. Dev.	Min	Max
				in billion Euro		
First wave						
Germany	Manager Magazin 200 (corrected)	200	1.36	1.85	0.50	17
	Manager Magazin 200 (original)	200	1.91	2.29	0.55	17
	Forbes (2011)	52	3.27	3.21	0.76	18
France	Challenges 200	200	1.08	2.60	0.16	23
	Forbes (2010)	11	5.86	6.80	0.87	22
Spain	El Mundo	74	1.49	2.06	0.50	16
	Forbes (2009)	12	2.35	3.76	0.78	14
Second wave						
Germany	Manager Magazin 200 (corrected)	200	1.78	2.18	0.60	15
	Manager Magazin 200 (original)	200	2.47	3.46	0.70	31
	Forbes (2014)	85	3.47	3.54	0.74	18
France	Challenges 200	200	1.92	4.26	0.35	31
	Forbes (2015)	47	4.74	7.16	0.88	35
Spain	El Mundo	117	6.78	3.66	0.19	16
	Forbes (2012)	15	1.11	3.66	0.90	39

Source: Manager magazin (2011, 2014), the corrected manager magazin adjusts the rich list entries by the number of households per entry, Challenges (2010, 2015) and El mundo (2009, 2012) and Forbes (2009, 2010, 2011, 2012, 2014, 2015), own calculations.

200 from the German list.[6] The wealth is reported for "families" which could consist of many households in the case of firms or foundations that are family-owned firms for generations. We correct the respective observations by using public available information on the number of shareholders. This is possible for the top 200 of the list by thorough internet research combined with information from the list's editor. However, measurement errors might clearly remain since there is often scarce information on the ownership structure provided by financial accounts and other companies' disclosures. Generally, German "*Mittelstand*" entrepreneurs are rather reluctant to provide information on their financial affairs and anxious to keep capital markets and external investors out of their firms. In the case of the lower-ranked families we generally assume four households per family. We also remove obvious non-resident households from the list (Table 2).

Challenges (France)

Since 1996, the *Challenges* magazine annually publishes a ranking 500 richest house-

[6]Table 12 in the Appendix illustrate the sensitivity of the estimated wealth concentration when we use national rich lists, the *Forbes* list or wealthy HFCS households to perform the top tail estimation.

holds in France. Their net wealth is estimated based on a large database, constructed and updated by the team of journalists at *Challenges*. It relies on various sources of information: Public data on share ownership and accounts, investigations of the ownership structure of unlisted companies, professional publications, seminars, award ceremonies and surveys that are sent to rich households directly (Treguier, 2012). Similar to the German case we finally use the top 200 observations of the Challenges (2010) list.

El Mundo (Spain)

For Spain, we rely on national rich lists compiled by the third largest newspaper, *El Mundo*. Since 2006, the newspaper publishes two lists based on the top 100 richest individuals. The first list of the top 50 "visible fortunes" relies on public information on share ownership from stock markets. The second list of the top 50 "estimated fortunes" is mainly based on estimations of shares in unlisted companies. The estimation uses information about purchase-sales of shares, venture capital investments and direct estimations of fortunes. The joint list for 2009 is based on the top 50 "visible fortunes" and the 27 top "estimated fortunes", where the last entry from the latter list reports the same net wealth as the poorest person from the first list. For the second wave, we use the joint list of 2012, compiled in the same way. It contains 100 "visible fortunes" and 17 "estimated fortunes". The final list contains the 74 and the 117 richest Spanish individuals (El mundo, 2009, 2012) in the first and second waves, respectively.

Forbes (Global)

To make it on the *Forbes* billionaire list, estimated personal net wealth has to be at least one billion US dollar. Similar to the lists described above, *Forbes* reporters compile available information on the big fortunes worldwide (Forbes, 2014). Compared to the national lists, the *Forbes* list seems to be more reliable as it focuses on the super-rich, for which reliable information is easier to collect. Moreover, many billionaires cooperate with the editors. However, distortions regarding the incompleteness and selectivity of the list likely remain when comparing the *Forbes* list with the national lists.

We matched the respective *Forbes* billionaire lists with the latest year of the survey: hence, we use the *Forbes* list 2011 and 2014 for Germany, 2010 and 2015 for France and 2009 and 2012 for Spain. For our analysis we recalculate the wealth in Euro.[7]

[7] The exchange rates corresponds to the date of the "snapshot" of the *Forbes* Billionaires Lists. Therefore, the respective date of the exchange rates are 13/02/2009 (ES), 25/08/2010 (FR) and 26/08/2011 (DE) for the first wave and 14/02/2012 (ES), 12/02/2014 (DE) and 13/02/2015 (FR) for the second wave.

3 Methodology of estimation and imputation of the top wealth distribution

This section describes how we construct the adjusted wealth distribution for Germany, France[8] and Spain. First, the theoretical background underlying the approach is briefly sketched. Based on this, we then estimate the Pareto coefficients for each country, relying on the HFCS and the corresponding national rich lists. Finally, we impute synthetic household net wealth for the missing wealth based on the Pareto coefficients for each country.

3.1 Theoretical background

This paper relies on the Pareto distribution which is mostly used in the literature to approximate the top tail of the wealth distribution.[9] A nice feature of this distribution is that its shape can be easily estimated by OLS.

The Pareto distribution is defined for any level of wealth higher than a certain threshold, w_{min}. The complementary cumulative distribution function (ccdf) is given by

$$P(W > w_i) = (\frac{w_{min}}{w_i})^{\alpha}; \forall\, w_i \geq w_{min} \tag{1}$$

Hence, the ccdf (equation 1) represents the relationship between observation i's wealth, the threshold w_{min}, and the Pareto coefficient α. It describes the probability of owning at least w_i, defined on the interval $[w_{min}, \infty]$. The coefficient α, also called tail index, determines the "fatness" of the tail. Note that the lower α, the fatter the tail and the more concentrated is wealth.

Based on the Zipf's law and following Vermeulen (2017), we express the ccdf in terms of a household's ranking in the top tail (above w_{min}). Accordingly, we assign the rank one to the wealthiest household and the lowest rank n to poorest household in the top tail. $n(w_i)$ denotes the individual rank of observation i:

$$\frac{n(w_i)}{n} \cong (\frac{w_{min}}{w_i})^{\alpha}; w_i \geq w_{min} \tag{2}$$

We follow Vermeulen (2017) and approximate the Pareto distribution by the ranking of the sample households, assuming that the sample is large enough to approximate the

[8]The French data in the second wave contains 82 observations with missing information in the net wealth variable. These observations are excluded from the estimation.

[9]We refer the interested reader to Dalitz (2016); Vermeulen (2017); Cowell (2011); Gabaix (2009); Gabaix and Ibragimov (2012); Clauset et al. (2009); Kleiber and Kotz (2003); Davies and Shorrocks (2000); Embrechts et al. (1997); Chakraborty and Waltl (2017).

ccdf. After taking the logarithm and re-arranging, we obtain:

$$ln(i) = C - \alpha ln(w_i) \tag{3}$$

with $C = ln(n) + \alpha ln(w_{min})$.

It has been shown that the estimates of the log-log rank-size regression are biased in finite samples. Gabaix and Ibragimov (2012) show that decreasing the rank by 0.5 corrects for this bias. Accordingly, we estimate the following relationship:

$$ln(i - \frac{1}{2}) = C - \alpha ln(w_i) \tag{4}$$

We follow Vermeulen (2017) by combining the results from the OLS estimation with the analytically calculated *maximum likelihood* estimator. This is derived directly from (1).

$$\tilde{\alpha}_{ml} = [\sum_{i=1}^{n} \frac{1}{n} ln(\frac{w_i}{w_{min}})]^{-1} \tag{5}$$

However, Vermeulen (2017) emphasizes that this estimator is biased when the calculation is based on complex survey data. He proposes the *pseudo maximum likelihood* estimator which also includes the survey weights of all observations (N) and the observation i (N_i):

$$\tilde{\alpha}_{pml} = [\sum_{i=1}^{n} \frac{N_i}{N} ln(\frac{w_i}{w_{min}})]^{-1} \tag{6}$$

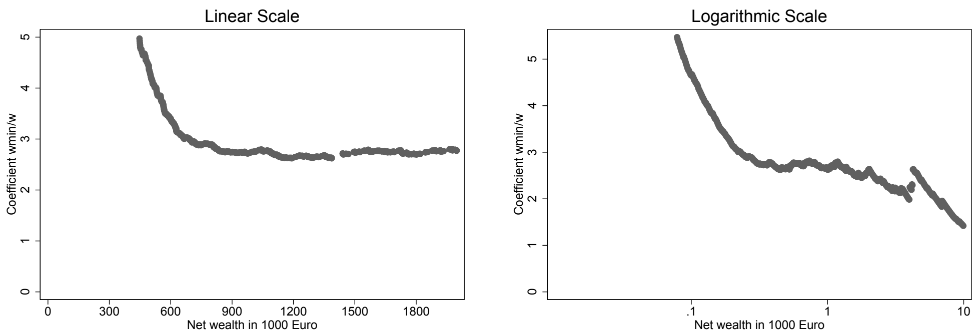
In the estimation, we follow European Central Bank (2016) and use the 5 implicates and the first 100 replicate weights to calculate the bootstrap variance. Unless otherwise indicated, the results report the average of the 5 implicates.

3.2 Estimation of the Pareto coefficient

To estimate α, we combine the HFCS data with information from national rich lists or from the *Forbes World's billionaires* list. The estimation of α depends on how we set w_{min} and, further, according to our integration approach, on the choice of the respective rich list. To obtain the proper cutoff point within the HFCS data, we mainly refer to the distinctive property of the Pareto distribution: The average wealth w_m above any wealth threshold w is a constant multiple of that threshold, which is labeled as "van der Wijk's law" (see Cowell (2011); Embrechts et al. (1997)). The coefficient of the "mean excess function" $\frac{w_m}{w}$ is labeled as inverted Pareto-Lorenz coefficient β and equals $\frac{\alpha}{(\alpha-1)}$. Based on the HFCS data, we plot the coefficient $\frac{w_m}{w}$ for wealth thresholds above 100,000 Euros for the three countries, exemplary for the first implicate in Figure 1 - Figure 6, given in linear scale up to 1 million Euros and in log scale up to 20 million Euros.

The graphs suggest a good representation of the Pareto distribution for household wealth above 500,000 Euros, which is around the 90$^{\text{th}}$ percentile in Germany, France, and Spain.[10] Therefore, we set the cut-off point of the Pareto distribution to 500,000 Euros.[11] Similar cut-off point for the three countries are also suggested by (Vermeulen, 2017, Online Appendix) for the first wave.

Figure 1: Ratio mean wealth above w, divided by w, w_m/w, Germany- first wave



Data source: HFCS (first wave), 1. Implicate, own calculations

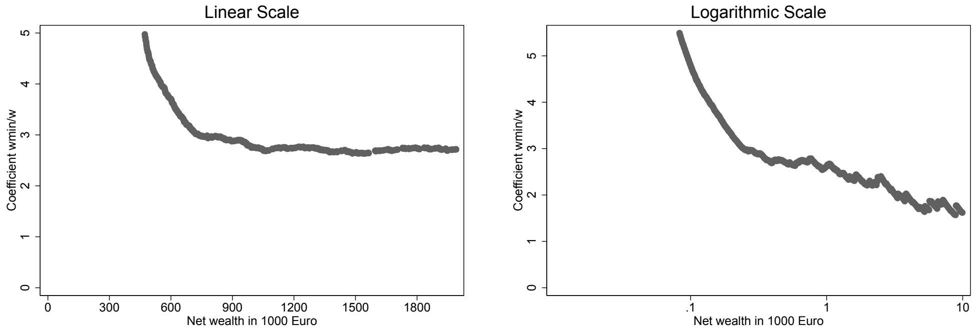
To choose the optimal combination of w_{min} and the rich list, we follow Vermeulen (2017), who experimented with 0.5, 1 and 2 million Euros as minimum wealth thresholds. For Germany and France, we consider the top 300, top 200, top 100, and *Forbes* entries of the national rich lists. We neglect the lower ranks due to potential "heaping effects" (see section 2.2). We assume that each entry in the corresponding rich list represents one household. Then, we calculate the Pareto coefficient for these subsamples per country. Table 3 - Table 5 show the estimated coefficients by country for the first and second wave. Figures 13 - 18 in the Appendix illustrate them graphically for Germany, France and Spain in the first and second wave.

