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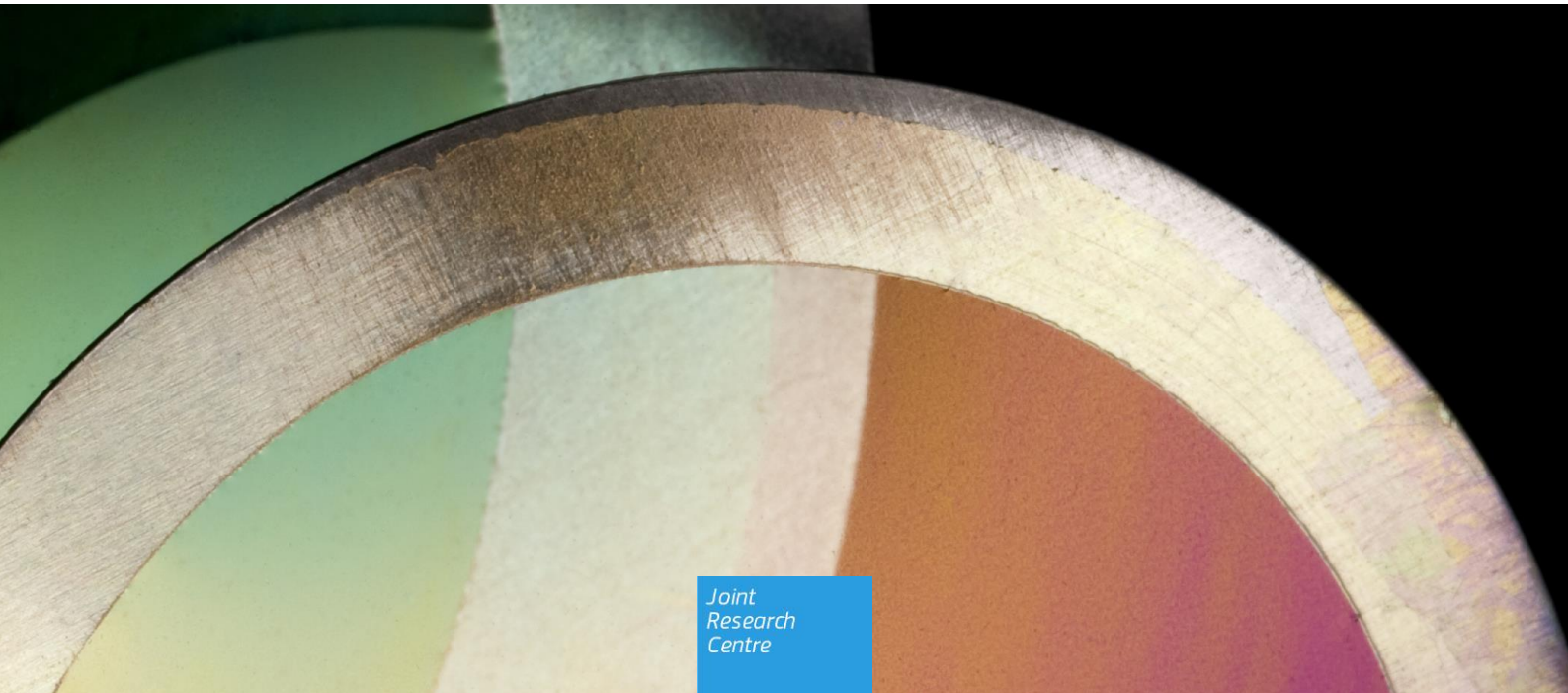

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Looking for the missing rich: Tracing the top tail of the wealth distribution*

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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 has gained increasing attention, in both public debate and academia. 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 and policy makers alike 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 systems being less progressive and rising 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). However, assessing the economic impact of such reforms is difficult due to the lack of precise information about wealth concentration at the top 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. In particular, we follow Vermeulen (2018) who suggests a straightforward method to combine household survey data with rich lists to jointly estimate a Pareto distribution for the top tail. We use this approach to derive an adjusted wealth distribution to better account for wealth at the very top which is usually partially covered in wealth surveys.

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 which allows international comparisons. 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, 2018). Personal wealth is generally considerably 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 tend to decrease with high income and wealth, especially at the top (Vermeulen, 2018). The bias of under-reporting is striking when comparing survey data with national accounts (Vermeulen, 2016; Chakraborty et al., 2018).[1]

[1] Chakraborty and Waltl (2018) 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.

A viable solution to better capture the missing rich is estimating the top wealth 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). However, the problem of biased wealth concentration remains if wealthy 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. The mortality multiplier approach uses estate tax records to infer top wealth concentration (Kopczuk and Saez, 2004; Alvaredo et al., 2016) for which, however, researchers have to deal with intricate issues of different mortality ("wealthier is healthier"). The capitalization of capital income tax records (Saez and Zucman, 2016) raises complex 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 of additional wealth 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). Furthermore, several national rich lists estimate wealth rankings of households or families in larger countries. The academia uses such lists to compare top wealth estimates based on survey data or to construct a joint data base (see e.g., Davies (1993) for Canada, Bach et al. (2014) for Germany, and Eckerstorfer et al. (2016) for Austria).

Vermeulen (2018) 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, the UK and several 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 the estimation is exclusively based on survey data without extreme tail observations.

We extend Vermeulen (2018) 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 follow Vermeulen (2018) 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 generally represent a broader base for the big fortunes. Drawing upon national rich lists is of particular importance in countries where relatively few dollar billionaires live who make it on the *Forbes* list, e.g. Spain. Second, we use the first and the second wave of the HFCS which allows analyzing wealth dynamics within a country.[2] Hence, we show how the wealth distribution has evolved across the two waves.

Our results are broadly in line with Vermeulen (2018). However, the inclusion of national rich lists, in addition to the *Forbes* list, leads to a slightly different top wealth concentration.[3] For Germany, we find that due to the top wealth imputation the top 1 percent wealth share jumps up from 24 to 31 percent and from 24 to 33 percent in the first and second wave of the HFCS, 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 data. The French top 1 percent wealth share increases from 18 to 22 percent in first wave, and from 19 to 22 percent in the second wave. In Spain, the top 1 percent share 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 and section 3 explains the estimation and impuation of top wealth. Section 4 discusses the results of the top wealth imputation on the wealth distribution, while the last section concludes.

[2]The comparability of wealth dynamics across countries is limited ,though, as a result of methodological differences, e.g. with respect to the fieldwork period.

[3]Vermeulen (2018) uses the first wave of the HFCS to perform the top tail estimation. According to his results, the top 1 percent wealth share increases to 32 - 34 percent in Germany, to 19 - 21 percent in France and to 15 - 17 percent in Spain. Compared with our findings the results of his paper are similar and slightly lower for France and Spain.

2 Data

In this paper, we use different types of data: Household survey data, namely the HFCS, national rich lists, and the *Forbes* list. In the following, we describe each of them in turn.

2.1 HFCS

The HFCS is a decentralized household survey focusing on Eurozone countries. It is conducted by national central banks or statistical offices. The HFCS aims at collecting information about consumption and the financial situation of households. We use the first and second waves.[4] The data was 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 selection criteria applied in the oversampling process differ across countries (European Central Bank, 2013, p. 9).

Table 1 shows that the response behavior varies 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 HFCS applies multiple imputation approach (European Central Bank, 2013, p. 39). Throughout the paper, results are calculated by taking into account all 5 implicates.[5]

Even though the HFCS was compiled in a harmonized way, it still relies on decentralized country surveys, which renders cross-country comparison difficult. Comparing the survey methodology across our three countries of interest reveals methodological differences which have to be kept in mind when interpreting the results: The response rate varies not only across both waves within countries (In Spain, e.g. 57 percent of contacted households participated in the first wave while this number dropped to 48 percent in the second wave), but also across countries. In contrast to Germany and Spain, French households are obliged to participate when being sampled (European Central Bank, 2013, p. 41). Furthermore, Germany and Spain exclude homeless and the institutionalized population, while France only excludes the latter (European Central Bank, 2013, p. 33). For our purpose, however, differences in oversampling of the top 10 percent are the major challenge.

[4] "Waves" refers to the (first and second) data collection rounds of the HFCS throughout the paper.

[5] Implicates are the set of imputed values for each missing observation. The distance between the values of the five implicates in the HFCS reflects the inherent uncertainty (European Central Bank, 2016).

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: $\frac{(S90-0.1)}{0.1}$, where S90 is the share of sample households in the wealthiest 10%.
b) Response rate including panel if available.
c) Countries with panel component.
Source: European Central Bank (2013, 2016).

The oversampling of rich Germans exploits geographical information about high-income municipalities whereas in France and Spain it relies on net wealth information from fiscal sources. Moreover, the timing and duration of the fieldwork period differs notably in Spain, Germany and France.[6]

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, deducting liabilities.[7] Household net

[6]In the first wave, Spanish households have been interviewed between November 2008 and July 2009, and in France between October 2009 and February 2010. In Germany, however, the fieldwork period was from September 2010 to July 2011. These temporal differences persist also in 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, 2016; European Central Bank, 2016).

[7]Often it is argued that it is particularly difficult to measure liabilities accurately in surveys. We

wealth does not include claims to social security or occupational and private pensions and health care plans. It is based on self-assessed property valuations of the survey respondents. There is no evidence suggesting systematic bias with respect to the self-assessment of respondents.

2.2 Rich lists

Since the 1980s, business media and researchers have provided rankings of the large 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).[8]

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 questionable, especially with regard to smaller fortunes, which are often dominated by non-quoted corporate shares, which makes 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 lower the ranking the more likely is the selectivity, as indicated by the heaping of rich list entries at round numbers, e.g. at 300, 400 or 500 million euros (heaping effect).

