

# Re-weighting to reduce unit non-response bias in household wealth surveys: a cross-country comparative perspective illustrated by a case study

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## Abstract

We discuss the problem of unit non-response in household wealth surveys, and review possible strategies to reduce non-response bias in the Eurosystem Household Finance and Consumption Survey (HFCS). The HFCS is a Eurosystem survey coordinated by the European Central Bank, to gather a set of ex-ante harmonised household wealth surveys from all euro area countries.

Information on idiosyncratic characteristics of non-respondents may not only be used to improve the data collection process (e.g. sample design, targeted contact strategies) in future waves, but may also crucially contribute to the ex-post adjustment of design weights for non-response. In addition, calibration of sampling weights on external auxiliary information may further help reduce unit non-response bias. For the specific case of the euro area wealth survey, we discuss how these two steps (namely non-response adjustment and calibration to auxiliary information) may be used to reduce non-response bias.

As a case study, we examine unit non-response in the Finnish Wealth Survey 2004 with information linked from registers to the non-responding part of the sample. We use the Finnish data to study how properties of selected wealth and debt indicators change with the amount of auxiliary information used in the calibration adjustments, i.e. from just using widely available variables (such as age and gender) to using a much larger set of variables (possibly existing only in a few countries). With these results we intend to extract lessons as to whether different country re-weighting approaches may have substantial effects on country comparability for the case of a cross-national survey such as the HFCS.

## 1. Introduction

This paper discusses how re-weighting may help reduce unit non-response bias in household wealth surveys by using information on idiosyncratic characteristics of non-respondents as well as through calibration of sampling weights on external auxiliary information.

While unit non-response may potentially affect any kind of survey, household surveys on wealth typically register lower response rates largely because of the sensitivity of the survey topic.

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The views expressed in this paper (as well as any possible mistakes) are exclusively the authors' and do not necessarily represent the views of either the European Central Bank nor of the Eurosystem Household Finance and Consumption Network.

In addition, such surveys may severely suffer from the effects of non-random selectivity caused by the difficulty to contact and convince particular groups of households (e.g. the wealthy) to participate. First of all, it is well-known that the distribution of wealth across households is highly skewed, i.e. a relatively small number of wealthy households own an important share of total household wealth. In addition, typically only a reduced share of households hold certain financial products, particularly the most sophisticated ones. Consequently, if such households are not well represented in the final sample, the results may not provide a reliable picture of the distribution and composition of household portfolios.

Achieving a representative portion of wealthy respondents through standard sampling-design and contact-strategy procedures may be challenging for several reasons. Firstly, establishing contact with wealthy respondents may be more difficult as they are likely to possess more than one residence, to be surrounded by additional security measures and also to be absent during prolonged periods of time. Secondly, both available time as well as self-perceived value/time ratio usually predispose wealthy households to refuse participating in surveys; in practice, a differentiated contact and interviewing strategy possibly implying additional persuasion effort is required. In many of these cases, best-practice measures may help mitigate the effects on final non-response, i.e. more flexible contact strategies and adaptation to household schedules, additional contact efforts, collection of information from non-household members, etc.<sup>2</sup>

Mitigating strategies notwithstanding, unit non-response is unlikely to be a random phenomenon and is likely to more severely affect wealthy households, which also happen to be the ones potentially providing the most interesting information in the specific case of household wealth surveys.

This is an important challenge for the Eurosystem Household Finance and Consumption Survey (HFCS). The HFCS is an initiative of the euro area national central banks (NCBs) coordinated by the European Central Bank, which consists of a set of ex-ante harmonised wealth surveys conducted across all sixteen euro area countries. The HFCS will collect microdata on household real and financial assets, debts, consumption and saving, income and employment, demographics, future pension entitlements, intergenerational transfers and gifts and risk attitudes. The resulting micro data will be made available to the research community in the future.<sup>3</sup>

The paper is split into five sections. Further to this introduction, the second section analyses differences in the response rates of wealth and other household surveys across countries. The third section presents, from the perspective of the HFCS as a cross-national survey, ways to maximise participation as well as how weighting adjustments can help reduce non-response bias, distinguishing between non-response and calibration adjustments. The fourth section illustrates possible strategies to reduce non-response bias with a case study based on the whole eligible sample of the Finnish Wealth Survey 2004, for which substantial auxiliary information from the sampling frame (i.e. also including non-respondents) and from record linkage to administrative and statistical registers is available. Using external information extracted from registers, the case study tries to show how different strategies to calibrate survey results with the use of a more or less exhaustive set of external auxiliary variables may affect the results. The fifth section concludes.