Comparing the first to the second wave in Germany shows that the wealth concentration increased over time as lower values of α indicate a stronger wealth concentration

[10]Eckerstorfer et al. (2016) propose an advanced method to obtain the cut-off point above which wealth follows a Pareto distribution. They suggest identifying suitable parameter combinations of maximum-likelihood estimates and goodness-of-fit tests. Dalitz (2016) and Krenek and Schratzenstaller (2017) use the Kolmogorov-Smirnov (K-S) criterion to identify the w_{min} that fits best to the empirical distribution. The K-S test compares alternative top tail distributions to the empirical one to determine the optimal lower bound. While it provides a quantitative decision criterion, the K-S test still has to rely on the empirical top tail distribution, however.

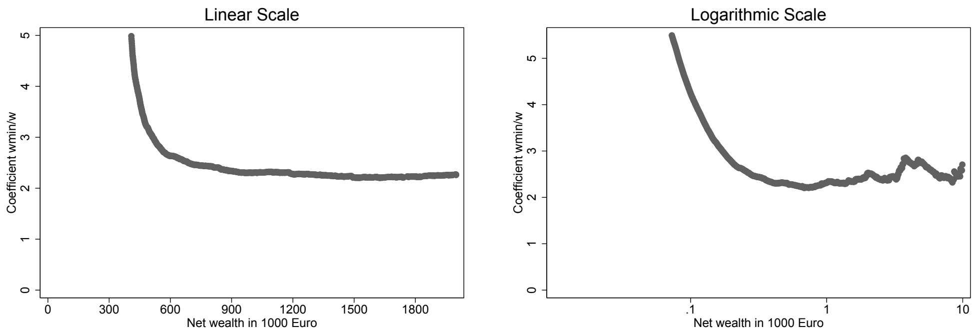
[11]The spike at the far right end of Figure 1 for Germany is driven by a small number of households and has no meaningful interpretation.

Figure 2: Ratio mean wealth above w, divided by w, w_m/w, Germany- second wave



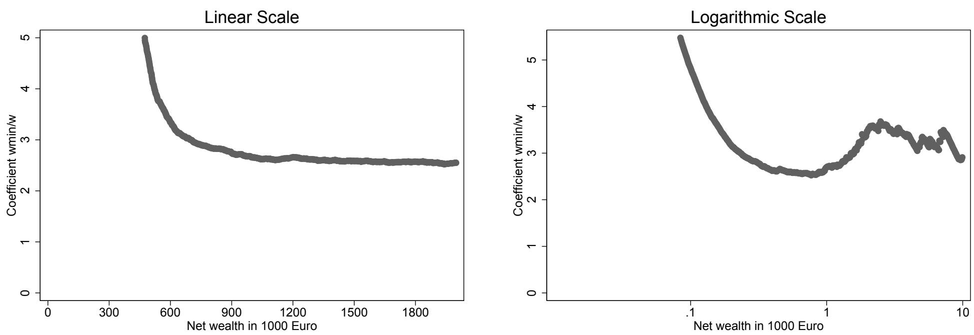
Data source: HFCS (second wave), 1. Implicate, own calculations

Figure 3: Ratio mean wealth above w, divided by w, w_m/w, France- First wave



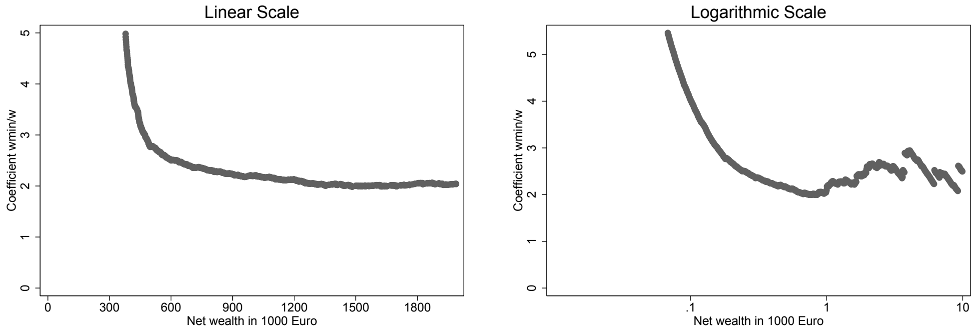
Data source: HFCS (first wave), 1. Implicate, own calculations

Figure 4: Ratio mean wealth above w, divided by w, w_m/w, France- Second wave



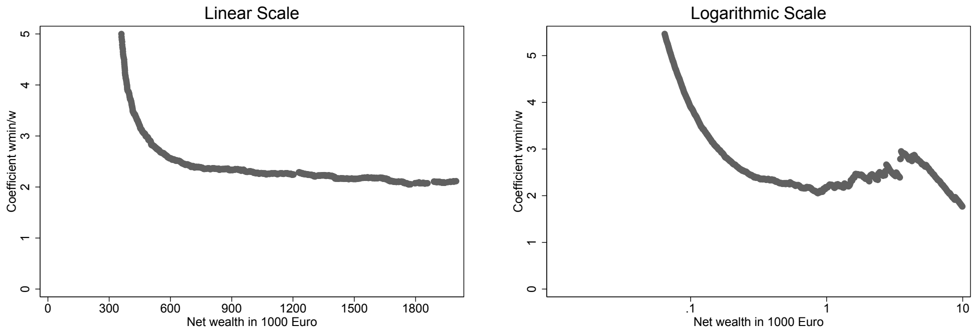
Data source: HFCS (second wave), 1. Implicate, own calculations

Figure 5: Ratio mean wealth above w, divided by w, w_m/w, Spain- First wave



Data source: HFCS (first wave), 1. Implicate, own calculations

Figure 6: Ratio mean wealth above w, divided by w, w_m/w, Spain- Second wave



Data source: HFCS (second wave), 1. Implicate, own calculations

Table 3: Estimated α-coefficients for different subsamples, Germany

W_{min} (in Euro)	Excluding the rich list		Including the rich list			
			Manager magazin top300	Manager magazin top200	Manager magazin top100	Forbes
	α_{pml}	α_{reg}	α_{reg}	α_{reg}	α_{reg}	α_{reg}
			First wave			
0.5 million	1.610	1.559	1.424	1.418	1.428	1.438
	(0.019)	(0.120)	(0.012)	(0.012)	(0.014)	(0.018)
1 million	1.442	1.506	1.399	1.391	1.400	1.406
	(0.053)	(0.214)	(0.018)	(0.018)	(0.018)	(0.019)
2 million	1.451	1.606	1.387	1.379	1.389	1.396
	(0.063)	(0.375)	(0.034)	(0.033)	(0.031)	(0.029)
			Second wave			
0.5 million	1.510	1.498	1.399	1.391	1.390	1.382
	(0.014)	(0.094)	(0.008)	(0.009)	(0.013)	(0.014)
1 million	1.399	1.470	1.379	1.369	1.365	1.354
	(0.029)	(0.162)	(0.014)	(0.014)	(0.015)	(0.015)
2 million	1.640	1.663	1.389	1.379	1.373	1.361
	(0.065)	(0.311)	(0.030)	(0.029)	(0.027)	(0.027)

Note: Robust standard errors are reported in brackets.

α_{pml} refers to the Pseudo-ML estimate and α_{reg} to the estimate based on OLS.

Source: HFCS, Manager magazin (2011, 2014) and Forbes (2011, 2014) own calculations.

Table 4: Estimated α-coefficients for different subsamples, France

W_{min} (in Euro)	Excluding the rich list		Including the rich list			
			Challenges top300	Challenges top200	Challenges top100	Forbes
	α_{pml}	α_{reg}	α_{reg}	α_{reg}	α_{reg}	α_{reg}
			First wave			
0.5 million	1.755	1.803	1.620	1.606	1.609	1.753
	(0.011)	(0.047)	(0.011)	(0.015)	(0.020)	(0.039)
1 million	1.842	1.805	1.565	1.539	1.523	1.701
	(0.027)	(0.072)	(0.013)	(0.014)	(0.069)	(0.049)
2 million	1.657	1.651	1.478	1.442	1.406	1.533
	(0.033)	(0.121)	(0.017)	(0.017)	(0.018)	(0.055)
			Second wave			
0.5 million	1.681	1.683	1.616	1.694	1.677	1.651
	-	(0.087)	(0.040)	(0.052)	(0.062)	(0.069)
1 million	1.794	1.655	1.577	1.687	1.656	1.606
	-	(0.140)	(0.044)	(0.061)	(0.078)	(0.093)
2 million	1.376	1.352	1.458	1.583	1.516	1.408
	-	(0.209)	(0.033)	(0.052)	(0.073)	(0.095)

Note: Robust standard errors are reported in brackets.

α_{pml} refers to the Pseudo-ML estimate and α_{reg} to the estimate based on OLS.

Source: HFCS, Challenges (2010, 2015) and Forbes (2010, 2015) own calculations.

Table 5: Estimated α-coefficients for different subsamples, Spain

W_{min} (in Euro)	Excluding the rich list		Including the rich list: El Mundo	Including the rich list: Forbes
	α_{pml}	α_{reg}	α_{reg}	α_{reg}
First wave				
0.5 million	1.849	1.879	1.663	1.838
	(0.044)	(0.070)	(0.033)	(0.058)
1 million	2.059	1.856	1.570	1.790
	(0.087)	(0.082)	(0.039)	(0.067)
2 million	1.718	1.672	1.419	1.623
	(0.143)	(0.091)	(0.040)	(0.071)
Second wave				
0.5 million	1.766	1.789	1.636	1.744
	(0.031)	(0.071)	(0.033)	(0.059)
1 million	1.903	1.794	1.586	1.718
	(0.059)	(0.072)	(0.031)	(0.058)
2 million	1.712	1.695	1.482	1.603
	(0.173)	(0.076)	(0.031)	(0.058)

Note: Robust standard errors are reported in brackets.
α_{pml} refers to the Pseudo-ML estimate and α_{reg} to the estimate based on OLS.
Source: HFCS, El mundo (2009, 2012) and Forbes (2009, 2012), own calculations.

at the top.[12] This finding holds true, in particular for w_{min} of 0.5 million and 1 million if we use only the HFCS data. However, Table 3 points out that including the rich list leads to a decrease of the α coefficient and, therefore, to an increase in concentration. Moreover, the table shows that the estimated coefficients are very robust over the different specifications of the rich lists.

Table 4 depicts the estimated α coefficients corresponding to the first and second wave for France. Comparing the estimates across both waves, in the specification that relies only on the original HFCS, we observe an increase in the wealth concentration (e.g. for w_{min} of 0.5 million, the estimated α_{reg} decreases from 1.803 in the first wave to 1.744 in the second wave). The choice of the rich list's length, i.e. the top 100, top 200 or top 300, seems not to strongly affect the estimated α. However, the results using the *Forbes* list differ substantially from these estimates. This difference disappears in the second wave. A reason for this result may be that the number of French persons on the *Forbes* list increased from 11 to 47. The development of the wealth concentration seems to follow no clear pattern. While there is a decrease of α in the "*Challenges* Top

[12]Based on tabulated data from the French wealth tax assessment of 1995, Zucman (2008) estimates α-coefficients of 1.7 to 2.0 depending on the wealth strata or cut-off point respectively. For Spain, we find similar estimations based on tax files.

300" list and in the "*Forbes*" list, the concentration seems to be very stable over time if "*Challenges* top 300" or "*Challenges* top 200" are used (with w_{min} 1 million or 2 million Euro).

The estimates for Spain in Table 5 depict an interesting pattern as they vary strongly over the rich list specifications but are quite robust over time using the *el Mundo* list. However, there is a substantial change when using the *Forbes* list. For instance the α_{reg} with w_{min} of 0.5 millions amounts to 1.838 in the first and 1.744 in the second waves. The finding from the *el Mundo* would indicate that the wealth concentration has barely changed, but this contradicts the presumption that the wealth concentration would have decreased in Spain from the first to the second wave due to the economic crisis. It seems reasonable to assume that in wealthy households were particularly affected by a devaluation of their real estate.

Figure 13 - Figure 18, in the Appendix, illustrate the wealth distribution of the top tail for Germany, France and Spain, distinguished by the type of rich list and the specific cut-off points w_{min}. Following the literature, we present the complementary cumulative distribution function (ccdf, equation 1), both the empirical distribution, and the estimated Pareto distribution. We show the tail distribution for the HFCS and the rich lists, where the first row augments the survey data with the top 300 richest households of the corresponding national rich lists, the second row with the top 200 richest households of the national rich lists, and the third row with the national entries on the *Forbes World's Billionaires* list. The first column shows the tail distribution for a lower bound for household wealth of 500,000 Euros, the second for w_{min} of 1 million Euros, and the third column for w_{min} of 2 million Euros. In addition, all graphs contain the estimated relationship on the log-log scale based on different samples (HFCS only and HFCS jointly with the rich list).