Rich lists report wealth in many cases for entrepreneurial "families" consisting actually of several households. In particular, many successful "*German Mittelstand*" firms, if not major enterprises, having been family-owned for generations made it on the German *manager magazin* rich list. This phenomenon is likely to be present in the French and Spanish national rich lists, too. This gives rise to the concern of the top wealth concentration being over-represented in wealth rankings as those rich list entries do not represent the fortune of one household but an entire family. Therefore, 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 residing abroad. For the French and Spanish rich lists, we neglect this issue as we do not have the necessary information to perform this adjustment.

address this argument by re-doing the top tail adjustment using a gross wealth concept. The results, however, are relatively similar to ones relying on net wealth.

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

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 could have unfavorable tax consequences in the countries analyzed in this paper. 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, Spain still imposes a recurrent wealth tax and France replaced its tax in 2018.[9] Inheritance, gift and estate taxes, which still exist in the main OECD countries, only capture intergenerational 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.[10] In the following, we describe the specific characteristics of the different rich lists one by one.

[9] Zucman (2008) uses tabulations of the French wealth tax base 1995 to analyze top wealth distribution. The French tax on net wealth has been replaced in 2018 by the *l'impôt sur la fortune immobilière (IFI)*, which is levied only on property. Alvaredo and Saez (2009) use tabulations of the Spanish wealth tax base from 1933 up to 2005 to estimate top wealth shares.

[10] 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). The main reasons for this inconsistency are 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	N	Mean	SD	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

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

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.

The incompleteness and selectivity of the list tends to increase with lower ranks since there is scarce information for households holding non-quoted firms or other assets, as indicated by the heaping effect. Therefore, we only use the top 200 from the German list.[11] 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. We have been able to to correct the rich list for the top 200 households 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 publishes annually a ranking of the 500 richest households in France. Their net wealth is estimated based on a large database, constructed and updated by the team of journalists. 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 use only the French list to the top 200 entries.

El Mundo (Spain)

The Spanish national rich list has been compiled since 2006 by the third largest newspaper, *El Mundo*. Their journalists have been providing two separate wealth rankings of the wealthiest families or individuals.[12] While the first list of the top50 (top100

[11] Table 6 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.

[12] Since 2016, El Mundo publishes one single rich list.

in 2012) "visible fortunes" relies on public information about the ownership structure of listed companies on the stock market, the list of the top50 (top 100 in 2012) "estimated fortunes" is mainly based on estimation of the share value of unlisted companies. The estimation uses information about purchase-sales of shares, venture capital investments and direct estimations of fortunes. The joint list for 2009, which we use in this paper, 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 50th 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 match the respective *Forbes* billionaire lists with the latest year of the survey: 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.[13]

3 Methodology of estimation and imputation of the top wealth distribution

This section describes how we construct the adjusted wealth distribution for Germany, France[14] and Spain. First, we briefly sketch the theoretical background of our approach. Second, we 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.

[13]The exchange rates (1 EUR in USD) corresponds to the date of the "snapshot" of the *Forbes* Billionaires Lists: 1.288038 USD (13/02/09, ES), 1.265274 (25/08/10, FR) and 1.270894 (26/08/11, DE) for the first wave and 1.314551 (14/02/12, ES), 1.359235, DE) and 1.366882 (13/02/15, FR) for the second wave.

[14]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.

3.1 Theoretical background

This paper relies on the Pareto distribution which is typically used in the literature to approximate the top tail of the wealth distribution.[15] 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}. Its complementary cumulative distribution function (ccdf) is given by

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

Accordingly, the ccdf (in 1) represents the relationship between household i's wealth w_i, the threshold w_{min}, and the Pareto coefficient α. It provides the probability of owning w_i or more, defined on the interval $[w_{min}, \infty[$. The coefficient α, also called tail index, determines the "fatness" of the top tail. In particular, the the lower α the fatter the tail and the more concentrated is the wealth distribution.

Based on the Zipf's law and following Vermeulen (2018), 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:

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

Then we approximate the Pareto distribution by the ranking of the sample households, assuming that the sample is large enough to approximate the ccdf. After taking the logarithm and re-arranging, we obtain:

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

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

Gabaix and Ibragimov (2012) show that the log-log-rank-size regressions are biased in finite samples. We follow their suggestion to correct ranks by subtracting $\frac{1}{2}$:

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

[15] We refer the interested reader to Dalitz (2016); Vermeulen (2018); 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 (2018).

We follow Vermeulen (2018) by also providing results based on the *maximum likelihood* estimator, 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 (2018) 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 estimations, we follow the recommendation of the 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.

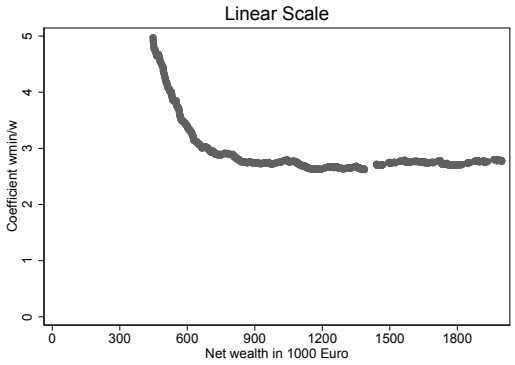
3.2 Estimation of the Pareto coefficient

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 $\frac{w_m}{w}$ for wealth thresholds above 100,000 Euros, exemplary for the first implicate for Germany in Figure 1, given in linear scale up to 2 million Euros and in log scale up to 10 million Euros. Figures 6 and 7 in the Appendix show the corresponding plots for France and Spain.

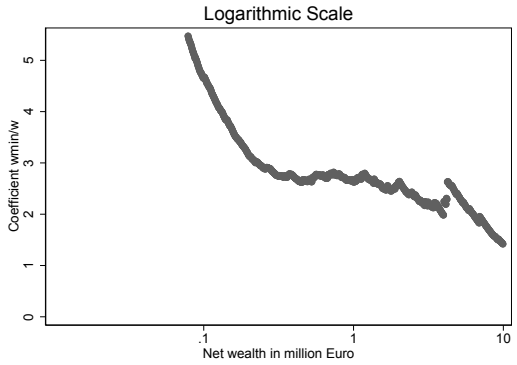
The graphs suggest a good representation of the Pareto distribution for household wealth above 500,000 Euros, which is around the 90th percentile in Germany, France, and Spain.[16] Therefore, we set the cut-off point of the Pareto distribution to 500,000

[16]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.

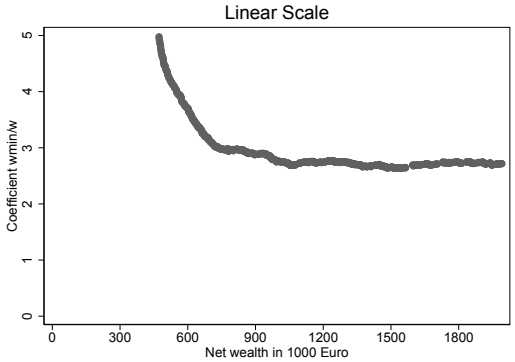
Figure 1: Ratio of mean wealth, w_m (above w) divided by w, w_m/w in Germany (1st and 2nd wave of the HFCS)



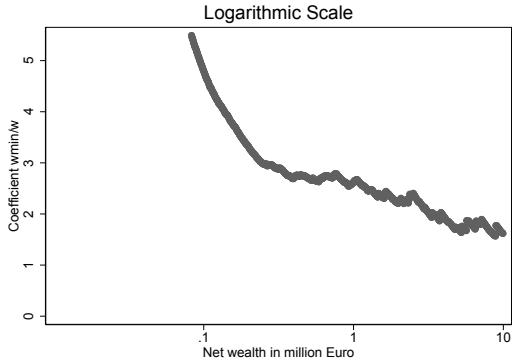
(a) 1st wave, linear scale



(b) 1st wave, logarithmic scale



(c) 2nd wave, linear scale



(d) 2nd wave, logarithmic scale

Source: HFCS, 1st Implicate, own calculations

Euros.[17] Similar cut-off point for the three countries are also suggested by (Vermeulen, 2018, Online Appendix) for the first wave. To choose the optimal combination of w_{min} and the rich list, we follow Vermeulen (2018), who tests several minimum wealth thresholds: 0.5, 1 and 2 million Euros. For Germany and France, we consider the top 300, top 200, top 100, and *Forbes* entries of the national rich lists. We do not consider lower ranks due to potential "heaping effects" (see section 2.2).[18] 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 14 - 19 in the Appendix illustrate them graphically for Germany, France and Spain in the first and second wave. Comparing α across time suggests that wealth concentration has in-

[17] 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.

[18] We assume that each entry in the corresponding French and Spanish rich list represents one household. With respect to the German list, we adjust the rich list as described above.

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

W_{min} (in Euro)	Excluding rich list		Including rich list			
			Manager magazin top 300	Manager magazin top 200	Manager magazin top 100	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.

creased for most levels of w_{min} as lower values of α indicate a stronger concentration.[19] Combining the HFCS with national rich lists decreases α substantially, therefore, indicating higher wealth concentration. Moreover, the results show that α is not sensitive to the choice of the national rich list (top100, top200 or top300).

Table 4 provides the α coefficients analogously for France. Comparing the estimated values, based on the original HFCS, suggests higher wealth concentration from the first to the second wave (for e.g. w_{min} of 0.5 million Euro, α_{reg} decreases from 1.80 to 1.68). The choice of the rich list's length, i.e. the top100, top200 or top300, seems not to strongly affect the estimated α, as in the German example. However, the estimated α values of the first wave based on the national rich list are always lower than those based on the *Forbes* list. In the second wave, however, this difference is not present. A potential explanation is the increase of the number of French dollar billionaires from 11 to 47 who made it on the Forbes list. Depending on the sample choice α seems to be rather stable across time (*Challenges* top300), decrease slightly (*Challenges* top200 & top100) or increase a bit (*Forbes*).

[19] 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.