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<sup>2</sup> Household Finance and Consumption Network (2008.a).

<sup>3</sup> More information on the HFCS is available on [http://www.ecb.europa.eu/home/html/researcher\\_hfcn.en.html](http://www.ecb.europa.eu/home/html/researcher_hfcn.en.html)

## 2. Unit non-response in wealth surveys

Substantial differences can be observed in the patterns of unit non-response across different sub-population groups, but also across different countries. Dissimilar societies, customs and cultural setups may result in substantially varying attitudes towards survey participation.

To illustrate this point with actual data, Table 1 below compares the response rates registered in different countries conducting similar wealth surveys as well as other European surveys.

**Table 1. Response rates in wealth and other household surveys** <sup>4 5</sup>

	Wealth surveys	EU-SILC 2006	HBS 2005	ESS 2006
Germany	40%	68%	Quota sample	55%
Greece	52%	79%	60%	-
Spain	41%	58%	65%	66%
France	74%	71%	57%	46%
Italy	42%	82%	75%	-
Austria	65%	59%	42%	64%
Portugal	57%	82%	62%	73%
Finland	66%	75%	52%	64%
United Kingdom	55%	77%	57%	54%
United States	44%			

Column 1 shows quite some degree of variation across countries concerning response rates for wealth surveys, ranging from around 40% for the surveys conducted in Germany, Spain, Italy and the US to 74% for the French survey. In addition to the above-mentioned cultural and social differences, this degree of variation can also be explained by a number of factors such as (i) whether each specific survey over-samples wealthy households (substantially increasing sampling efficiency at the expense of increasing the overall level of (unweighted) non-response, as is the case of the Spanish and US surveys); (ii) survey exhaustiveness (for instance the Austrian survey only covers housing – but not financial – wealth, thus decreasing the number of sensitive topics in the interview, with a positive effect in response rates); (iii) whether survey participation is legally binding to respondents (as may be the case of surveys run by National Statistical Institutes); (iv) sample design and contact strategies (whether the sample design is based on registers of households/persons or of dwellings, with the former approach permitting a more personalised first-contact strategy positively impacting on response rates); (v) allowing proxy respondents; (vi) making use of non-respondent substitutes/replacements, etc.

It is also possible to horizontally compare response rates within countries between wealth and other kinds of surveys, namely the Survey on Income and Living Conditions (SILC), the Household Budget Survey (HBS) and the European Social Survey (ESS). As can be seen, there is a tendency in each country toward lower response rates in wealth surveys compared with those in other surveys (with the exception of France and Austria). This is a logical consequence of the sensitiveness of the survey topic, the length of the interviews (highly dependent on the complexity of the household's

<sup>4</sup> In making comparisons across countries, it is very important to dispose of comparable figures, namely to apply a single methodology for the calculation of response rates. In particular, Table 1 was elaborated by computing response rates as the ratio of final interviews to total eligible households in the sample.

<sup>5</sup> Wealth surveys: DE: Socio-Economic Panel (SOEP) 2006; ES: Encuesta Financiera de las Familias 2005; FI: Wealth and Housing Survey 2004; FR: Enquête Patrimoine 2004; GR: Survey of Indebtedness of Greek Households 2007; IT: Survey of Household Income and Wealth 2006; PT: Inquérito ao Património e Endividamento das Famílias 2006; US: Survey on Consumer Finances 2007; UK: Wealth and Assets Survey 2006/08.

Other household surveys: EU-SILC: Survey on Income and Living Conditions; HBS: Household Budget Survey; ESS: European Social Survey.

portfolio) as well as the level of effort required from them (mental calculations, preparation and use of supporting documentation, etc.).

To confirm the validity of these calculations, in particular with a view to double-checking the comparability of the country figures, it may be useful to dig more into the specifics of how response rates are calculated for each survey. Table 2 below shows the gross sample size for each survey, the number of units regarded as ineligible, those for which it was not possible to establish contact, and finally the split between refusals and other reasons for non-response (language barriers, discarded after supervision, discarded due to high item non-response, etc.).