By comparing the plots for the top 300, top 200, and the *Forbes* rich list, we observe that the top 200 provides a good fit to the Pareto lines for Germany and France, including HFCS and the national rich list. Therefore, we choose the top 200 households of the corresponding rich lists for Germany and France as baseline specification. At this point, we face a trade-off between efficiency and precision as including more households from the national rich list would increase the risk of the "heaping effect" and the wealth information becomes less reliable. At the same time, we aim to use as much information from the rich list as possible and, thusly, prefer the top 200 over the top 100 rich list. For Spain, we rely on the entire national rich list.

3.3 Imputation of the missing rich households

This section describes how we impute the missing rich households in the HFCS. For Germany, Figure 13 and 14 show a large gap between the richest household in the HFCS and the poorest household in the corresponding rich lists. In France and Spain, this gap is substantially smaller as illustrated by Figures 15 - 18. This suggests that the top tail is better represented in France and in Spain than in Germany. To fill the gap (pictured by the orange line) we impute "synthetic households". Therefore, we generate observations according to the Pareto density function of the respective α_{reg}.

Furthermore, Figure 13 - Figure 18 show that HFCS observations with high wealth tend to deviate more strongly from the Pareto line, in particular for Germany and Spain. Obviously, high levels of household wealth are more prone to sampling error and selectivity due to non-response. Therefore, we impute values starting from w_{min}. This implies the assumption that the Pareto distribution holds at this point. Hence, we expect the information from the synthetic households to be more reliable. However, at the end of the top tail distribution we use the data from the respective rich list as we believe that these wealth rankings are the best approximation for the very top.

Next, we calculate the complementary cumulative distribution function (ccdf) of the Pareto distribution, based on the chosen parameters with w_{min} of 500,000 Euros and α of 1.42 for Germany in the first and in the second wave 1.39.[13] In France we base the estimation on the α coefficient of 1.62 and 1.69.[14] For the Spanish estimation we base our analysis on α of 1.66 in the first wave and 1.64 in the second wave.[15] The imputed households are weighted such that they match the total sum of household weights in the HFCS with wealth higher than the mentioned threshold and lower than net wealth from the respective rich lists. We restrict the range of imputed households to values from this threshold to the poorest household from the national rich list. The joint tail wealth distributions for the three countries are plotted in Figure 7 - Figure 12 in the Appendix. Note that the steeper the Pareto line the lower is the wealth concentration.

[13] The values given in table 3 represent the average over the 5 implicates. The values vary between 1.416 and 1.419 in the first wave and between 1.389 and 1.393 in the second wave.

[14] The values given in the upper part of table 4 represent the average over the 5 implicates. The values vary between 1.602 and 1.610 in the first wave. In the second wave, there is only a single imputation in France.

[15] The values given in table 5 represent the average over the 5 implicates. The values vary between 1.654 and 1.668 in the first wave and between 1.616 and 1.651 in the second wave.

4 Results: Impact of correcting for the missing top wealth on the wealth distribution

In this section, we analyze the impact of correcting for the missing rich on the wealth distribution. In doing so, we rely on the integrated data sets, which contain the households from the HFCS, from the imputation, and from the corresponding national rich lists.

Table 6 and 7 show the German household net wealth distribution before and after the top wealth imputation in the first and second wave. The left part covers the distribution that is based on the original HFCS, while the right part shows the adjusted household net wealth distribution, consisting of the HFCS, the imputed households and those that represent the wealth ranking of *manager magazin*. The lower panel provides summary inequality measures of household net wealth. The given values represent the average over the estimations of the 5 implicates. The confidence intervals capture the variability due to the multiple imputation.

Focusing on the left part, household net wealth distribution exhibits a large concentration of wealth in the top decile. While the poorest 50 percent of all households in Germany in the first wave hold 2.8 percent of total net wealth, the share of the richest 10 percent is almost 60 percent. The share of the richest ten percent, however, increases by 0.6 percentage points. Among them, the richest 1 percent of all households owns about 24.3 percent of total wealth in the first and 23.6 in the second wave, based on the original HFCS.

After adjusting the net wealth distribution for the missing rich, the total household net wealth increases by more than 700 billion Euros to 8,504 billion Euros (+10 percent) in the first wave. This adjustment substantially increases wealth concentration. The share of household net wealth, held by the top decile, increases by more than 3 percentage points to 62.8 percent, while the share of the richest 1 percent climbs up by almost 8 percentage points to 31 percent. The wealth share of the top 0.1 percent increases most strongly from 4 to 16 percent since the imputation mainly affects this wealth quantile.

In the second wave, the pattern is not changing much. The total household net wealth even increases by nearly 1 000 billion Euros, a rise of 11 percent. Hence, the share of the net wealth attributed to the 10th decile raises by 4 percentage points to almost 64 percent. After imputation, the share held by the richest percent increases from 23.6 to 33.1 percent. The share of the top 0.1 percent increases by more than 11 percentage points after including the imputed households. Thus, compared to the first wave, wealth in-

Table 6: The distribution of household net wealth in Germany, first wave of the HFCS (2010/2011)

Fractiles household net wealth	Database HFCS			Database HFCS including imputed top wealth distribution		
	Percentile 1000 Euro	Total bill. Euro	%	Percentile 1000 Euro	Total bill. Euro	%
1st - 5th decile	\	217 [213 - 222]	2.8	\	217 [213 - 222]	2.6
6th decile	51	290 [287 - 293]	3.7	51	290 [287 - 293]	3.4
7th decile	97	495 [491 - 498]	6.4	97	495 [491 - 498]	5.8
8th decile	163	837 [829 - 845]	10.8	163	837 [829 - 845]	9.8
9th decile	261	1 322 [1 313 - 1 332]	17.1	261	1 322 [1 313 - 1 332]	15.6
10th decile	442	4 582 [4 540 - 4 623]	59.2	442	5 343 [5 325 - 5 361]	62.8
Total	\	7 743 [7 702 - 7 784]	100.0	\	8 504 [8 476 - 8 532]	100.0
Top 5%	660	2 614 [2 063 - 3 166]	33.8	600	4 305 [4 280 - 4 329]	50.6
Top 1%	1 923	1 882 [1 839 - 1 925]	24.3	2 000	2 668 [2 656 - 2 679]	31.4
Top 0.1%	13 503	306 [299 - 312]	3.9	10 160	1 367 [1 365 - 1 369]	16.1
Gini coefficient		0.7483			0.7712	
Entropy meas.[a)]						
GE(1)		1.3020			1.7787	
GE(2)		5.6902			311.40	

Note: a) GE(1) is the Theil index, and GE(2) is half of the square of the coefficient of variation.
Source: HFCS (First wave), Manager magazin (2011), own calculations.

equality increases substantially in Germany. While the poorer half of the distribution decreases its overall net wealth, the top decile of the distribution increases its wealth by nearly one trillion Euros.

The considerable increase in wealth concentration due to the adjustment of the household net wealth distribution is also reflected in standard inequality measures. The Gini Coefficient and the entropy measurements increase in the first and in the second wave to 77 percent and 78 percent, respectively. In the calculation of the Gini coefficient, we set negative or zero net wealth to one Euro; however, smaller positive values do not affect the results.[16] The GE(2) measure, which strongly responds to changes at the top of the distribution, skyrockets.

Table 8 and Table 9 provide the corresponding French household net wealth distribution for both waves of the HFCS. Again, the left part covers the distribution that is based on the original HFCS, while the right part shows the adjusted household net wealth distribution, consisting of HFCS households, imputed households and entries

[16] In Germany, the share of households holding zero or negative net wealth is 5 percent in the first wave and 6 percent in the second wave (in France: 3 percent in the first and 2 percent in the second wave; in Spain: 2 percent in the first and second waves).

Table 7: The distribution of household net wealth in Germany, second wave of the HFCS (2014)

Fractiles household net wealth	Database HFCS				Database HFCS including imputed top wealth distribution			
	Percentile 1000 Euro	Total bill. Euro	CI	%	Percentile 1000 Euro	Total bill. Euro	CI	%
1st - 5th decile	\	214	[209 - 219]	2.5	\	214	[209 - 219]	2.3
6th decile	61	335	[333 - 337]	3.9	61	335	[333 - 337]	3.5
7th decile	112	557	[548 - 566]	6.5	112	557	[548 - 566]	5.9
8th decile	175	893	[886 - 901]	10.5	175	893	[886 - 901]	9.4
9th decile	274	1 422	[1 408 - 1 435]	16.7	274	1 422	[1 408 - 1 435]	15.0
10th decile	469	5 080	[5 041 - 5 118]	59.8	469	6 037	[6 002 - 6 073]	63.8
Total	\	8 500	[8 471 - 8 529]	100.0	\	9 458	[9 425 - 9 490]	100.0
Top 5%	730	2 675	[1 988 - 3 362]	31.5	700	4 831	[4 790 - 4 871]	51.1
Top 1%	2 320	2 010	[1 993 - 2 027]	23.6	2 220	3 134	[3 114 - 3 154]	33.1
Top 0.1%	8 864	531	[527 - 536]	6.3	11 720	1 647	[1 643 - 1 651]	17.4
Gini coefficient		0.7514				0.778		
Entropy meas.[a)]								
GE(1)		1.3009				1.882		
GE(2)		5.3361				374.432		

Note: a) GE(1) is the Theil index, and GE(2) is half of the square of the coefficient of variation.
Source: HFCS (Second wave), Manager magazin (2014), own calculations.

Table 8: The distribution of household net wealth in France, first wave of the HFCS (2009/2010)

Fractiles household net wealth	Database HFCS			Database HFCS including imputed top wealth distribution		
	Percentile 1000 Euro	Total bill. Euro	%	Percentile 1000 Euro	Total bill. Euro	%
1st - 5th decile	\	352	5.4	\	352	5.2
		[350 - 353]			[350 - 353]	
6th decile	116	406	6.2	116	406	6.0
		[404 - 407]			[404 - 407]	
7th decile	175	578	8.9	175	578	8.6
		[575 - 580]			[575 - 580]	
8th decile	237	780	12.0	237	780	11.6
		[778 - 781]			[778 - 781]	
9th decile	329	1 139	17.5	329	1 484	22.0
		[1 135 - 1 142]			[1 479 - 1 488]	
10th decile	512	3 249	50.0	500	3 162	46.8
		[3 226 - 3 272]			[3 150 - 3 174]	
Total	\	6 503	100.0	\	6 760	100.0
		[6 486 - 6 519]			[6 750 - 6 770]	
Top 5%	775	2 375	36.5	700	2 634	39.0
		[2 353 - 2 397]			[2 623 - 2 645]	
Top 1%	1 782	1 166	17.9	1 900	1 519	22.5
		[1 144 - 1 188]			[1 511 - 1 528]	
Top 0.1%	6 959	458	7.0	7 960	713	10.6
		[441 - 475]			[711 - 716]	
Gini coefficient		0.6750			0.6909	
Entropy meas.[a)]						
GE(1)		1.0222			1.3081	
GE(2)		6.4715			482.33	

Note: a) GE(1) is the Theil index, and GE(2) is half of the square of the coefficient of variation.
Source: HFCS (First wave), Challenges (2010), own calculations.

Table 9: The distribution of household net wealth in France, second wave of the HFCS (2014/2015)

Fractiles household net wealth	Database HFCS			Database HFCS including imputed top wealth distribution		
	Percentile 1000 Euro	Total bill. Euro	%	Percentile 1000 Euro	Total bill. Euro	%
1st - 5th decile	\	443	6.3	\	443	6.1
6th decile	113	412	5.9	113	412	5.7
7th decile	170	586	8.3	170	586	8.2
8th decile	236	810	11.5	236	810	11.3
9th decile	332	1 214	17.3	332	1 483	20.6
10th decile	536	3 569	50.7	500	3 478	48.2
Total		7 033	100.0		7 211	100.0
Top 5%	812	2 629	37.4	700	2 891	40.0
Top 1%	1 814	1 315	18.7	2 000	1 600	22.2
Top 0.1%	7 651	514	7.3	8 400	722	10.0
Gini coefficient		0.6735			0.6841	
Entropy meas.[a)]						
GE(1)		1.0177			1.4310	
GE(2)		5.4835			1216.82	

Note: a) GE(1) is the Theil index, and GE(2) is half of the square of the coefficient of variation.
Source: HFCS (Second wave), Challenges (2015), own calculations.

from the *Challenges* rich list. First, we consider the wealth distribution based on the original HFCS (left panel). Both waves reveal a substantial wealth concentration, however somewhat lower than in Germany. While households below the median hold 5.4 percent in the first wave and 6.3 percent in the second wave, the corresponding share of the top decile is about 50 percent in both waves. The richest 1 percent of all households owns about 18 percent in the first and 19 percent in the second wave.