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

W_{min} (in Euro)	Excluding rich list		Including rich list			
			Challenges top 300	Challenges top 200	Challenges top 100	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 reports estimated α by sample and w_{min}. Depending on the sample (*El Mundo*, *Forbes* or only the HFCS) and time the estimates of α vary substantially. Considering, for instance, w_{min} of 0.5 million α decreases from 1.84 (first wave) to 1.74 (second wave). Figure 14 - Figure 19, 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 illustrates 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).

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

W_{min} (in Euro)	Excluding rich list		Including rich list	
			El mundo	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.

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 national rich list. Therefore, we choose the top 200 households of the corresponding rich lists for Germany and France as baseline specification. We face a trade-off between efficiency and precision when choosing the rich list sample. On the one hand, larger rich lists increase the risk of heaping at round numbers, which reflects that wealth ranking estimates are less reliable. One the other hand, 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. We use the entire *El Mundo* list for Spain.

3.3 Imputation of the missing rich households

This section describes how we impute the missing rich households in the HFCS. Table 2 showed the large wealth gap between the richest household in the German part of the HFCS and the poorest household in the corresponding rich lists. The same is true for France and Spain, however, the gap is smaller compared to Germany. This suggests that the top tail is better represented in France and in Spain than in Germany. To fill the gap, we impute "synthetic households", effectively replacing HFCS households above

w_{min}. Therefore, we create synthetic observations according to the Pareto density function of the respective α_{reg}.

Furthermore, HFCS observations with high wealth tend to deviate more strongly from the Pareto line, in particular for Germany and Spain.[20] Obviously, high levels of household wealth are more prone to sampling error and selectivity due to non-response. Therefore, we impute household wealth starting from w_{min} assuming that the top tail of the wealth distribution is Pareto distributed. At the very end of the distribution, we use the wealth ranking from the respective national rich lists.

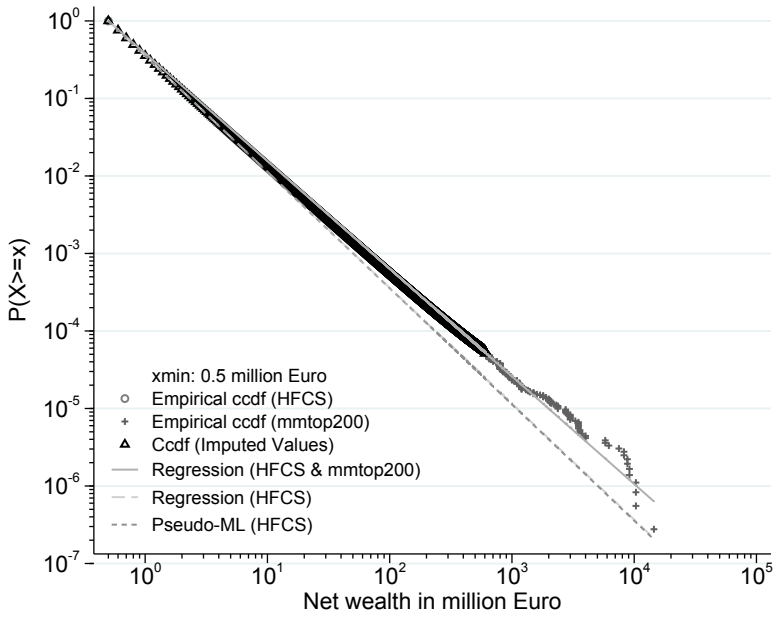
First, we calculate the complementary cumulative distribution function (ccdf) of the Pareto distribution, based on the chosen parameters, i.e. with w_{min} of 0.5 million Euros and α of 1.42 (1.39) for Germany in the first (second) wave.[21] In France, the corresponding α is 1.62 (1.69) and in Spain 1.66 (1.64) in the first (second) wave.[22] According to the Pareto distribution, we assign population weights to each imputed household such that total weights of the new households, i.e. those owning wealth of at least w_{min}, matches the total weights of the corresponding households in the original HFCS which are replaced. We impute households according to the Pareto distribution from w_{min} up to the wealth of the poorest rich list household. The very end of the top tail, we replace by households from the corresponding rich list. As an example, Figure 2 plots the adjusted tail wealth distribution for Germany (2^{nd} wave). The joint tail wealth distributions for the three countries are plotted in Figure 8 - Figure 13 in the Appendix.

[20] See Figures 14 to 19 in the Appendix, illustrating top tail observations from the HFCS and the corresponding rich lists, including estimated Pareto lines.

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

[22] α values in the tables 4 & 5 are averages over the 5 implicates, except for the second wave for France, where no multiple imputation has been applied. The estimated α values vary between 1.602 and 1.610 in the first wave for France. The corresponding values for α in Spain vary between 1.654 and 1.668 (between 1.616 and 1.651) in the first wave (second wave).

Figure 2: Adjusted tail wealth distribution, Germany - 2nd wave of the HFCS



Source: HFCS (2nd wave), Manager magazin (2011) ; own calculations.

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

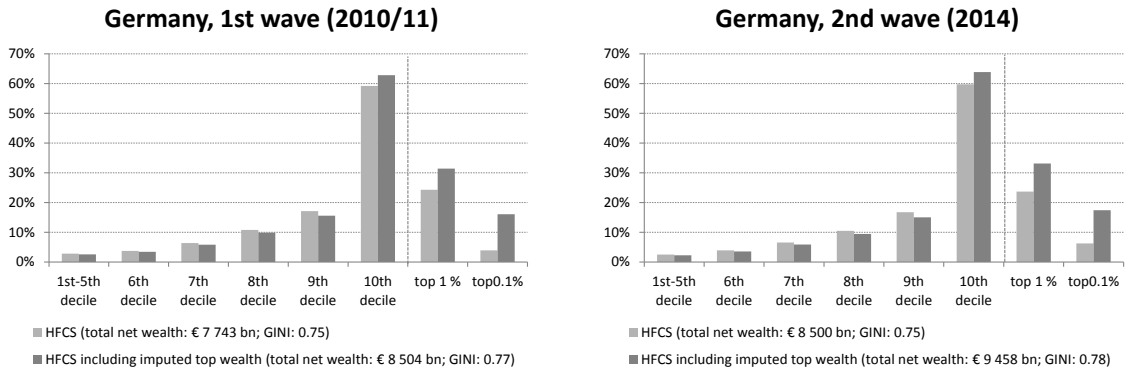
In this section, we analyze the impact of correcting for the missing rich on the wealth distribution. In doing so, we rely on the integrated data sets, composed of households from the HFCS, from the imputation, and from the corresponding national rich lists.

Figure 3 shows the impact of correcting the HFCS for the missing rich on the household net wealth distribution in Germany for the first and second wave.[23] The left plot focuses on the first wave of the HFCS and compares the wealth distribution based on the original HFCS to one when relying on the top tail adjusted sample. Regardless of the underlying data, wealth is strongly concentrated. The richest decile owns almost 60 percent of total wealth, whereas the bottom half owns merely 3 percent, when relying on the original HFCS. Moreover, wealth is further concentrated within the last decile, as the top 1 percent owns almost a quarter of total net worth.

Adjusting for the missing rich increases not only wealth concentration substantially, but also total net wealth: Total household net wealth increases by more than 700 billion Euros to 8 504 billion Euros (+10 percent) in the first wave. The share of household net wealth, held by the top decile, increases by more than 3 percentage points to 62.8

[23] Table 7 and Table 8 in the Appendix provide more extensive results.

Figure 3: The distribution of household net wealth in Germany



Note: Table 7 and Table 8 in the Appendix provide more extensive results.
Source: HFCS, Manager magazin (2011), Manager magazin (2014), own calculations.

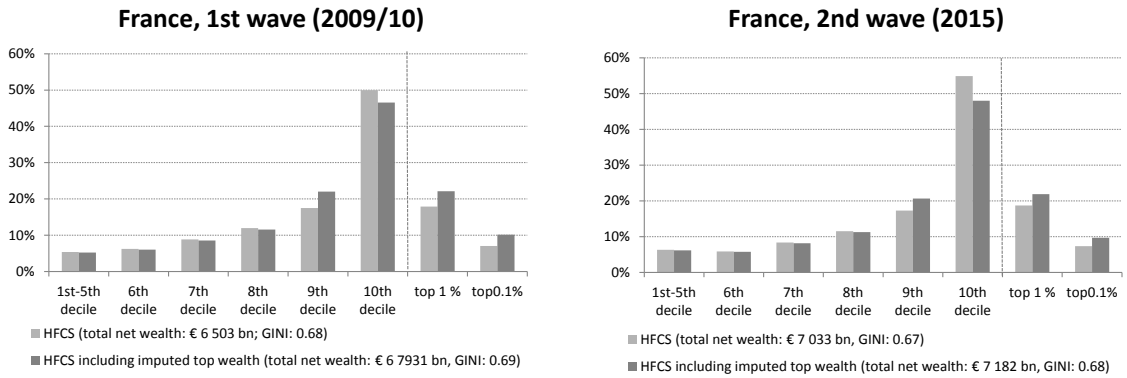
percent, while the share of the richest 1 percent climbs up by 7 percentage points to 31 percent. The imputation mainly affects the top 0.1 percent and leads therefore to an increase of 12 percentage points to 16 percent.

Using the second wave of the HFCS, we observe a similar pattern (right plot). The wealth share of the top 1 percent increases by 4 percentage points to about 64 percent, while the top 1 percent share raises from 23.6 to 33.1 percent due to the top tail adjustment. Similar to the first wave, wealth of the richest 0.1 percent increases by 11 percentage points. Higher wealth concentration due to the top tail adjustment is also reflected by the higher Gini coefficient, the standard inequality measure, by 0.02 (0.03) points to 0.77 (0.78) in the first (second) wave. [24]

When we compare the wealth distributions of two waves, we have to bear in mind that the first wave refers to 2011 and the second wave to 2014. Based on the top tail adjusted sample, total net wealth has increased by about one trillion Euros (+11%) to 9 460 billion Euros. Top wealth concentration is similarly high in the two waves.