**Table 2. Response rate components in wealth surveys**

	Sample	Out of scope/over-coverage	Eligible cases	(1) Non-contact	(2) Total Refusal	(3) Other reasons for non-response	Total Respondents
Germany (2006) Socio-Economic Panel (SOEP)	3931 105%	181 5%	3750 100%	485 13%	1659 44%	100 3%	1506 40%
Spain (2005) EFF	15662 109%	1275 9%	14387 100%	1602 11%	6823 47%	189 1%	5962 41%
France (2004) Enquête Patrimoine	15093 115%	1939 15%	13154 100%				9692 74%
Italy (2006) SHIW	18814 102%	304 2%	18510 100%	4139 22%	6603 36%		7768 42%
Austria (2008) OeNB Survey on Wealth	3338 104%	141 4%	3197 100%	433 14%	636 20%	47 1%	2081 65%
Finland (2004) Household Wealth Survey	5300 101%	74 1%	5226 100%	338 6%	1400 27%	33 1%	3455 66%
UK (2006/08) Wealth and assets survey	62800 112%	6971 12%	55829 100%	4135 7%	19210 34%	1889 3%	30595 55%
US (2007) SCF	9980 100%		9980 100%	288 3%	5114 51%	156 2%	4422 44%

Note: Other reasons for nonresponse includes language barriers, high item non-response, items discarded after supervision, etc. Blank cells correspond to information not available to the authors.

Sources: following publications plus authors' own calculations: Finland: Niemeläinen, S., T. Sandström, M. Säylä, V.-M. Törmälehto (2006) / Spain: Bover, O. (2008) / Italy: Banca d'Italia (2008) / Austria: Fessler, P., P. Mooslechner, M. Schürz and K. Wagner (2009) / Germany: Von Rosenblatt, B., N. Sigel, S. Stimmel and F. Strutz (2007) / France: INSEE (2007) / US: Kennickell, A. B. (2009) / UK: Office for National Statistics (2009)

Mirroring the substantial degree of variation across countries observed in Table 1, a sizeable divergence also exists in the distribution of eligible cases between non-contacts, refusals, other non-response and final respondents. For instance, the non-contact rate is particularly high for the Italian SHIW, while it is fairly low in the case of the Finnish, the US and the UK surveys. This may have to do with the sampling approach as well as with the level of effort employed in each individual case, which reduces the effects on selectivity bias at the expense of increasing total survey costs per individual respondent.

With regard to refusals, the highest rates are registered in the case of the wealth surveys corresponding to US, Germany and Spain, while the lowest rates correspond to the surveys conducted in Austria (possibly related to the survey focus limited to housing wealth) and Finland

(where the survey is conducted by the National Statistical Institute<sup>6</sup>). The split between direct refusals and other non-response (due to language barriers, interviews that had to be discarded due to high item non-response, etc.) is quite homogenous, ranging in between 1% and 3% in all cases.

It would obviously be very interesting to know more about the specific reasons why potential respondents directly refused to participate in order to consider alternative contact strategies with a view to future survey waves. Further information is only available for the Finnish survey though<sup>7</sup>.

### **3. Maximising participation and reducing non-response bias in cross-national surveys: the HFCS**

#### **3.1 Approaches to reduce non-response for the HFCS**

The figures analysed so far suggest that different approaches and different practices significantly affect response rates across countries and across surveys. Indeed, while some issues cannot be controlled (e.g. the survey theme and its effects on potential respondents, the need to cover both urban and rural areas - with response rates significantly lower in the former -, etc.), applying best practices with regard to some others may make a big difference. During the preparatory work for the Eurosystem HFCS, different practices were carefully studied and recommendations to minimise non-response were put forward.<sup>8</sup>

The following is a non-exhaustive selection of factors that were identified as playing a crucial role (and on which Member States were advised to put special emphasis): (i) selecting experienced interviewers and participating actively in their training; (ii) carefully monitoring interviewers' workload and compensation scheme; (iii) providing concrete instructions as to the contact schedule;<sup>9</sup> (iv) taking due care in providing information materials beforehand (e.g. advance letter signed by NCB Governor closely before the first interviewer's visit, supporting materials to be used during on-site visits covering uses of the data, etc.); (v) selecting incentives that respondents may particularly appreciate;<sup>10</sup> and (vi) providing feedback to respondents ex-post about uses of the data (particularly helpful in the case of panels).