Adjusting the French household net wealth distribution for the missing rich increases total wealth moderately, compared to Germany, by 228 billion (+3.5 percent) to 6,760 billion Euros in the first wave. A very similar pattern is observable in the second wave, where the top tail imputation increases total wealth by 178 billion (+ 2.5 percent) to 7,211 billion Euros.

The share of total net wealth held by the top 1 percent increases by 4 percentage points to 22 percent of total household net wealth in the first wave and by nearly 3 percentage points to 22 percent in the second wave. It should be noted, however, that the wealth share of the richest decile declines due to the imputation. This result may appear odd at first glance and is due to w_{min}. As mentioned above, we impute wealth from 0.5 billion to the rich list. This is below the 90^{th} percentile in France. Moreover, the response rate is rather high (see table 1) and so is the impact of households in the HFCS with wealth above 0.5 billion (see figure 15 and figure 16). By imputing these values, we make the distribution more equal than it is actually. Since the data quality on the top of the distribution is comparatively good, the impact of the imputation is more powerful than e.g. in Germany. The Gini coefficient for France rises as a result of the top tail imputation, from 0.68 to 0.69 in the first wave and from 0.67 to 0.68 in the second wave, reflecting France's substantially lower inequality.

The results for Spain are provided in tables 10 and 11.[17] The poorest 50 percent of the net wealth distribution own 13.0 percent and 12.0 percent of total net wealth in the first and second waves, respectively. The richest decile, however, holds 2 152 billion Euros (43.4 percent) in the first and 2 173 billion Euros (45.6 percent) in the second wave. The richest 1 percent of the households owns 14.9 percent in the first wave, and 16.3 percent in the second wave. Contrary to our findings in section 3.2, this finding corresponds to our assumption concerning the economic crisis that took place in Spain between the first and the second wave in Spain. Due to the crisis the value of business assets and real estates decreased, thus resulting in a reduction of overall wealth.

After including the imputed households, the total amount of net wealth increases by

[17] Azpitarte (2010) analyzes the Spanish household net wealth distribution based on the Spanish Survey of Household Finances (EFF) 2002 and finds a similar distribution for 2002.

Table 10: The distribution of household net wealth in Spain, First wave (2008/2009)

Fractiles household net wealth	Database HFCS			Database HFCS including imputed top wealth distribution		
	Percentile 1000 Euro	Total bill. Euro	%	Percentile 1000 Euro	Total bill. Euro	%
1st - 5th decile	\	643 [638 - 647]	13.0	\	643 [643 - 647]	12.4
6th decile	183	346 [344 - 347]	7.0	183	346 [344 - 347]	6.7
7th decile	228	437 [434 - 440]	8.8	228	437 [434 - 440]	8.4
8th decile	289	568 [564 - 572]	11.5	289	568 [564 - 572]	11.0
9th decile	387	813 [808 - 818]	16.4	387	807 [801 - 812]	15.6
10th decile	608	2 152 [2 123 - 2 182]	43.4	500	2 375 [2 354 - 2 395]	45.9
Total	\	4 958 [4 920 - 4 996]	100.0	\	5 174 [5 149 - 5 199]	100.0
		[1 846 - 1 900]			[2 117 - 2 154]	
Top 5%	879	1 532 [1 095 - 1 120]	30.9	800	1 802 [1 379 - 1 425]	34.8
Top 1%	1 857	737 [560 - 566]	14.9	2 180	992 [768 - 786]	19.2
Top 0.1%	7 453	295 [293 - 298]	6.0	8 670	452 [448 - 457]	8.7
Gini coefficient		0.5752			0.5955	
Entropy meas.[a)]						
GE(1)		0.7563			0.9805	
GE(2)		8.2173			155.8989	

Note: a) GE(1) is the Theil index, and GE(2) is half of the square of the coefficient of variation.

Source: HFCS (First wave), El mundo (2009), own calculations.

Table 11: The distribution of household net wealth in Spain, Second wave (2011/2012)

Fractiles household net wealth	Database HFCS			Database HFCS including imputed top wealth distribution		
	Percentile 1000 Euro	Total bill. Euro	%	Percentile 1000 Euro	Total bill. Euro	%
1st - 5th decile	\	574 [570 - 579]	12.0	\	574 [570 - 579]	11.7
6th decile	160	316 [314 - 317]	6.6	160	316 [314 - 317]	6.4
7th decile	205	406 [405 - 408]	8.5	205	406 [405 - 408]	8.3
8th decile	265	539 [536 - 542]	11.3	265	539 [536 - 542]	11.0
9th decile	359	760 [756 - 764]	15.9	359	885 [880 - 890]	18.1
10th decile	542	2 173 [2 127 - 2 220]	45.6	500	2 180 [2 155 - 2 205]	44.5
Total	\	4 768 [4 876 - 4 905]	100.0	\	4 900 [4 868 - 4 917]	100.0
Top 5%	864	1 586 [1 539 - 1 633]	33.3	800	1 673 [1 646 - 1 700]	34.1
Top 1%	1 860	779 [741 - 816]	16.3	2 020	984 [970 - 999]	20.1
Top 0.1%	9 808	307 [302 - 312]	6.4	8 320	451 [442 - 460]	9.2
Gini coefficient		0.5939			0.6071	
Entropy meas.[a)]						
GE(1)		0.8000			1.0450	
GE(2)		3.7360			617.79	

Note: a) GE(1) is the Theil index, and GE(2) is half of the square of the coefficient of variation.
Source: HFCS (First wave), El mundo (2012), own calculations.

4.3 percent (+216 billion Euros) in the first and 2.7 percent (+ 132 billion Euros) in the second wave. Hence, including the imputed households also has a relatively low impact in Spain compared to the German distribution. However, this finding does not hold true for the upper part of the distribution. Adjusting the Spanish household net wealth distribution leads to an increase of the top 1 percent of more than 4 percentage points in the first and 3.7 percentage points in the second wave.

Comparing the inequality measures calculated on the basis of the original HFCS with those that are based on the adjusted data reflects again the greater wealth concentration. The Gini coefficient for instance increases by 0.02 points due to the data adjustment in the first wave and by 0.01 in the second wave. When we compare it across both waves using the original HFCS, the results suggest that wealth concentration has increased between 2009 and 2012 in Spain, despite a slight drop in total wealth. However, overall inequality is notably lower than in France or Germany.

Next, we discuss the robustness of our results. Table 12 compares wealth shares in the respective countries, held by the top 5, 1 and 0.1 percent of households, based on the original HFCS and the adjusted data, respectively. Wealth shares are provided for different combinations of data sources and values of w_{min}. This comparison allows testing the sensitivity of wealth concentration to the choice of the data source and w_{min}.[18]

The results show that including external information from the national rich lists or the *Forbes* list increases the shares in all three countries. In all three countries, the choice of w_{min} has only a minor impact on the calculated shares. Further, our results indicate that the shares estimated with the national rich list and the *Forbes* list are very similar. This suggests that the findings are robust, independent of the kind of rich list.

Finally, as a check for the adjusted wealth distribution we compare our results with macroeconomic wealth data for the household sector from the national and financial accounts statistics (see Appendix). Based on the detailed items provided from the financial accounts we calculate a corrected net wealth aggregate by deducting items that are not recorded in the HFCS, i.e. currency, the value of non-life insurance technical reserves (in particular with private health insurance schemes), and pension entitlements. In the case of Germany, the adjusted households net wealth aggregate reported in national and financial accounts statistics of 7,969 billion Euros (2010) even falls short of our estimation for total personal net wealth of 8,504 billion Euros (including imputed top wealth) in the first wave. The gap between the aggregated data and the estimation nearly closes in the second wave (National and Financial accounts: 9,355; Estimation: 9,458). However, German financial accounts presumably underestimate unlisted corporate shares and other equity by at least 1,000 billion Euros since there is no reliable data on financial or tax accounts data of the *'German Mittelstand'* and many family-owned major enterprises. In contrast, the personal net wealth aggregate for France reported in national and financial accounts is much higher than our estimate (9,463 compared to 6,760 billion Euros, in the first wave, and 9,964 compared to 7,182 billion Euros, in the second wave). Likewise, in Spain the households net wealth aggregate in macroeconomic statistics considerably exceeds our estimates in both waves (First wave: 6,394 compared to 5,174 billion Euros; Second wave: 5,805 compared to 4,892 billion Euros). The remarkable underestimation of household net wealth in France and Spain compared to the respective aggregates from national and financial accounts might suggest a remaining under-representation of the top wealth inherent in our estimation. Yet, national and financial accounts of household wealth might be flawed by estimation risks, in particular with respect to non-financial assets, corporate shares in non-quoted firms, and financial assets abroad. This is also true for Germany. Thus, the differences between the national and financial accounts and results from household surveys should by analyzed in detail for the different components of household wealth and liabilities (Chakraborty and Waltl, 2017; Chakraborty et al., 2018).

[18] Tables 19 and 20 test the sensitivity of the estimated wealth concentration measured by the share of the richest 5 percent, by increasing w_{min} in 250,000 Euros steps up to 3.5 million Euros.

Table 12: Sensitivity of wealth concentration to sample choice and w_{min}

Country	HFCS wave	original HFCS	only wealthy HFCS households (0.5)	(1)	(2)	National rich list (0.5)	(1)	(2)	Forbes list (0.5)	(1)	(2)
			Net wealth share of top 5 percent								
Germany	1_{st}	45.6	44.1	46.7	46.1	50.6	50.3	50.3	50.3	50.5	50.7
	2_{nd}	46.3	45.1	48.4	47.5	51.1	52.1	53.3	51.2	52.2	52.9
France	1_{st}	36.5	31.9	35.4	36.5	39.3	40.6	39.5	33.8	37.2	38.0
	2_{nd}	38.3	36.9	38.0	41.6	39.6	40.4	40.5	39.6	40.4	41.3
Spain	1_{st}	30.9	27.2	30.3	30.8	34.8	35.7	34.3	28.6	31.4	331.4
	2_{nd}	33.3	31.1	32.6	30.8	34.1	36.8	36.0	32.8	34.1	31.4
			Net wealth share of top 1 percent								
Germany	1_{st}	24.3	25.0	26.5	25.0	31.4	31.2	30.9	31.1	31.5	31.4
	2_{nd}	23.6	27.2	28.1	25.7	33.1	32.9	33.7	33.1	33.2	33.4
France	1_{st}	17.9	16.5	16.6	17.9	22.8	23.0	21.8	18.3	18.8	19.9
	2_{nd}	20.2	19.2	19.6	24.2	22.8	22.6	22.8	22.5	22.2	23.8
Spain	1_{st}	14.9	13.7	13.9	14.7	19.2	19.9	19.1	19.2	19.9	19.1
	2_{nd}	16.3	15.1	15.4	14.7	20.1	20.4	19.7	20.1	17.3	15.5
			Net wealth share of top 0.1 percent								
Germany	1_{st}	3.9	11.0	12.2	10.5	16.1	16.3	16.2	16.4	17.0	16.9
	2_{nd}	6.3	12.6	13.4	10.6	17.4	17.6	17.7	17.3	17.6	17.6
France	1_{st}	7.0	6.0	6.0	7.1	10.5	10.9	10.9	7.4	7.8	9.0
	2_{nd}	8.1	7.7	7.9	12.8	12.0	11.8	12.2	10.5	10.8	12.7
Spain	1_{st}	6.4	5.6	5.7	5.8	9.1	9.4	9.5	9.1	9.4	9.5
	2_{nd}	6.4	5.6	5.7	5.8	9.2	9.5	9.6	9.2	7.1	6.5

Header structure: Sample; top tail estimation based on (only wealthy HFCS households, National rich list, Forbes list); w_{min} in million EUR: 0.5, 1, 2.

Note: The top tail estimation is based on OLS, as explained in section 3.

Source: HFCS (First and second wave), Manager magazin (2011), Challenges (2010), El mundo (2009), Forbes (2009, 2010, 2011), own calculations.