[24] 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. 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).

Figure 4: The distribution of household net wealth in France



Note: Table 9 and Table 10 in the Appendix provide more extensive results.
Source: HFCS, Challenges (2010), Challenges (2015), own calculations.

Figure 4 illustrates the impact of adjusting for the missing rich on the French household net wealth distribution for both waves.[25] Wealth is strongly concentrated in France as well: The lower half owns 5.4 percent (6.3 percent), while the top 1 percent holds about 18 percent (19 percent) of total net wealth, based on the first (second) wave of the original HFCS.

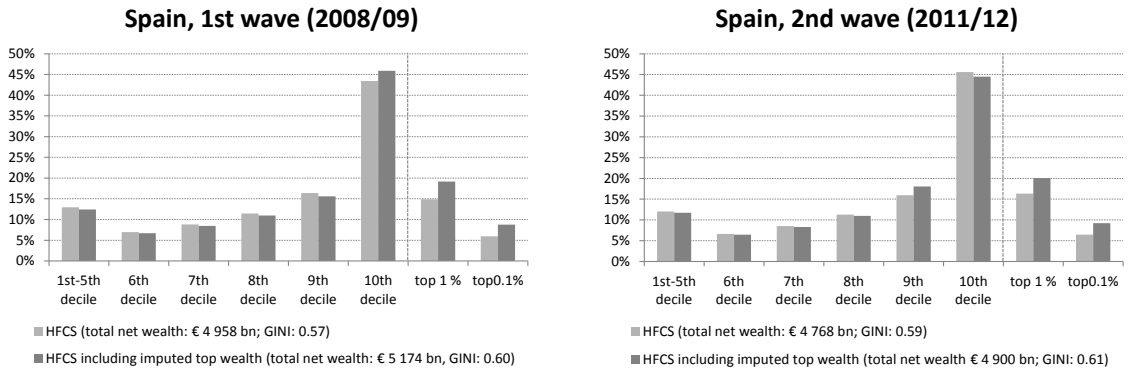
Adjusting the French net wealth distribution for the missing rich increases total wealth moderately by 285 billion (+4.4 percent) to 6 678 billion Euros in the first wave, and by 168 billion (+ 2 percent) to 7 202 billion Euros in the second wave. Interestingly, total net wealth held by the last decile declines due to the imputation. This result may appear odd at first glance, but it results from the choice of w_{min}.[26] The top 1 percent wealth share, however, increases by 4.5 (4.7) percentage points in the first (second) wave as a result of the top tail adjustment. Wealth inequality, expressed by the Gini coefficient, increases by about 0.01 Gini-points in both waves due to the top tail adjustment.

Total net wealth has increased from the first (2009/2010) to the second (2014/2015) wave by about 7 percent, or 450 billion Euro, thus somewhat lower than in Germany. Top wealth concentration, measured e.g. by the top 1 percent, share remained fairly stable around 22 percent across the two waves.

[25] Table 9 and Table 10, in the Appendix provide detailed results.

[26] We impute households whose net wealth ranges between half a million Euros and the the net wealth which corresponds to the last entry of the respective rich list. As the 90th wealth percentile is below half a million Euros, all households in the 10^{th} decile of the adjusted wealth distribution are imputed or replaced by rich list households (at the very end).

Figure 5: The distribution of household net wealth in Spain



Note: Table 11 and Table 12 in the Appendix provide more extensive results.
Source: HFCS, El Mundo (2009), El Mundo (2012), own calculations.

Figure 5 shows the impact adjusting for the missing rich on the Spanish net wealth distribution.[27] First, we focus on the wealth distribution obtained from the original HFCS. The poorer half of all households owns 13 percent and 12 percent of total net wealth based on 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 net wealth share of the richest percent of all households is 14.9 percent (16.3 percent) in the first (second) wave of the HFCS. Net wealth, expressed in absolute terms, is slightly lower in the second wave (4 770 bn Euros) relative to the first (4 960 bn Euros). A potential explanation is the global recession that hit Spain in 2009, shortly after the first wave has been conducted. In the aftermath of the economic crisis the worth of business assets and real estate decreased substantially, thus resulting in a overall reduction of wealth.

The top tail adjustment increases total net wealth by 4.3 percent (+216 billion Euros) in the first and 2.7 percent (+ 132 billion Euros) in the second wave. Hence, the adjustment affects the wealth distribution only moderately compared to Germany. Furthermore, the top 1 percent wealth share increases by about 4 percentage points in both waves due to the imputation of the top tail. Wealth inequality, measured by the Gini coefficient, increases by 0.02 points in the first wave and by 0.01 in the second wave. However, overall net wealth inequality is still notably lower than in France or Germany.

Next, we discuss the robustness of our results. Table 6 shows wealth shares in the respective countries, held by the top 5, 1 and 0.1 percent of households, comparing original HFCS and the adjusted data. Wealth shares are provided for different combinations

[27] Table 11 and Table 12, in the Appendix, provide detailed results.

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}.[28]

Including external information from the national rich lists or the *Forbes* list increases the top wealth shares in all specifications when the HFCS is combined with external wealth rankings. However, the choice of w_{min} has only a minor impact on the calculated shares within the same sample. Further, the shares estimated with the national rich list and the *Forbes* list are relatively similar. This suggests that the findings are relatively robust to the choice 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 figures 14 - 18 in 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 database, 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 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 (and somewhat in Germany) 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,

[28] 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 6: Sensitivity of wealth concentration to sample choice and w_{min}

		Top tail estimation based on									
		original HFCS	only wealthy HFCS households			National rich list			Forbes list		
	HFCS	w_{min} in million EUR									
Country	wave		0.5	1	2	0.5	1	2	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	31.4
	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

Note: The top tail estimation is based on OLS, as explained in section 3.
Source: HFCS (First and second wave), Manager magazin (2011, 2014), Challenges (2010, 2015), El Mundo (2009, 2012), Forbes (2009, 2010, 2011), own calculations.

corporate shares in non-quoted firms, and financial assets abroad. 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, 2018; Chakraborty et al., 2018).

5 Conclusion

In this study, we analyze the top tail of the wealth distribution and construct an integrated micro database for Germany, France, and Spain that better represents the top wealth concentration. Following Vermeulen (2018), we use the first and second wave

of the HFCS, combine it with national rich lists and the Forbes list in Germany, France and Spain and estimate a joint Pareto distribution for the wealth top tail. 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.

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 [29] or programs to promote housing ownership and capital formation.

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.

[29] 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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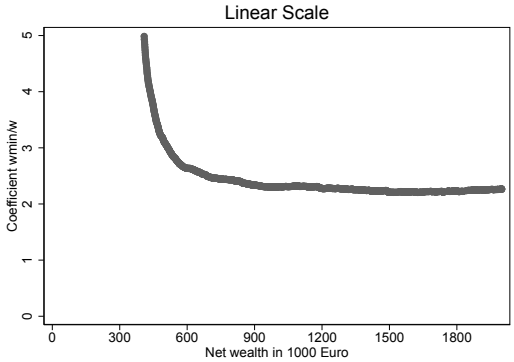
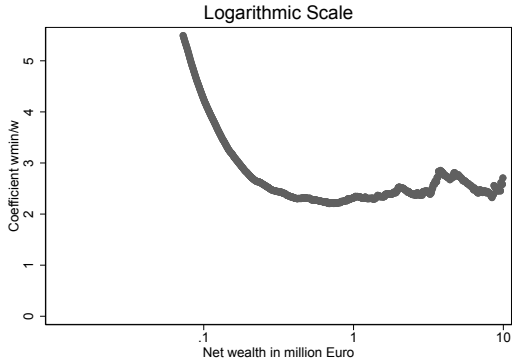
6 Appendix

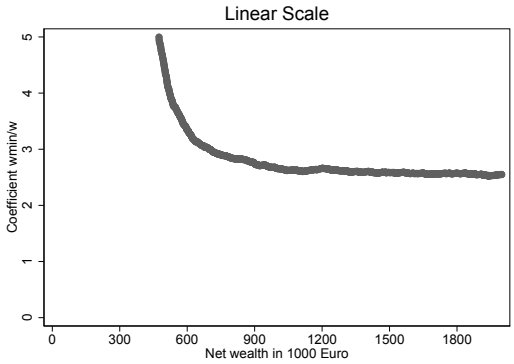
Figure 6: Ratio of mean wealth, w_m (above w) divided by w, w_m/w in France (1st and 2nd wave of the HFCS)



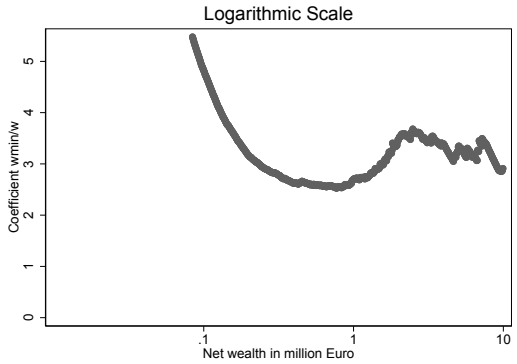
(a) 1st wave, linear scale



(b) 1st wave, logarithmic scale



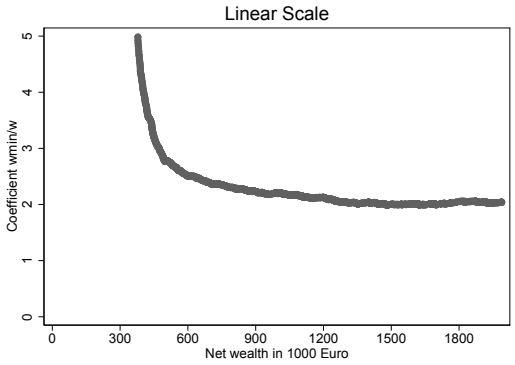
(c) 2nd wave, linear scale



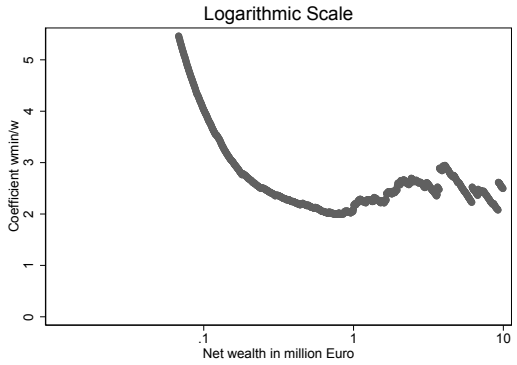
(d) 2nd wave, logarithmic scale

Source: HFCS, 1st Implicate, own calculations

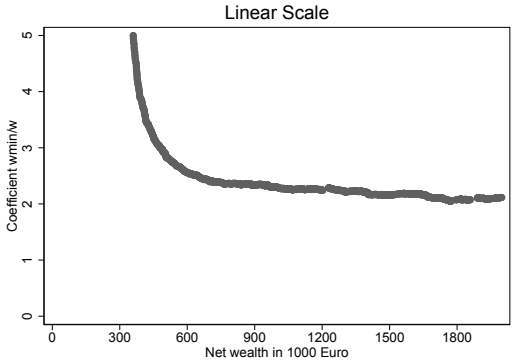
Figure 7: Ratio of mean wealth, w_m (above w) divided by w, w_m/w in Spain (1st and 2nd wave of the HFCS)