As a last resort, refusal conversion (i.e. applying additional effort to convince initially reluctant respondents to participate, possibly via a refusal-conversion specialist) may also have non-negligible effects on response rates.

#### **3.2 Re-weighting as a way to reduce unit non-response bias**

Regardless of the preventive measures taken, response rates in the euro area wealth surveys may be lower than in other household surveys such as those included in Table 1 most likely due to the sensitivity of the survey topic. Lower response rates imply lower efficiency of the estimates because of smaller effective sample sizes. Whether the estimates are more biased depends on the

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<sup>6</sup> NSIs' reputation may make them more trustworthy vis-à-vis respondents than it may be the case of private survey companies.

<sup>7</sup> Out of 1,400 refusals in the Finnish survey, 160 were due to the survey topic, 276 because of alleged lack of time, 274 were hard-core non-respondents (units which as a matter of principle do not participate in any kind of surveys), and 403 did not give any specific reason.

<sup>8</sup> Household Finance and Consumption Network (2008.b).

<sup>9</sup> It was specifically recommended to make a minimum of four personal visits to each sampling unit (including at least one visit in the evening and one over the weekend, spread over at least two different weeks) as well as to systematically record contact attempts and check them regularly.

<sup>10</sup> The best incentives very much vary from country to country: symbolic tokens (for instance symbolic goods only produced by central banks), lottery tickets, charity donations, occasionally some money, etc.

(lack of) of non-response randomness and on the extent that re-weighting of design weights may help reduce the possible bias.

The weights should carry information on both the sample selection process (design weights) and non-response process (labelled final estimation weights in the HFCS). The cross-sectional weighting in the euro area HFCS is expected to follow the standard two-step path, i.e. (1) adjustment of the design weights for non-response (sample-based non-response weighting) and (2) adjusting the weights such that particular estimates will match external information (population-based adjustment of weights).

### ***3.2.1 Re-weighting to adjust for non-response in the HFCS***

Adjustment of the design weights for non-response may be conducted by using response propensities, for instance within homogenous response groups. This adjustment requires that information on the characteristics of non-respondents are known.

Generally, in the 16 euro area countries the following data may be available, to a varying extent, to assess the characteristics of the non-respondents (largely only available at country level):

- 1) Contact attempt information
- 2) Interviewer observations on non-respondents (paradata information)
- 3) Panel attrition in subsequent waves (for those surveys with a longitudinal component)
- 4) Microgeographic information
- 5) Information derived from the sampling frame
- 6) Record-linked data from administrative and statistical registers (only for a few surveys)

In the euro area survey, (1) contact attempt information and (2) interviewer observations should be centrally available as countries will in principle report them to the ECB. Survey process data such as contact attempts may be used in the non-response adjustment by assuming that non-respondents have similar characteristics as those households who have responded only after several contact attempts.<sup>11</sup>

Interviewer observations on non-respondents in the euro area HFCS comprise descriptive information on geographical distribution, dwelling rating, appearance, location, surrounding neighbourhood, and security measures which are part of the paradata information collected in the survey. Such variables may be very useful to detect specific patterns of non-response. In addition, those non-respondents who refuse to participate could ideally also be convinced to provide some limited information on personal reasons to refuse participating.

Some surveys (e.g. those in Italy, Spain, Germany, the Netherlands and Belgium) include a longitudinal component and thus in the coming years characteristics from previous waves could be used to study panel attrition and to estimate response propensities, if it is assumed that panel attrition can be used to make inference on cross-sectional response propensities.

Microgeographic information (available at country level but not centrally collected by the ECB for confidentiality reasons) may help if for instance the income level of the local neighbourhood (e.g. at zip-code level) where the non-responding household lives is known although the income level of the non-responding household itself is not available.