5 Summary and conclusion

In this study, we analyze the top tail of the wealth distribution and construct an integrated database for Germany, France, and Spain that better represents the top wealth concentration. We use the first and second wave of Eurosystem's Household Finance and Consumption Survey (HFCS). Since top wealth is likely to be underrepresented in household surveys, we integrate the big fortunes from rich lists provided by business media. We use the *Forbes* list of billionaires and national rich lists, in particular those from the German business periodical *manager magazin* (2011,2014), from the French magazine *Challenge* (2010,2015), and from the Spanish newspaper *el Mundo* (2009, 2012).

Following Vermeulen (2017), we combine the household survey data with the rich lists to jointly estimate a Pareto distribution for the top tail of wealth in both countries. After testing different minimum wealth thresholds of the Pareto distribution, namely 0.5, 1, and 2 million Euros, we set it to 0.5 million Euros. We mainly rely on national rich lists since they represent a broader base for the big fortunes. Moreover, we test different specifications of the national rich lists for Germany and France before choosing our preferred specification of the top 200 richest households.

Based on the preferred Pareto coefficients, we impute synthetic households representing the missing rich. We show the entire distribution of net wealth, both for the original HFCS sample and the top tail adjusted one. The results show that the wealth concentration is remarkably higher in Germany than in France or Spain. Further, we find that the missing rich in the HFCS have a large effect on the wealth concentration in Germany. The share of the top percentile in household wealth jumps up from 24 percent, based on the original HFCS, to 31 percent after the wealth imputation in the first and even from 24 to 33 percent in the second wave.

The share of the top 0.1 percent hikes up from 4 to 16 percent in the first wave and from 6 to 17 percent in the second wave. Wealth inequality, measured by the Gini coefficient, increases from 0.75 to 0.77 and from 0.75 to 0.78 in the first and the second wave, respectively. For France and Spain, we find smaller effects of the imputation of wealth in the top tail since rich households are better captured in the HFCS in these countries. The share of total net wealth held by the French top 1 percent increases by 4 percentage points to 22 percent in the first wave and by 3 percentage points to 22 percent in the second wave. In Spain, we observe a similar pattern. The top 1 percent wealth share increases in both waves of the HFCS by 4 percentage points due to the top tail imputation to 19 percent (first wave) and 20 percent (second wave), respectively.

The Gini coefficient increases slightly due to the top tail imputation in all estimations.

It has to be mentioned that the our findings should be interpreted with some caution. Uncertainty emerges from the estimation strategy of the top wealth concentration, which relies on the Pareto distribution, and from measurement errors in household wealth, in both the HFCS and the rich lists. Regarding the rich lists, its reliability is contentious and often debated in the public. We suppose that these wealth rankings rather under-report the very top wealth concentration with respect to some selectivity in favor of corporate wealth and against private wealth, such as real estate properties and financial portfolios. It is difficult to evaluate the self-assessed property valuations of the survey respondents or the valuations of properties collected in the rich lists. We have no evidence of systematic biases in this respect.

Actually, these issues indicate substantial need for research. Tax files from wealth and estate taxation or disclosed financial statements of large family-owned corporations, foundations, or trusts might be a source for further top wealth research. Sampling design, survey strategy, and field work of voluntary household surveys might be improved to better collect data from the wealthy strata of the population.

The data in our analysis refers to the period between 2008 and 2011, for the first wave, and to the period between 2011 and 2015, for the second wave of the HFCS. Historically low interest rates adversely affect fixed-income securities such as bank deposits, bonds, and pension plans, while increasing the market valuation of investments such as real estate, businesses, and corporate shares. As the latter dominate top wealth strata, the wealth distribution might have concentrated further, at least in Germany. Counter-factual microsimulation analyses could shed light on the distributional impact involved (Domanski et al., 2016). Moreover, our integrated database could be used for the analyses of redistribution policies, for instance wealth taxation [19] or programs to promote housing ownership and capital formation.

[19] Bach and Thiemann (2016b) rely on the integrated database to simulate the tax revenue of reviving the German recurrent net wealth tax. Not surprisingly, the results show that tax revenues are substantially higher if the integrated database is used instead of the original data of the HFCS. Moreover, based on the integrated database, Bach and Thiemann (2016a) simulate future estates and inheritances by static aging procedures and estimate future tax revenue and distribution of estate taxation scenarios.

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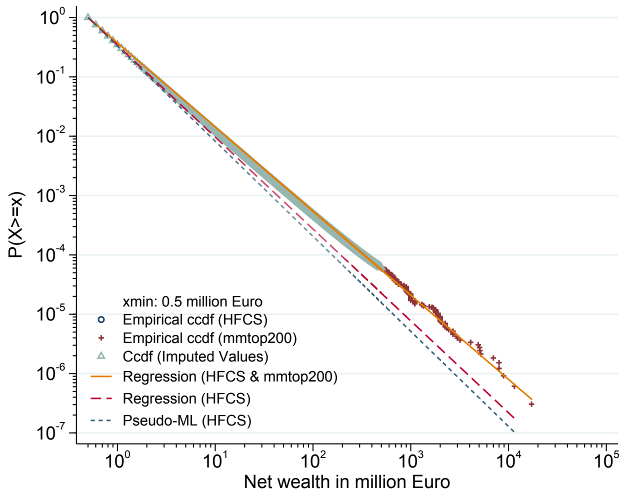
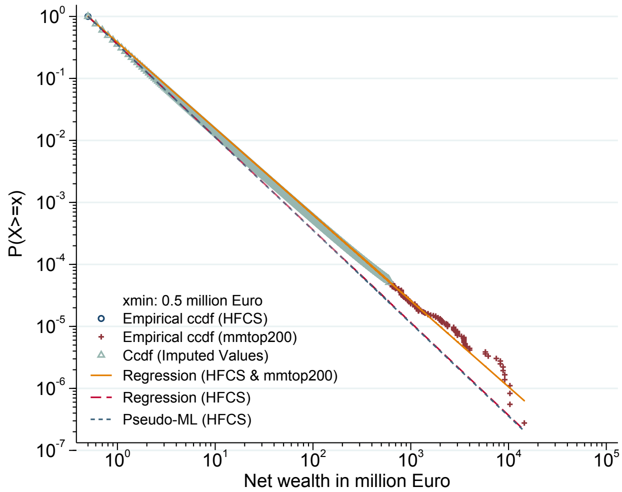
6 Appendix

Figure 7: Adjusted tail wealth distribution, Germany - first wave of the HFCS



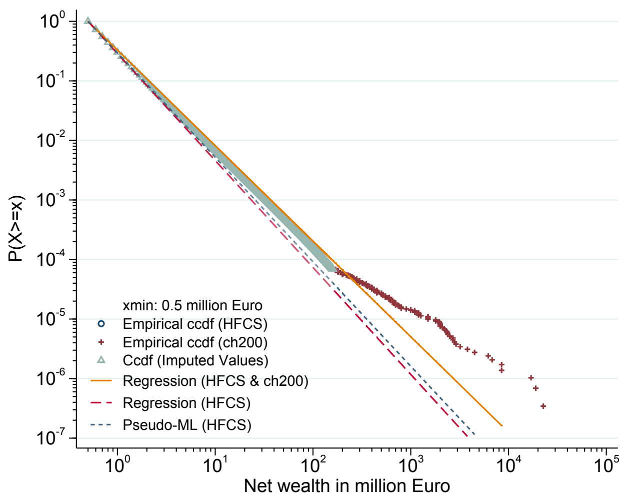
Data source: HFCS (first wave), Manager magazin (2011) and Forbes (2011); own calculations.

Figure 8: Adjusted tail wealth distribution, Germany - second wave of the HFCS



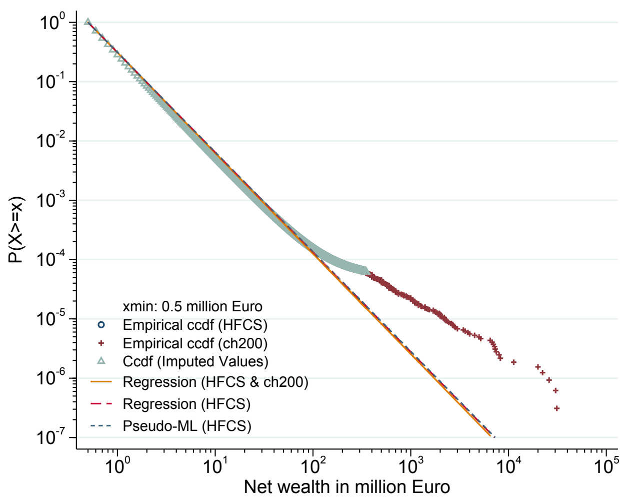
Data source: HFCS (second wave), Manager magazin (2014) and Forbes (2014); own calculations.

Figure 9: Adjusted tail wealth distribution, France - first wave of the HFCS



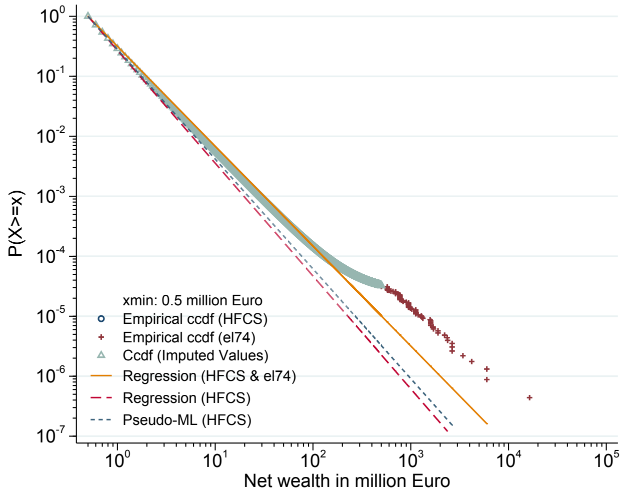
Data source: HFCS (first wave), Challenges (2010) and Forbes (2010); own calculations.

Figure 10: Adjusted tail wealth distribution, France - second wave of the HFCS



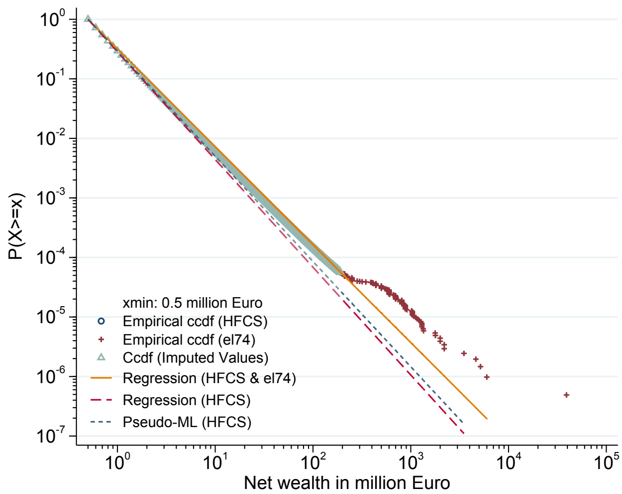
Data source: HFCS (second wave), Challenges (2015) and Forbes (2015); own calculations.