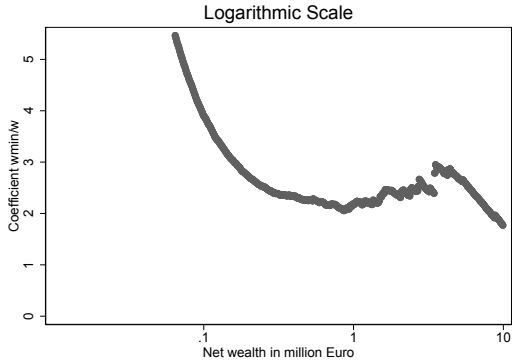
(a) 1st wave, linear scale



(b) 1st wave, logarithmic scale



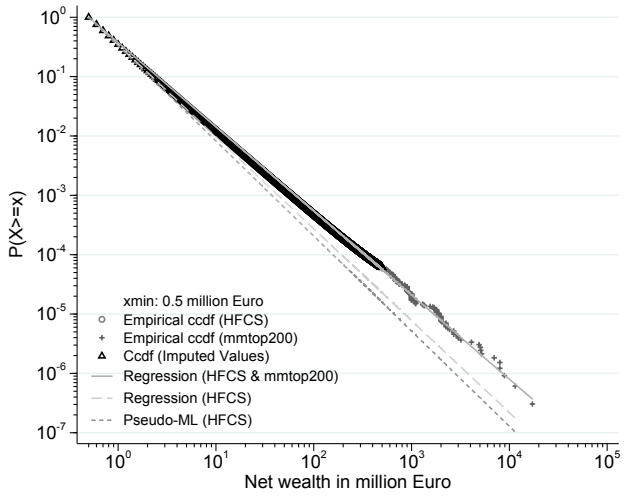
(c) 2nd wave, linear scale



(d) 2nd wave, logarithmic scale

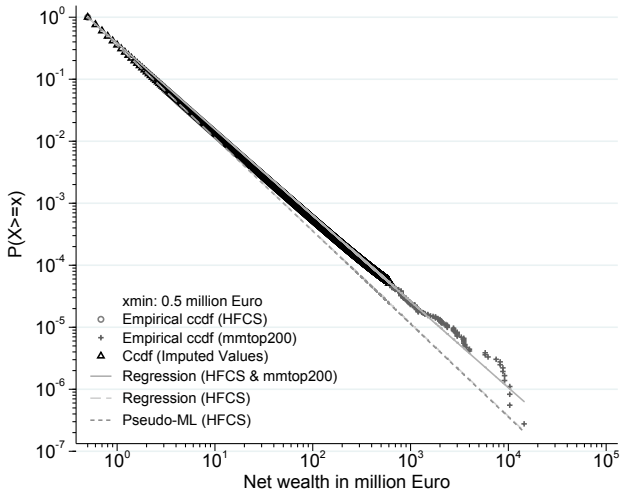
Source: HFCS, 1st Implicate, own calculations

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



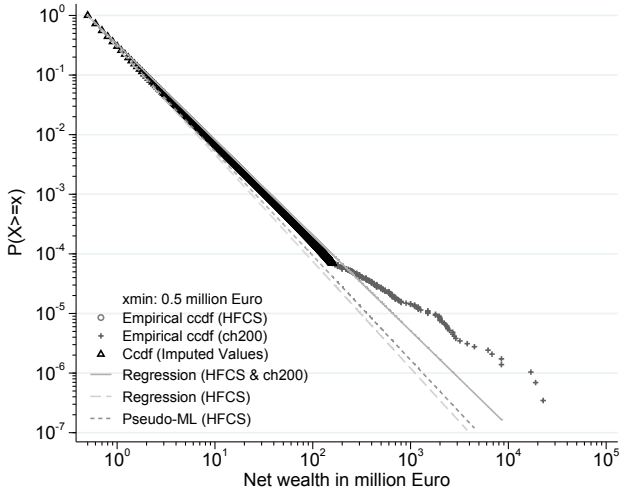
Source: HFCS (first wave), Manager magazin (2011) and Forbes (2011); own calculations.

Figure 9: Adjusted tail wealth distribution, Germany - second wave of the HFCS



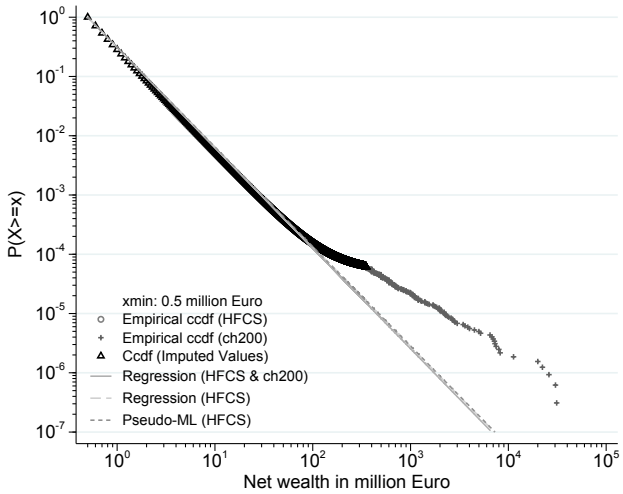
Source: HFCS (second wave), Manager magazin (2014) and Forbes (2014); own calculations.

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



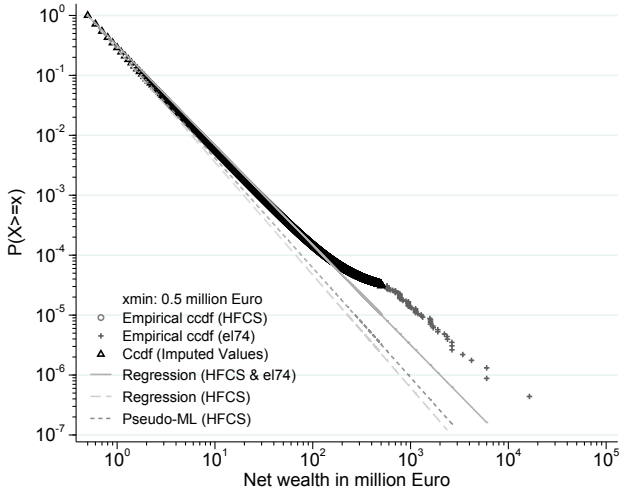
Source: HFCS (first wave), Challenges (2010) and Forbes (2010); own calculations.

Figure 11: Adjusted tail wealth distribution, France - second wave of the HFCS



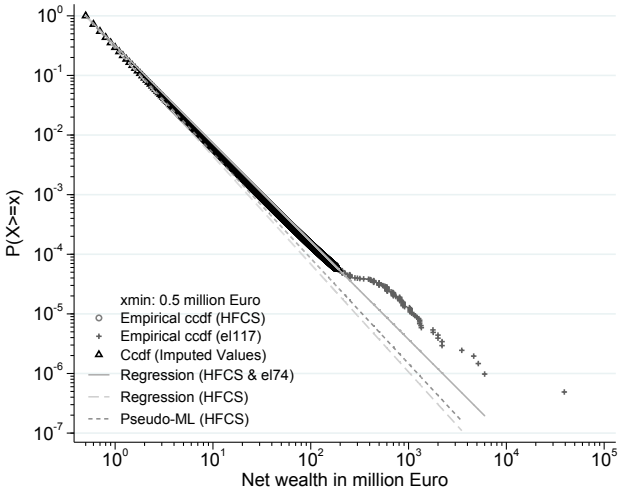
Source: HFCS (second wave), Challenges (2015) and Forbes (2015); own calculations.