Exact matching on case level is generally not feasible in the euro area countries, but some existing surveys have been able to use register-based auxiliary information in sampling and non-response analysis. The Spanish Wealth Survey (EFF) has used wealth tax data, both to stratify the sample to over-sample wealthy households and to describe unit non-response. The Finnish

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<sup>11</sup> For example, D'Alessio and Faiella (2002) examine response propensities in the Italian wealth survey SHIW by assuming that households requiring two or more attempts are representative of non-responding units as a whole.

Household Wealth Survey extensively uses administrative data in stratification, estimation and also as survey outcome variables (see case study in the third section of this paper).

### 3.2.2 Calibration adjustments in the HFCS

Adjustments to external sources require that information for each specific respondent is available in an external source at population level. The adjustments should build on non-response analysis but it is likely that in practise they highly depend on the information available to each country. Typically, in the existing euro area wealth surveys the weights have been adjusted to demographic and geographical distributions such as age, gender, household size, geographical area, and size of the geographical area (Table 3). Such information is usually available from the census or other major household surveys and the necessary condition of strict correspondence of variable definition in the sample and the external source is generally satisfied. The HFCS definitions are aimed to be aligned with, for example, the core social variables defined by Eurostat. This should improve also possibilities for using information derived from other surveys in the weight adjustments.

**Table 3. Overview of external information used for weight adjustments in some existing household wealth surveys.**<sup>12</sup>

Country and survey	External information used in re-weighting
Germany 2006 Socio-Economic Panel (SOEP)	Age, gender, non-German nationality, region, community size, household size, home ownership status (Kroh, 2009)
Spain 2005 <sup>(*)</sup> Encuesta Financiera de las Familias	Gender, age by municipality size, and household size by municipality size (Bover, 2008)
France 2004 <sup>(*)</sup> Enquête Patrimoine	Age, socioeconomic status and education of the reference person, gender, household type and region (INSEE 2007)
Italy 2006 <sup>(*)</sup> Survey of Household Income and Wealth	Gender, age group, geographical area and size of the municipality of residence (Banca d'Italia 2008)
Austria 2008 <sup>(*)</sup> Household Survey on Housing Wealth	Province of residence, size of municipality, size of household (Fessler et. al. 2009)
Finland 2004 <sup>(*)</sup> Household Wealth Survey	Household size, age and gender, region, degree of urbanisation, income totals, number of income recipients, total amount of taxable wealth (Statistics Finland 2007)
United Kingdom 2006/08 Wealth and assets survey	Age and sex, region (ONS, 2009)

## 4. A case study with Finnish data

In this section, we study non-response bias and alternative re-weighting scenarios using the Finnish Household Wealth Survey 2004 which had an overall unweighted non-response rate of 34 percent. This wealth survey data set is particularly well suited for bias analysis because variables from administrative and statistical registers can be record-linked to the sample, including variables on taxable wealth, outstanding debt, and income.<sup>13</sup> Therefore, for all members of the sample we have identical measurements which are good proxies (but still only proxies) of the eventual survey variables. Finally, the Finnish Wealth Survey 2004 by and large complies with the requirements set

<sup>12</sup> Surveys marked with an asterisk are part of the HFCS.

<sup>13</sup> The wealth tax was abolished in Finland in 2006, so this is the last wealth survey data with the variable on taxable wealth available. The wealth tax has also been abolished in Austria, Germany, Luxembourg, the Netherlands, and Spain in recent years, leaving France and Greece as the only two euro area countries with a tax on net worth.

for the euro area HFCS<sup>14</sup>, such that the results may therefore complement the existing knowledge about non-response in wealth surveys.

The Wealth Survey 2004 sample is a stratified one-stage probability proportional-to-size sample, drawn in two phases. In the first phase, persons are drawn from the population register to create a fairly large master sample. Because the frame is sorted by domicile code (address), sampling is proportional to household size and there is implicit stratification by region. In the second phase, the final sample is drawn from the master sample, stratifying explicitly by type and level of income. The explicit stratification over-samples high-income households but in terms of wealth, the over-sampling is somewhat limited. Table 4 compares the over-sampling rate<sup>15</sup> in the Finnish survey with the Spanish Wealth Survey (EFF 2005) and the Italian Wealth Survey (SHIW 2006)<sup>16</sup>.