Figure 11: Adjusted tail wealth distribution, Spain - first wave of the HFCS



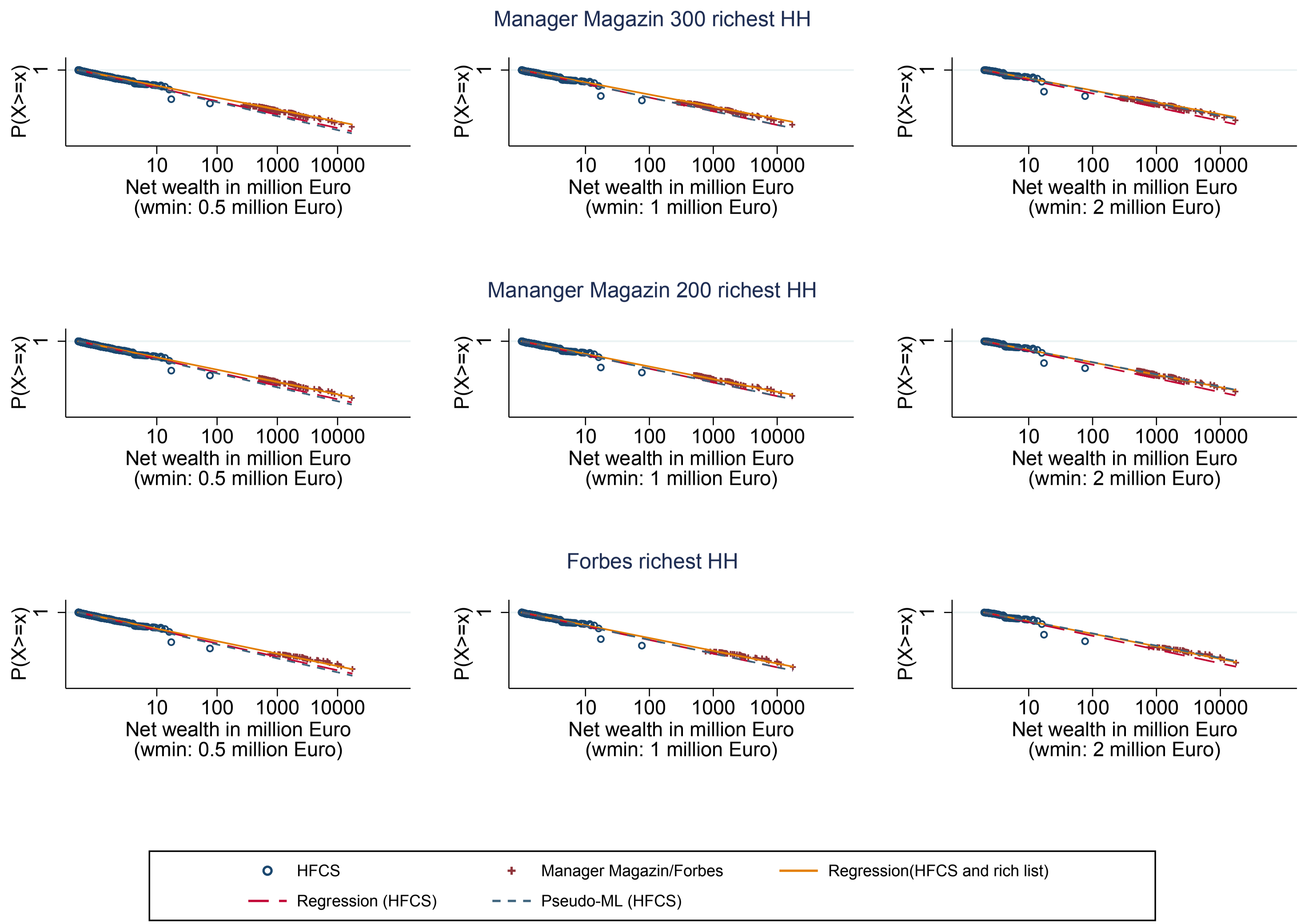
Data source: HFCS (first wave), El mundo (2009) and Forbes (2009); own calculations.

Figure 12: Adjusted tail wealth distribution, Spain - second wave of the HFCS



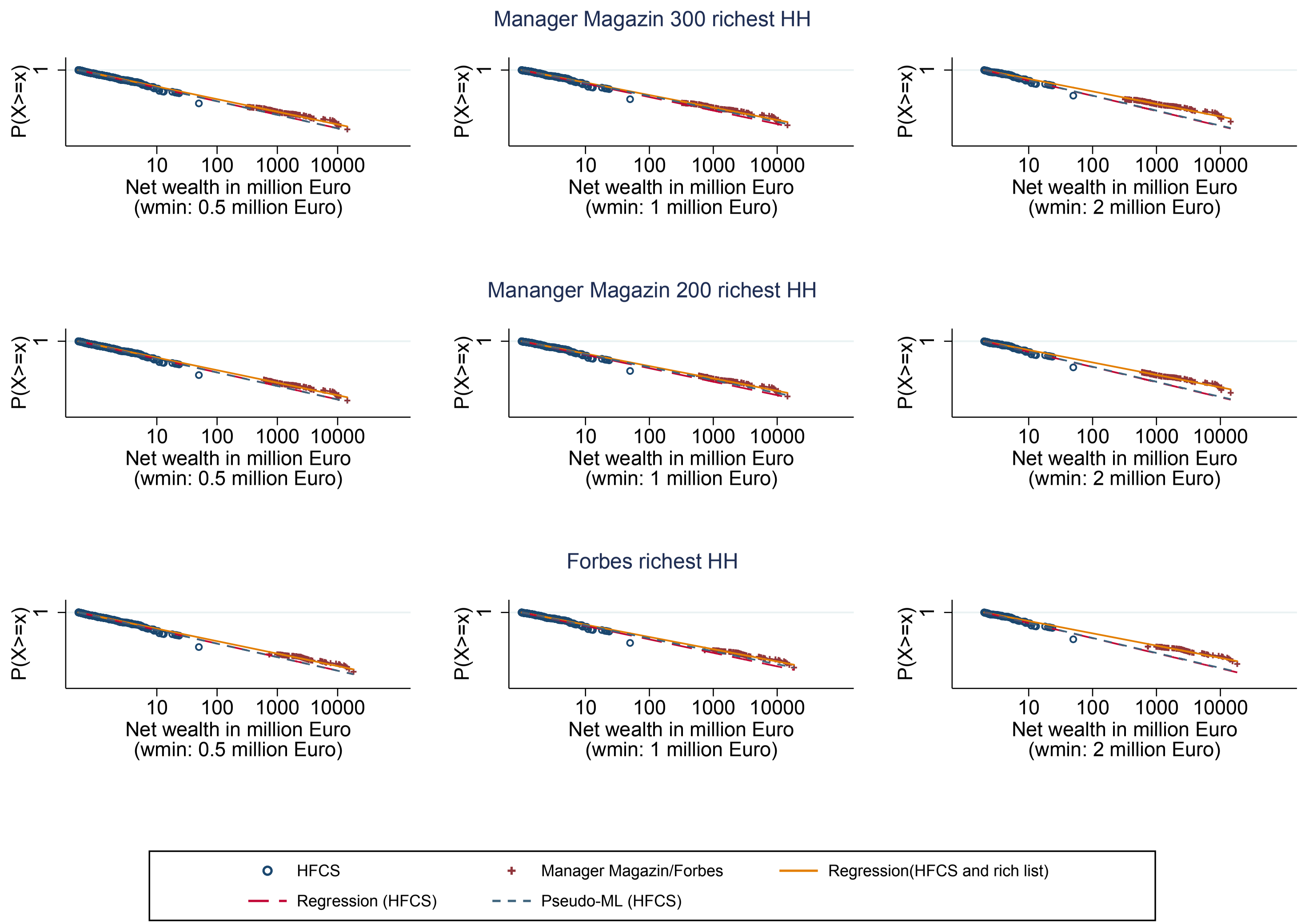
Data source: HFCS (second wave), El mundo (2012) and Forbes (2012); own calculations.

Figure 13: Tail wealth distribution by rich list and minimum wealth, Germany, first wave of the HFCS



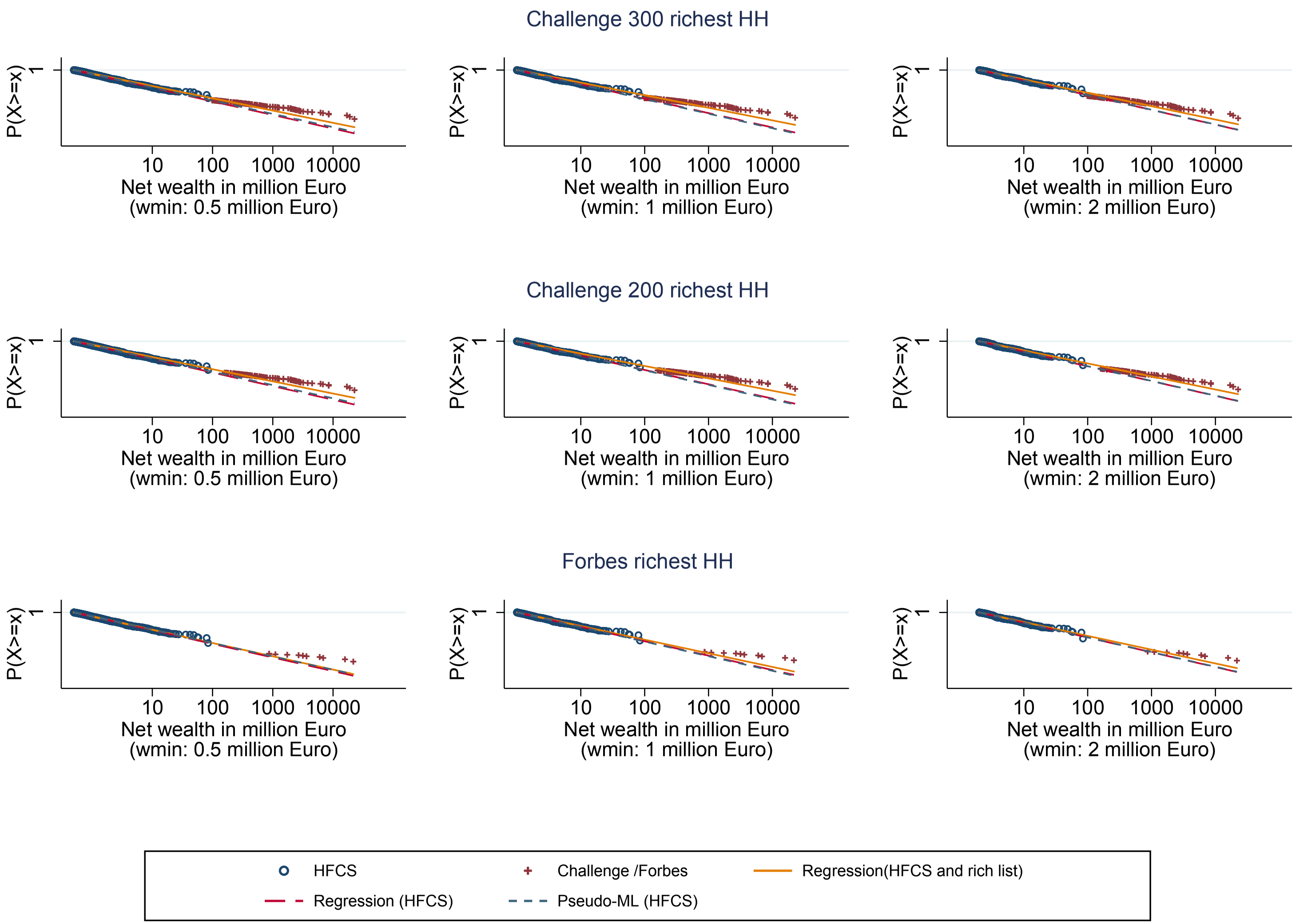
Data source: HFCS (first wave), Manager magazin (2011) and Forbes (2011); own calculations.

Figure 14: Tail wealth distribution by rich list and minimum wealth, Germany, second wave of the HFCS