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



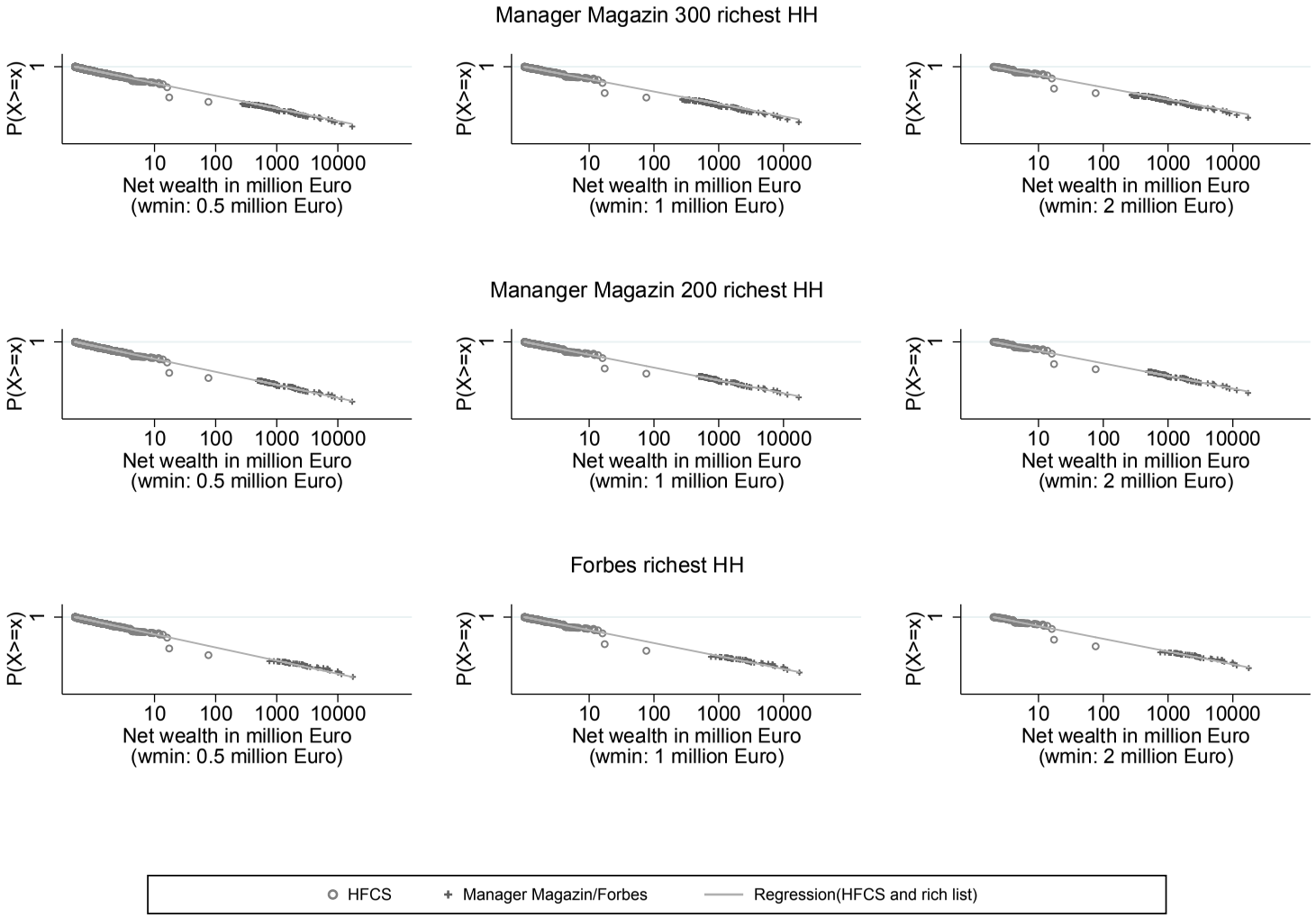
Source: HFCS (first wave), El Mundo (2009) and Forbes (2009); own calculations.

Figure 13: Adjusted tail wealth distribution, Spain - second wave of the HFCS



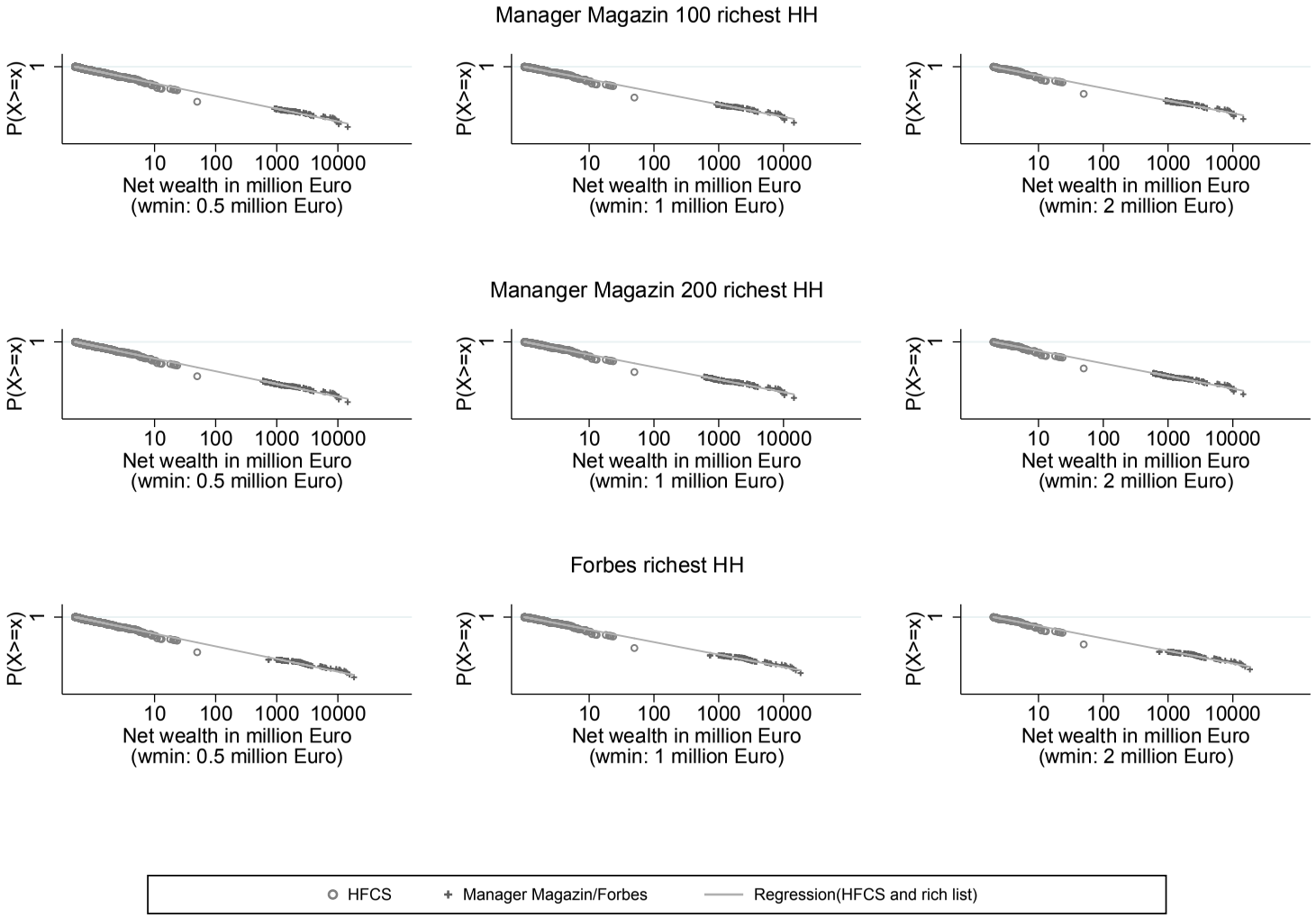
Source: HFCS (second wave), El Mundo (2012) and Forbes (2012); own calculations.

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



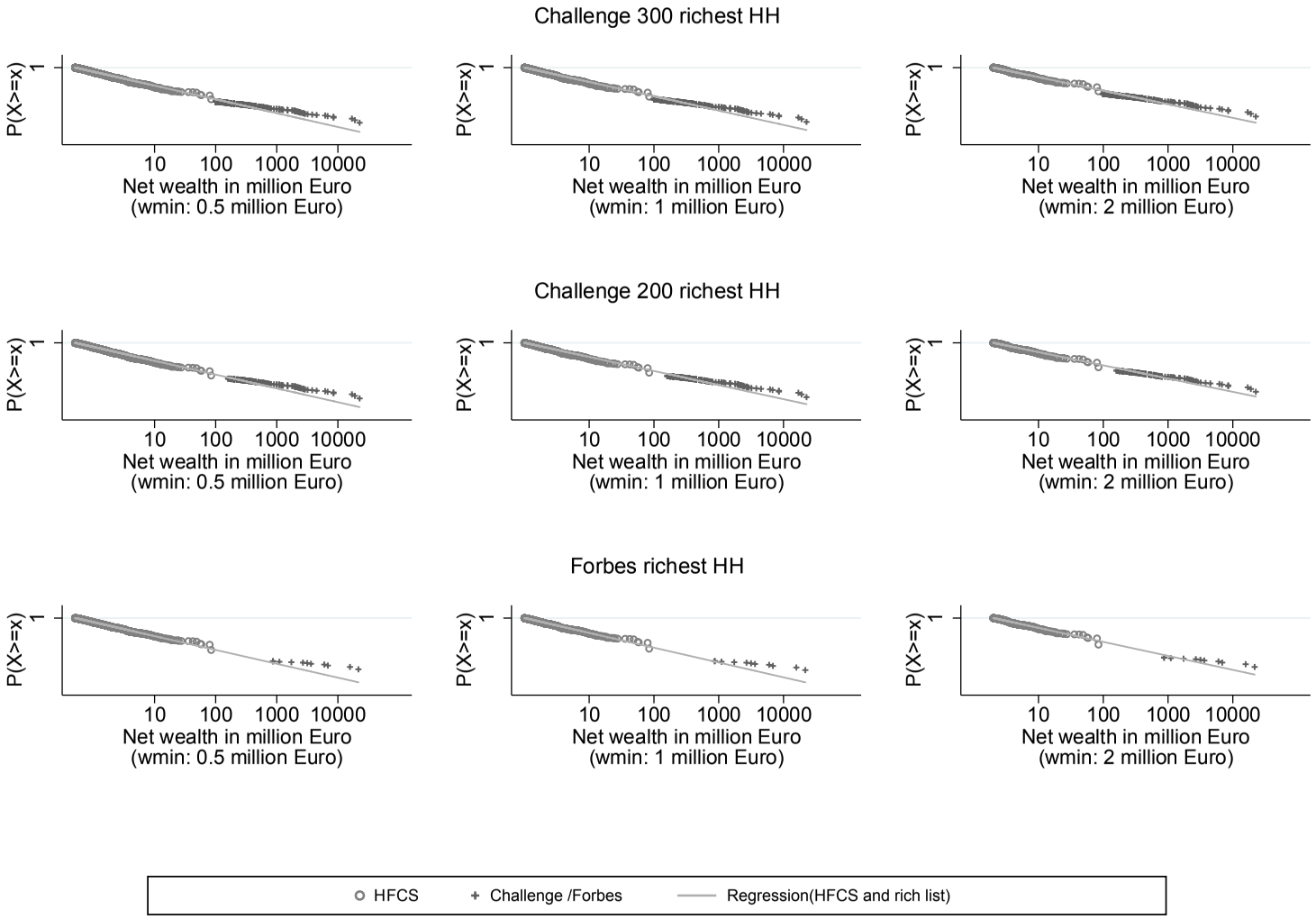
Source: HFCS (first wave), Manager magazin (2011) and Forbes (2011); own calculations.