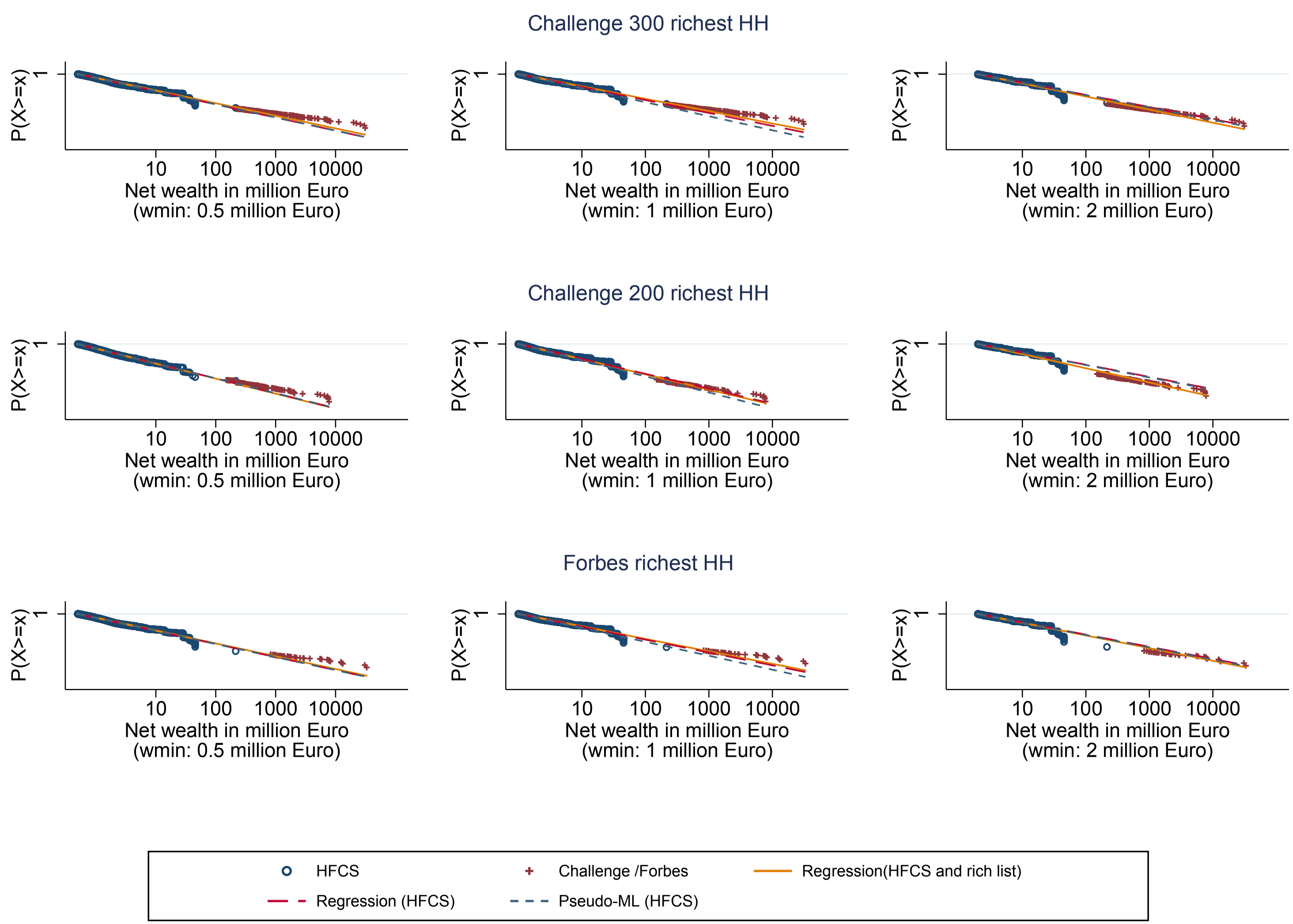
Data source: HFCS (second wave), Manager magazin (2014) and Forbes (2014); own calculations.

Figure 15: Tail wealth distribution by rich list and minimum wealth, France, first wave of the HFCS



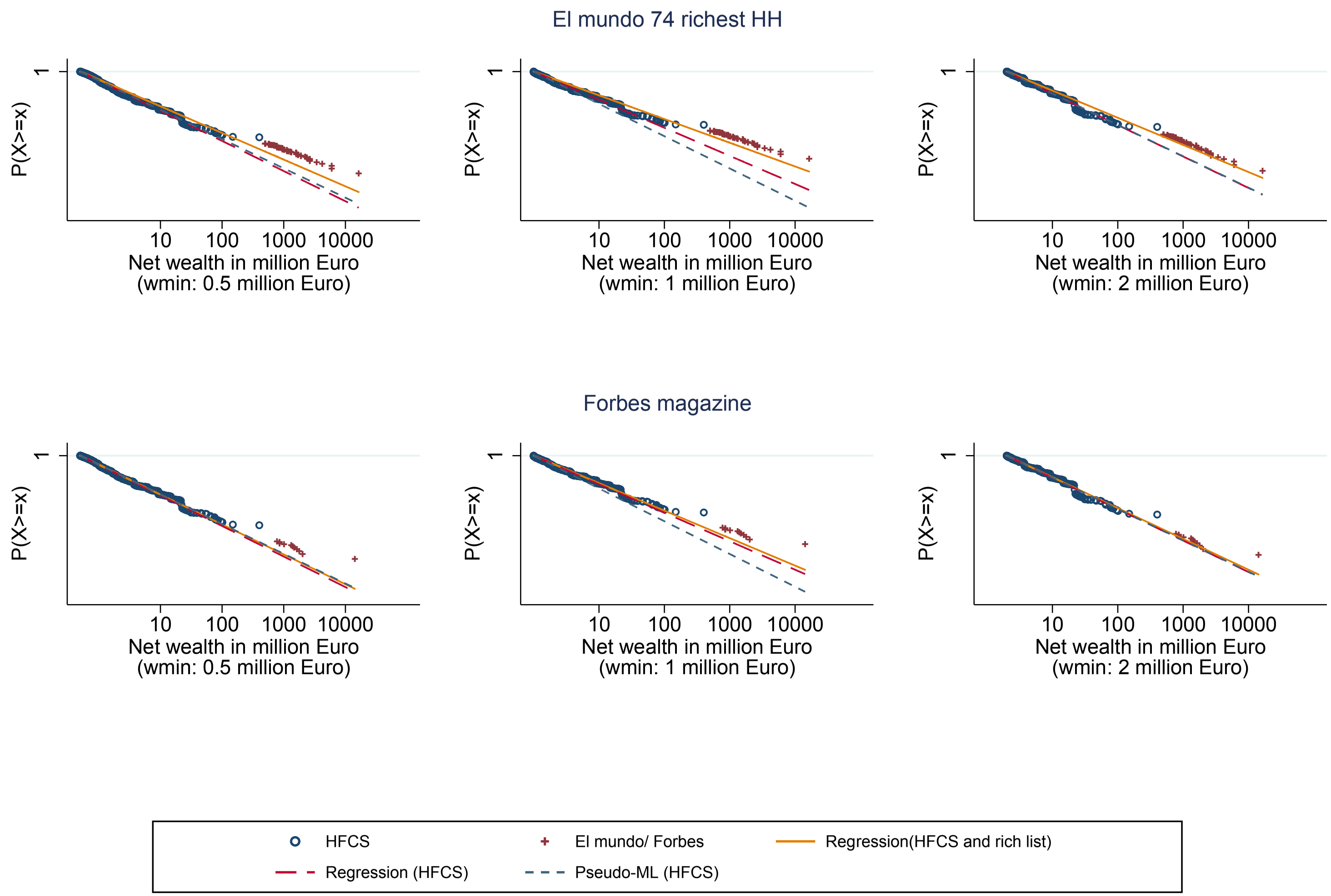
Data source: HFCS (first wave), Challenges (2010) and Forbes (2010); own calculations.

Figure 16: Tail wealth distribution by rich list and minimum wealth, France, second wave of the HFCS



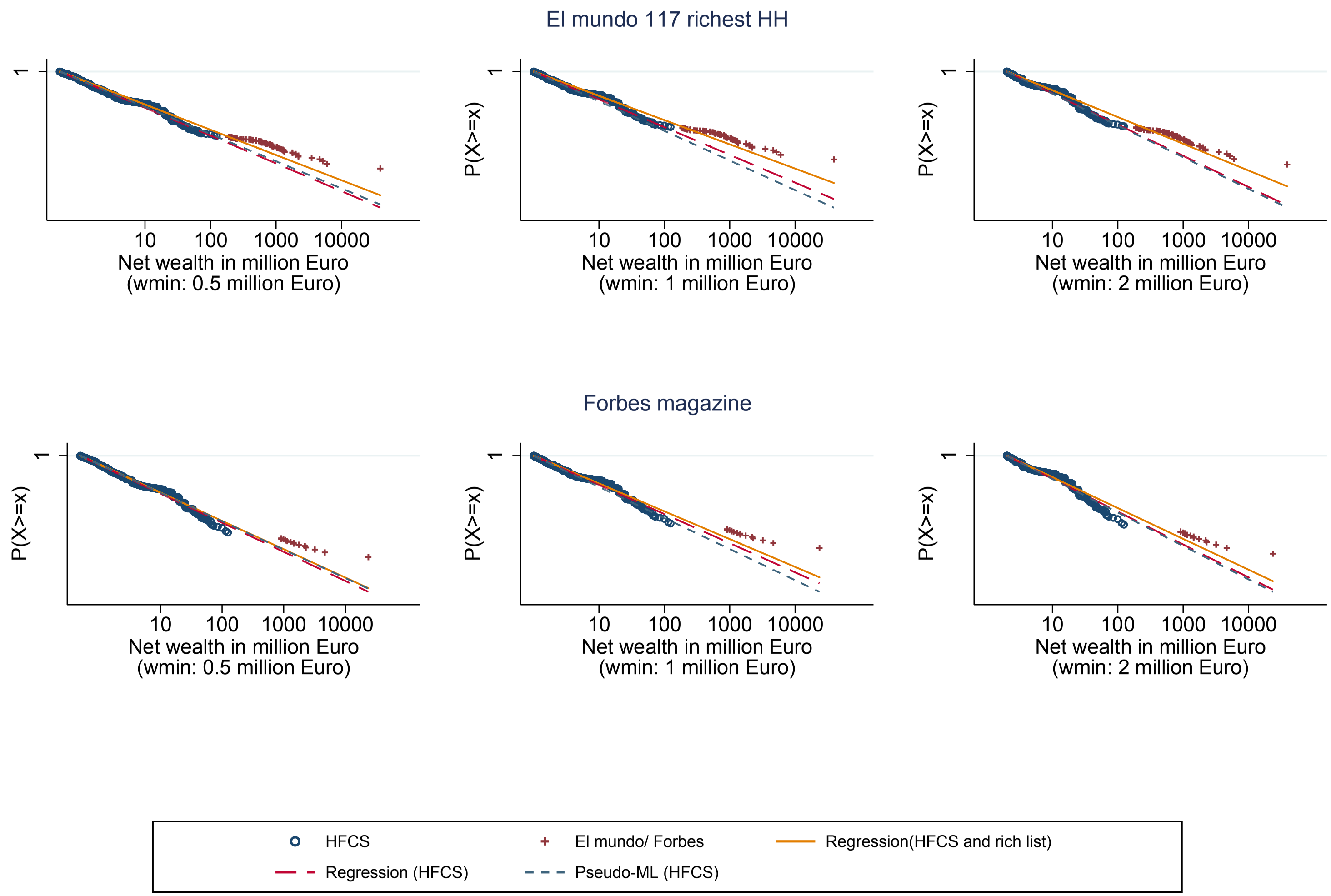
Data source: HFCS (second wave), Challenges (2015) and Forbes (2015); own calculations.

Figure 17: Tail wealth distribution by rich list and minimum wealth, Spain, first wave of the HFCS



Data source: HFCS (first wave), El mundo (2009) and Forbes (2009); own calculations.

Figure 18: Tail wealth distribution by rich list and minimum wealth, Spain, second wave of the HFCS



Data source: HFCS (second wave), El mundo (2012) and Forbes (2012); own calculations.

Table 13: Asset and liabilities of households in Germany according to national and financial accounts, 2010 (End-of-year level)

ESA 2010	Assets	billion Euro	%	ESA 2010	Liabilities	billion Euro	%
	Non-financial assets[1)]	6 040	57.8		Loans and other liabilities	1 520	14.5
AN.111	Dwellings	3 483	33.3	AF.41	Short-term loans	75	0.7
AN.112	Other buildings and structures	413	4.0	AF.42	Long-term loans	1 434	13.7
AN.113	Machinery and equipment	134	1.3	AF.8	Other liabilities	11	
AN.2111	Land underlying buildings and structures	1 775	17.0				
AN.2112-9	Land under cultivation, other land	212	2.0				
	Other non-financial assets[2)]	23	0.2				
	Financial assets	4 411	42.2				
AF.21	Currency	106	1.0				
AF.22	Transferable deposits	694	6.6				
AF.23	Other deposits	913	8.7				
AF.3	Debt securities	219	2.1				
AF.511	Listed shares	191	1.8				
AF.512	Unlisted shares	46	0.4				
AF.519	Other equity	184	1.8				
AF.52	Investment fund shares or units	396	3.8				
AF.61	Non-life insurance technical reserves	243	2.3		Net wealth	8 932	85.5
AF.62	Life insurance and annuity entitlements	765	7.3		*Net wealth less currency,*		
AF.63	Pension entitlements	614	5.9		*non-life insurance technical reserves,*		
AF.8	Other financial assets	39	0.4		*pension entitlements*	*7 969*	*76.2*
	Total	10 451	100.0		Total	10 451	100.0

Note: 1) Including non-profit institutions serving households (NPISH).

2) Cultivated assets and other natural resources, intellectual property products, inventories.

Source: Federal Statistical Office, national accounts; Deutsche Bundesbank, financial accounts.

Table 14: Asset and liabilities of households in Germany according to national and financial accounts, 2014 (End-of-year level)

ESA 2010	Assets	billion Euro	%	ESA 2010	Liabilities	billion Euro	%
	Non-financial assets[1)]	7 037	58.0		Loans and other liabilities	1 587	13.1
AN.111	Dwellings	4 047	33.4	AF.41	Short-term loans	65	0.5
AN.112	Other buildings and structures	436	3.6	AF.42	Long-term loans	1 506	12.4
AN.113	Machinery and equipment	141	1.2	AF.8	Other liabilities	17	
AN.2111	Land underlying buildings and structures	2 100	17.3				
AN.2112-9	Land under cultivation, other land	286	2.4				
	Other non-financial assets[2)]	27	0.2				
	Financial assets	5 093	42.0				
AF.21	Currency	128	1.1				
AF.22	Transferable deposits	981	8.1				
AF.23	Other deposits	889	7.3				
AF.3	Debt securities	162	1.3				
AF.511	Listed shares	234	1.9				
AF.512	Unlisted shares	69	0.6				
AF.519	Other equity	206	1.7				
AF.52	Investment fund shares or units	443	3.6				
AF.61	Non-life insurance technical reserves	307	2.5		Net wealth	10 542	86.9
AF.62	Life insurance and annuity entitlements	886	7.3		*Net wealth less currency,*		
AF.63	Pension entitlements	752	6.2		*non-life insurance technical reserves,*		
AF.8	Other financial assets	36	0.3		*and pension entitlements*	*9 355*	*77.1*
	Total	12 129	100.0		Total	12 129	100.0

Note: 1) Including non-profit institutions serving households (NPISH).

2) Cultivated assets and other natural resources, intellectual property products, inventories.

Source: Federal Statistical Office, national accounts; Deutsche Bundesbank, financial accounts.

Table 15: Asset and liabilities of households in France according to national and financial accounts, 2010 (End-of-year level)

ESA2010	Assets	billion Euro	%	ESA2010	Liabilities	billion Euro	%
	Non-financial assets	7 042	63.5		Loans and other liabilities	1 323	11.9
AN.111	Dwellings	3 076	27.7	AF.4	Loans	1 057	9.5
AN.112	Other buildings and structures	150	1.4	AF.8	Other liabilities	266	2.4
AN.113	Machinery and equipment	43	0.4				
AN.2111	Land underlying buildings and structures	3 164	28.5				
AN.2112-9	Land under cultivation, other land	430	3.9				
	Other non-financial assets[1)]	179	1.6				
	Financial assets	4 043	36.5				
AF.21	Currency	49	0.4				
AF.22	Transferable deposits	288	2.6				
AF.29	Other deposits	773	7.0				
AF.3	Debt securities	77	0.7				
AF.4	Loans	25	0.2				
AF.511	Listed shares	160	1.4				
AF.512	Unlisted shares	330	3.0				
AF.519	Other equity	306	2.8				
AF.52	Investment fund shares or units	257	2.3				
AF.61	Non-life insurance technical reserves	87	0.8		Net wealth	9 763	88.1
AF.62	Life insurance and annuity entitlements	1 249	11.3		*Net wealth less currency,*		
AF.63	Pension entitlements	164	1.5		*non-life insurance technical reserves,*		
AF.8	Other financial assets	277	2.5		*and pension entitlements*	*9 463*	85.4
	Total	11 085	100.0		Total	11 085	100.0

Note: 1) Cultivated assets and other natural resources, intellectual property products, inventories.

Source: INSEE, national accounts; Banque de France and European Central Bank, financial accounts.

Table 16: Asset and liabilities of households in France according to national and financial accounts, 2014 (End-of-year level)

ESA2010	Assets	billion Euro	%	ESA2010	Liabilities	billion Euro	%
	Non-financial assets	7 141	61.1		Loans and other liabilities	1 354	11.6
AN.111	Dwellings	3 435	29.4	AF.4	Loans	1 178	10.1
AN.112	Other buildings and structures	147	1.3	AF.8	Other liabilities	176	1.5
AN.113	Machinery and equipment	37	0.3				
AN.2111	Land underlying buildings and structures	2 907	24.9				
AN.2112-9	Land under cultivation, other land	441	3.8				
	Other non-financial assets[1)]	175	1.5				
	Financial assets	4 538	38.9				
AF.21	Currency	65	0.6				
AF.22	Transferable deposits	319	2.7				
AF.29	Other deposits	888	7.6				
AF.3	Debt securities	77	0.7				
AF.4	Loans	31	0.3				
AF.511	Listed shares	189	1.6				
AF.512	Unlisted shares	373	3.2				
AF.519	Other equity	366	3.1				
AF.52	Investment fund shares or units	291	2.5				
AF.61	Non-life insurance technical reserves	109	0.9		Net wealth	10 326	88.4
AF.62	Life insurance and annuity entitlements	1 415	12.1		*Net wealth less currency,*		
AF.63	Pension entitlements	188	1.6		*non-life insurance technical reserves,*		
AF.8	Other financial assets	228	2.0		*and pension entitlements*	*9 964*	85.3
	Total	11 680	100.0		Total	11 680	100.0

Note: 1) Cultivated assets and other natural resources, intellectual property products, inventories.

Source: INSEE, national accounts; Banque de France and European Central Bank, financial accounts.

Table 17: Asset and liabilities of households in Spain according to national and financial accounts, 2009 (End-of-year level)

ESA 2010	Assets	billion Euro	%	ESA 2010	Liabilities	billion Euro	%
	Non-financial assets[1)]	5 884	77.5		Loans and other liabilities	942	12.4
	Financial assets	1 711	22.5	AF.4	Loans	901	11.9
AF.21	Currency	92	1.2	AF.8	Other liabilities	41	0.5
AF.22	Transferable deposits	300	3.9				
AF.29	Other deposits	408	5.4				
AF.3	Debt securities	39	0.5				
AF.511	Listed shares	104	1.4				
AF.512	Unlisted shares	253	3.3				
AF.519	Other equity	45	0.6				
AF.52	Investment fund shares or units	151	2.0				
AF.61	Non-life insurance technical reserves	24	0.3		Net wealth	6 653	87.6
AF.62	Life insurance and annuity entitlements	110	1.4		*Net wealth less currency, non-life*		
AF.63	Pension entitlements	143	1.9		*insurance technical reserves,*		
AF.8	Other financial assets	42	0.6		*and pension entitlements*	*6 394*	84.2
	Total	7 595	100.0		Total	7 595	100.0

Note: 1) Only real estate assets. Including non-profit institutions serving households (NPISH).

Source: Banco de España and European Central Bank, financial accounts; estimation on real estate assets by Banco de España.

Table 18: Asset and liabilities of households in Spain according to national and financial accounts, 2011 (End-of-year level)

ESA 2010	Assets	billion Euro	%	ESA 2010	Liabilities	billion Euro	%
	Non-financial assets[1)]	5 208	74.7		Loans and other liabilities	918	13.2
	Financial assets	1 761	25.3	AF.4	Loans	868	12.5
AF.21	Currency	89	1.3	AF.8	Other liabilities	50	0.7
AF.22	Transferable deposits	299	4.3				
AF.29	Other deposits	434	6.2				
AF.3	Debt securities	82	1.2				
AF.511	Listed shares	90	1.3				
AF.512	Unlisted shares	237	3.4				
AF.519	Other equity	83	1.2				
AF.52	Investment fund shares or units	121	1.7				
AF.61	Non-life insurance technical reserves	19	0.3		Net wealth	6 051	86.8
AF.62	Life insurance and annuity entitlements	116	1.7		*Net wealth less currency,*		
AF.63	Pension entitlements	139	2.0		*non-life insurance technical reserves*		
AF.8	Other financial assets	52	0.8		*and pension entitlements*	*5 805*	83.3
	Total	6 969	100.0		Total	6 969	100.0

Note: 1) Only real estate assets. Including non-profit institutions serving households (NPISH).

Source: Banco de España and European Central Bank, financial accounts; estimation on real estate assets by Banco de España.

Table 19: Sensitivity of wealth concentration of the top 5 percent to sample choice and w_{min}, first wave of the HFCS

	Net wealth share of top 5 percent													
Rich list	w_{min} in million EUR													
	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50
	Germany													
HFCS only	46.9	44.1	48.3	46.7	47.2	46.2	46.5	46.1	46.2	45.7	46.0	45.6	46.0	45.7
MM 300	50.8	50.1	50.9	49.8	50.7	50.6	50.6	50.0	50.8	50.6	51.1	50.9	51.0	50.7
MM 200	51.4	50.6	51.3	50.3	51.1	51.0	51.0	50.3	51.2	51.0	51.5	51.3	51.3	51.0
MM 100	50.8	50.1	51.1	50.0	50.9	50.8	50.8	50.1	51.1	50.8	51.4	51.1	51.2	50.9
Forbes	50.9	50.3	51.6	50.5	51.5	51.3	51.3	50.7	51.7	51.4	52.0	51.7	51.8	51.5
	France													
HFCS only	38.2	31.9	33.5	35.4	36.4	36.1	36.6	36.5	36.7	36.6	36.8	36.7	36.9	37.0
Challenges 300	39.4	39.0	39.9	40.3	40.9	40.2	40.2	39.3	39.7	39.4	39.5	39.4	39.5	39.1
Challenges 200	40.0	39.4	40.4	40.7	41.3	40.5	40.5	39.6	40.0	39.7	39.8	39.6	39.8	39.3
Challenges 100	40.4	39.7	40.9	41.4	42.1	41.4	41.4	40.6	40.9	40.6	40.7	40.5	40.6	40.1
Forbes	39.2	33.8	35.7	37.3	38.4	38.0	38.0	38.0	38.4	38.3	38.5	38.3	38.5	38.2
	Spain													
HFCS only	31.7	27.2	29.7	30.3	31.1	30.7	31.0	30.8	31.0	30.8	31.0	30.8	31.0	30.9
El Mundo 74	35.5	34.8	36.9	35.7	35.7	35.2	35.2	34.3	34.2	33.9	34.1	34.0	34.1	34.2
Forbes	32.4	28.6	31.2	31.4	32.0	31.6	31.6	31.4	31.5	31.3	31.5	31.4	31.6	31.6

Note: The top tail estimation is based on OLS, as explained in section 3.

Source: HFCS (First and second wave), Manager magazin (2011), Challenges (2010), El mundo (2009), Forbes (2009, 2010, 2011), own calculations.

Table 20: Sensitivity of wealth concentration of the top 5 percent to sample choice and w_{min}, second wave of the HFCS

	Net wealth share of top 5 percent													
Rich list	w_{min} in million EUR													
	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50
	Germany													
HFCS only	52.5	45.1	50.4	48.4	48.6	47.7	48.2	47.5	47.8	47.7	47.5	46.7	47.0	46.9
MM 300	52.4	50.4	52.3	51.5	53.0	52.6	52.6	52.7	52.9	51.8	52.0	52.3	53.1	52.6
MM 200	52.3	50.7	52.5	51.7	53.2	52.8	52.8	52.9	53.1	52.0	52.1	52.4	53.2	52.7
MM 100	52.4	50.7	52.6	51.8	53.2	52.9	52.9	53.0	53.1	52.0	52.2	52.5	53.2	52.8
Forbes	52.0	51.2	53.1	52.2	53.7	53.3	53.3	53.3	53.5	52.4	52.5	52.8	53.6	53.1
	France													
HFCS only	39.9	36.9	37.9	38.0	39.3	39.3	40.7	41.6	42.1	42.1	41.9	40.9	40.6	40.3
Challenges 300	42.8	39.2	40.4	40.2	41.1	40.4	40.4	40.3	40.4	40.1	40.2	40.2	40.2	40.1
Challenges 200	40.7	39.6	40.7	40.4	41.3	40.6	40.6	40.5	40.6	40.2	40.3	40.2	40.3	40.1
Challenges 100	41.4	39.8	40.8	40.6	41.5	40.9	40.9	40.9	41.0	40.5	40.6	40.4	40.4	40.2
Forbes	41.5	39.6	40.6	40.4	41.4	41.0	41.0	41.3	41.3	40.8	40.9	40.6	40.5	40.3
	Spain													
HFCS only	32.5	31.1	32.7	32.6	33.6	32.9	33.3	33.0	33.2	33.0	33.1	32.9	33.0	32.9
El Mundo 74	37.1	34.1	37.7	36.8	37.5	36.2	36.2	36.0	35.8	35.6	35.1	35.2	35.3	35.2
Forbes	33.7	32.8	34.4	34.1	35.0	34.2	34.2	34.3	34.3	34.1	33.9	33.9	34.0	33.9

Note: The top tail estimation is based on OLS, as explained in section 3.

Source: HFCS (First and second wave), Manager magazin (2011), Challenges (2010), El mundo (2009), Forbes (2009, 2010, 2011), own calculations.