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



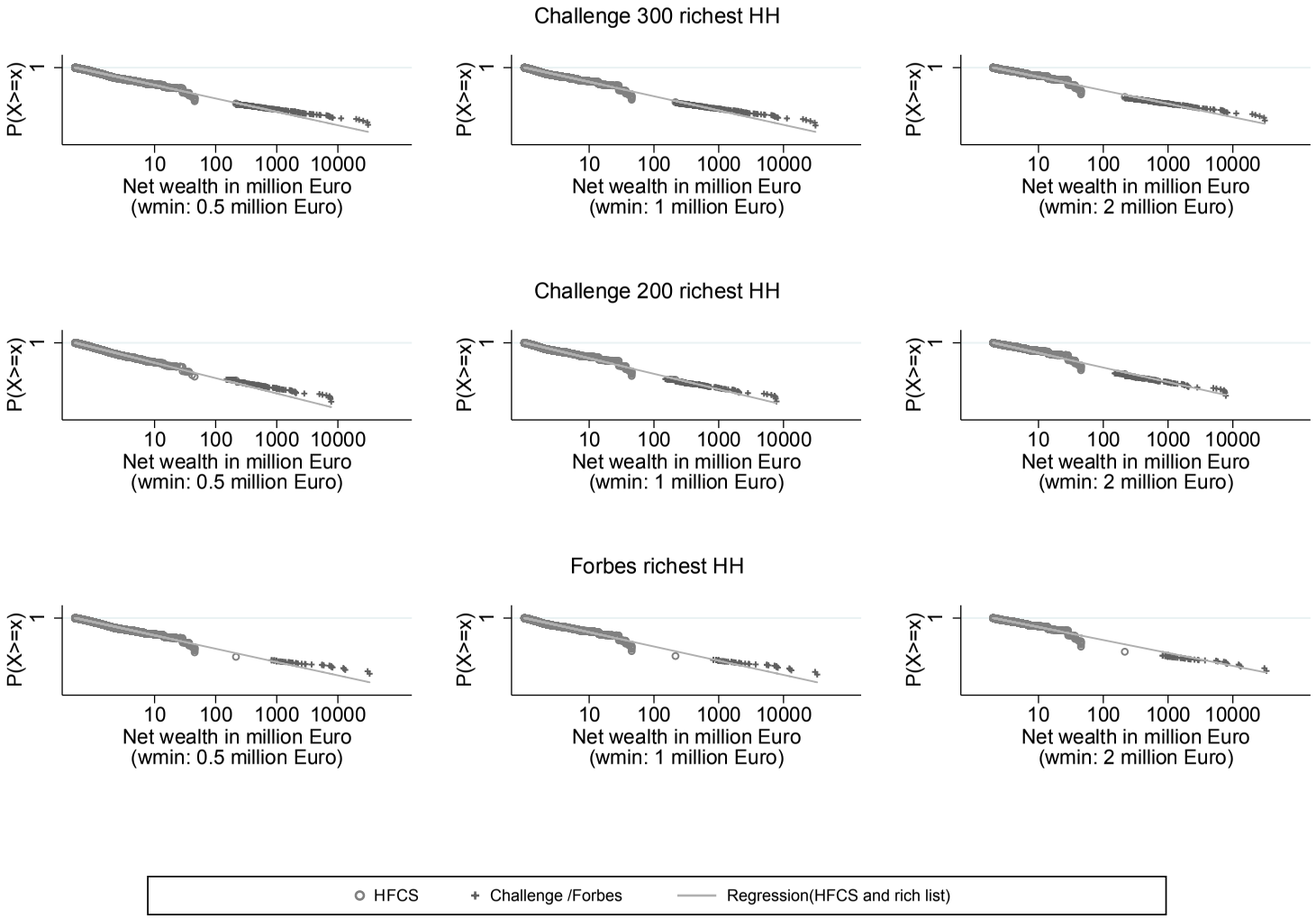
Source: HFCS (second wave), Manager magazin (2014) and Forbes (2014); own calculations.

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



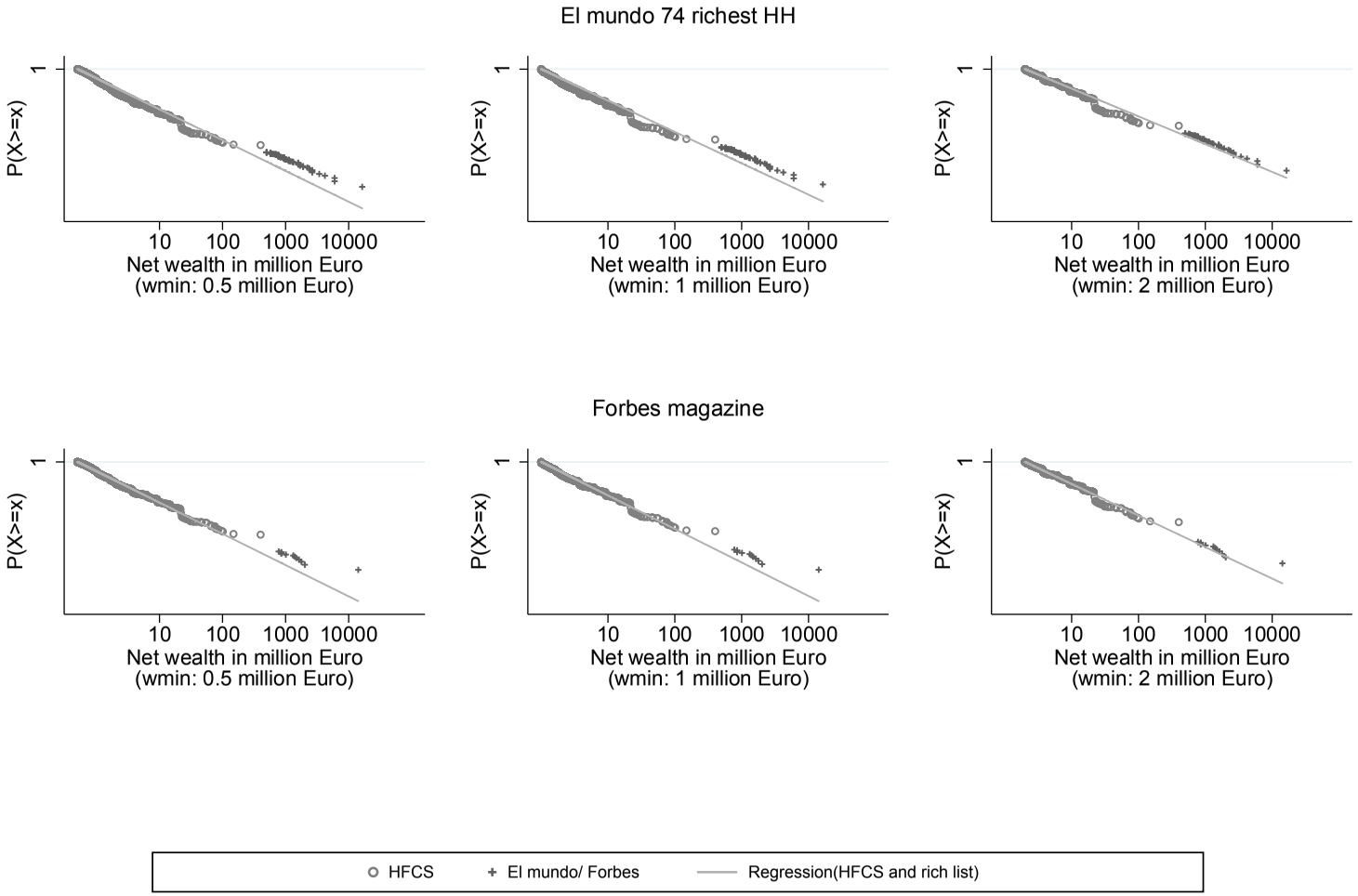
Source: HFCS (first wave), Challenges (2010) and Forbes (2010); own calculations.

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



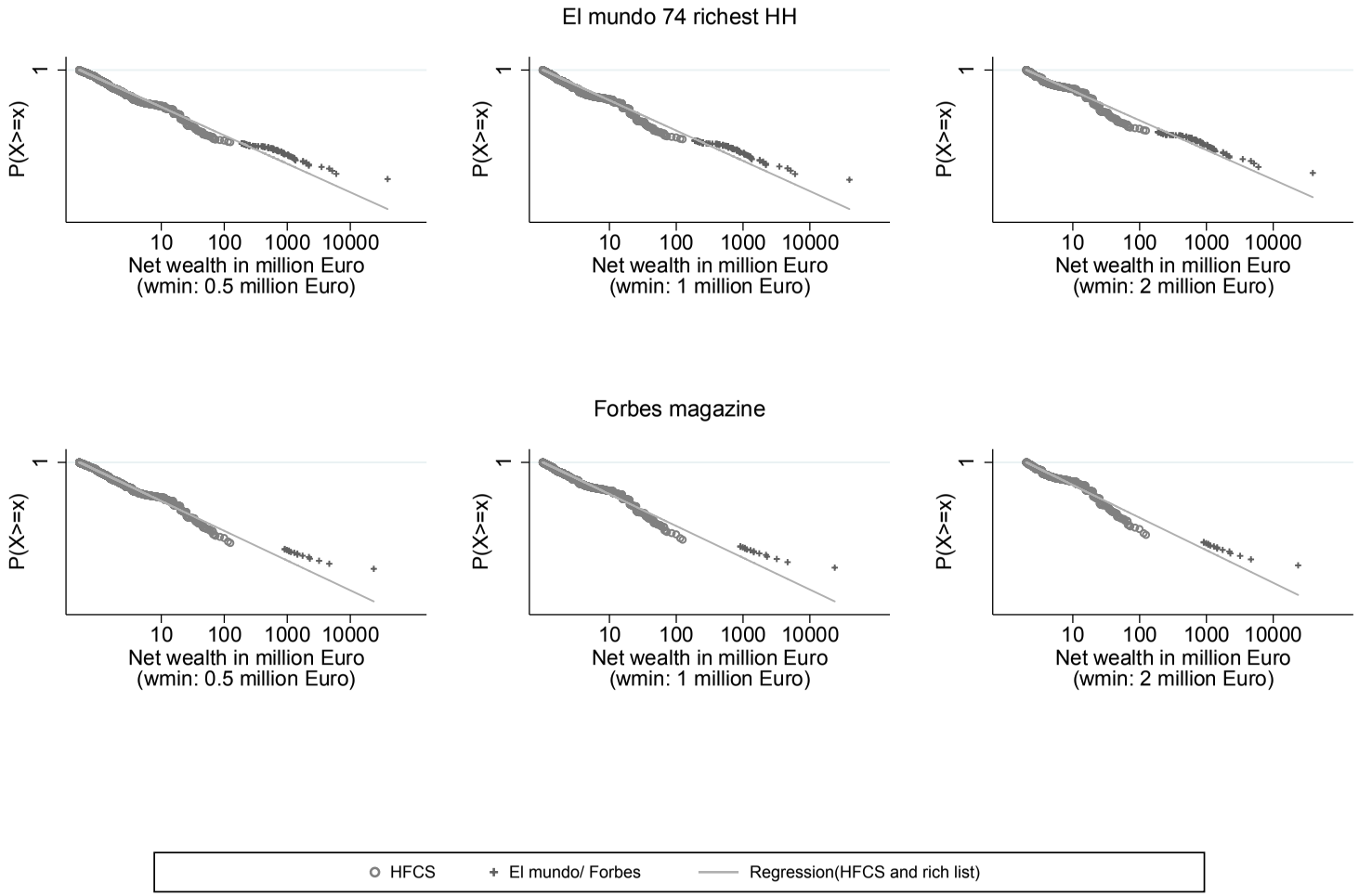
Source: HFCS (second wave), Challenges (2015) and Forbes (2015); own calculations.

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



Source: HFCS (first wave), El Mundo (2009) and Forbes (2009); own calculations.

Figure 19: Tail wealth distribution by rich list and minimum wealth, Spain, second wave of the HFCS



Source: HFCS (second wave), El Mundo (2012) and Forbes (2012); own calculations.

Table 7: 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	2.8	\	217	2.6
		[213 - 222]			[213 - 222]	
6th decile	51	290	3.7	51	290	3.4
		[287 - 293]			[287 - 293]	
7th decile	97	495	6.4	97	495	5.8
		[491 - 498]			[491 - 498]	
8th decile	163	837	10.8	163	837	9.8
		[829 - 845]			[829 - 845]	
9th decile	261	1 322	17.1	261	1 322	15.6
		[1 313 - 1 332]			[1 313 - 1 332]	
10th decile	442	4 582	59.2	442	5 343	62.8
		[4 540 - 4 623]			[5 325 - 5 361]	
Total	\	7 743	100.0	\	8 504	100.0
		[7 702 - 7 784]			[8 476 - 8 532]	
Top 5%	660	2 614	33.8	600	4 305	50.6
		[2 063 - 3 166]			[4 280 - 4 329]	
Top 1%	1 923	1 882	24.3	2 000	2 668	31.4
		[1 839 - 1 925]			[2 656 - 2 679]	
Top 0.1%	13 503	306	3.9	10 160	1 367	16.1
		[299 - 312]			[1 365 - 1 369]	
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.

Table 8: 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	%	Percentile 1000 Euro	Total bill. Euro	%
1st - 5th decile	\	214	2.5	\	214	2.3
		[209 - 219]			[209 - 219]	
6th decile	61	335	3.9	61	335	3.5
		[333 - 337]			[333 - 337]	
7th decile	112	557	6.5	112	557	5.9
		[548 - 566]			[548 - 566]	
8th decile	175	893	10.5	175	893	9.4
		[886 - 901]			[886 - 901]	
9th decile	274	1 422	16.7	274	1 422	15.0
		[1 408 - 1 435]			[1 408 - 1 435]	
10th decile	469	5 080	59.8	469	6 037	63.8
		[5 041 - 5 118]			[6 002 - 6 073]	
Total	\	8 500	100.0	\	9 458	100.0
		[8 471 - 8 529]			[9 425 - 9 490]	
Top 5%	730	2 675	31.5	700	4 831	51.1
		[1 988 - 3 362]			[4 790 - 4 871]	
Top 1%	2 320	2 010	23.6	2 220	3 134	33.1
		[1 993 - 2 027]			[3 114 - 3 154]	
Top 0.1%	8 864	531	6.3	11 720	1 647	17.4
		[527 - 536]			[1 643 - 1 651]	
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 9: 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 [350 - 353]	5.4	\	352 [350 - 353]	5.2
6th decile	116	406 [404 - 407]	6.2	116	406 [404 - 407]	6.0
7th decile	175	578 [575 - 580]	8.9	175	578 [575 - 580]	8.5
8th decile	237	780 [778 - 781]	12.0	237	780 [778 - 781]	11.5
9th decile	329	1 139 [1 135 - 1 142]	17.5	329	1 481 [1 476 - 1 485]	21.8
10th decile	512	3 249 [3 226 - 3 272]	50.0	500	3 193 [3 150 - 3 174]	47.0
Total	\	6 503 [6 486 - 6 519]	100.0	\	6 778 [6 777 - 6 799]	100.0
Top 5%	775	2 375 [2 353 - 2 397]	36.5	700	2 898 [2 654 - 2 681]	39.3
Top 1%	1 782	1 166 [1 144 - 1 188]	17.9	1 900	1 547 [1 536 - 1 558]	22.8
Top 0.1%	6 959	458 [441 - 475]	7.0	8 160	715 [712 - 719]	10.5
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 10: 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	1 501	20.6
10th decile	536	3 569	50.7	500	3 451	48.2
Total		7 202	100.0		7 211	100.0
Top 5%	812	2 629	37.4	700	2 852	40.0
Top 1%	1 814	1 315	18.7	2 000	1 639	22.2
Top 0.1%	7 651	514	7.3	8 400	862	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.

Table 11: 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	13.0	\	643	12.4
		[638 - 647]			[643 - 647]	
6th decile	183	346	7.0	183	346	6.7
		[344 - 347]			[344 - 347]	
7th decile	228	437	8.8	228	437	8.4
		[434 - 440]			[434 - 440]	
8th decile	289	568	11.5	289	568	11.0
		[564 - 572]			[564 - 572]	
9th decile	387	813	16.4	387	807	15.6
		[808 - 818]			[801 - 812]	
10th decile	608	2 152	43.4	500	2 375	45.9
		[2 123 - 2 182]			[2 354 - 2 395]	
Total	\	4 958	100.0	\	5 174	100.0
		[4 920 - 4 996]			[5 149 - 5 199]	
		[1 846 - 1 900]			[2 117 - 2 154]	
Top 5%	879	1 532	30.9	800	1 802	34.8
		[1 095 - 1 120]			[1 379 - 1 425]	
Top 1%	1 857	737	14.9	2 180	992	19.2
		[560 - 566]			[768 - 786]	
Top 0.1%	7 453	295	6.0	8 670	452	8.7
		[293 - 298]			[448 - 457]	
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 12: 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	12.0	\	574	11.7
		[570 - 579]			[570 - 579]	
6th decile	160	316	6.6	160	316	6.4
		[314 - 317]			[314 - 317]	
7th decile	205	406	8.5	205	406	8.3
		[405 - 408]			[405 - 408]	
8th decile	265	539	11.3	265	539	11.0
		[536 - 542]			[536 - 542]	
9th decile	359	760	15.9	359	885	18.1
		[756 - 764]			[880 - 890]	
10th decile	542	2 173	45.6	500	2 180	44.5
		[2 127 - 2 220]			[2 155 - 2 205]	
Total	\	4 768	100.0	\	4 900	100.0
		[4 876 - 4 905]			[4 868 - 4 917]	
Top 5%	864	1 586	33.3	800	1 673	34.1
		[1 539 - 1 633]			[1 646 - 1 700]	
Top 1%	1 860	779	16.3	2 020	984	20.1
		[741 - 816]			[970 - 999]	
Top 0.1%	9 808	307	6.4	8 320	451	9.2
		[302 - 312]			[442 - 460]	
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.

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

Rich list	Net wealth share of top 5 percent													
	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

Rich list	Net wealth share of top 5 percent													
	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	33.4	31.6	33.2	33.0	33.9	33.0	33.2	32.8	33.2	32.9	32.9	32.8	32.9	32.8
El Mundo 74	35.0	34.2	35.5	35.1	35.9	34.8	34.8	34.6	34.7	34.5	34.2	34.3	34.4	34.4
Forbes	33.9	32.4	34.0	33.7	34.6	33.6	33.6	33.5	33.7	33.5	33.4	33.4	33.4	33.4

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.

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