**Table 4. The degree of oversampling in the final sample: Spain, Italy and Finland**

	Net worth quantiles					Sample size, net
	Bottom 50 %	50 % to 90 %	90 % to 95 %	95 % to 99 %	Top 1 %	
Spain	0.75	0.85	1.61	2.83	8.99	5,962
Italy	0.94	1.06	1.08	1.07	1.16	7,768
Finland	0.83	1.07	1.49	1.67	1.59	3,455

Source: Bover (2008), Statistics Finland (2007), SHIW data 2006; authors' own calculations.

The permanent field interviewers of Statistics Finland attempted to contact the person selected from the population register. In this paper, the household characteristics from the registers are characteristics of this selected person. In responding households, the survey responses were sought from the person best aware of the financial situation of the household.

#### 4.1 Non-respondents in the Finnish Household Wealth Survey 2004

The basic descriptive breakdowns of non-respondents are included in Statistics Finland (2007), showing that non-response is higher in urban areas, in Southern Finland, among less educated households, and among middle income households. Remarkably, and contrary to what one might expect, non-response rates did not increase along the level of taxable wealth. This may be a survey-specific feature as response rates in the top decile of taxable wealth increased substantially compared with the previous 1998 survey.

In Table 5 we provide results of a model-based analysis of the determinants of non-response. One motivation is finding the variables most correlated with response propensities so that the re-weighting scheme could be designed to reduce the ensuing no-response bias.

Overall the (weighted) non-response rate is 33%, but there is significant variation across strata, age groups, regions, and education levels; women are also slightly more likely to participate. In particular, “farmers” (a category determined from the tax register) have a much lower than expected probability of not responding, while city dwellers, as is common in other countries, have a higher than usual probability of not responding. Persons whose main language is neither Finnish nor Swedish (the two official languages in Finland) participate in the survey less often. Although

<sup>14</sup> The mode of collection is CAPI, survey has a representative probability sample stratified to over-sample high income households, and covers assets, liabilities, income, demographics, and employment.

<sup>15</sup> The oversampling rate is the number of responding households in the wealth range divided by the number of households one would expect if the sample was randomly drawn from the population (Bover, 2008).

<sup>16</sup> For the SHIW, wealthy households are not over-sampled.

not properly significant, other things being equal the propensity to respond increases with the education level.

**Table 5. Logit regression of non-response on personal characteristics**

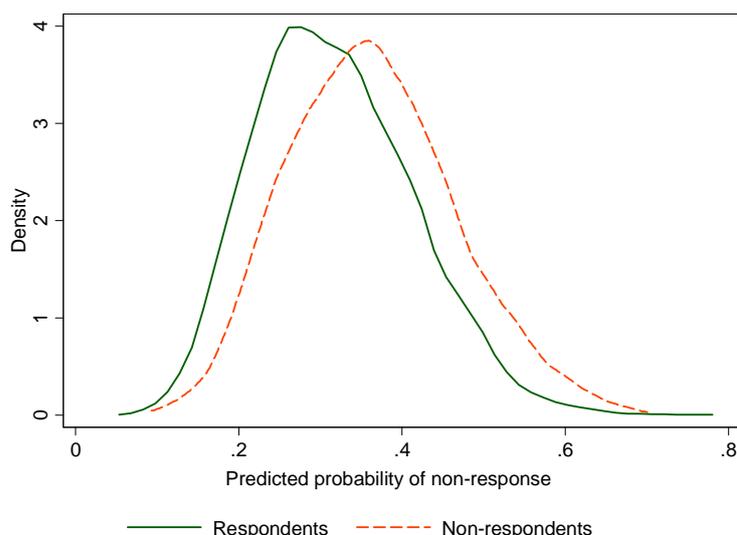
Variable <sup>17</sup>	Odds ratio	t-stat	Variable	Odds ratio	t-stat
Stratum 5 (self-employed 1)	0.717*	-1.71	Language:		
Stratum 6 (self-employed 2)	0.615*	-1.92	Swedish	1.080	0.47
Stratum 7 (farmers 1)	0.377***	-3.49	Language: Other	1.640**	2.31
Stratum 11 (other income 1)	0.773**	-2.19	ISCED 1	1.269**	2.51
Helsinki	1.368***	2.96	ISCED 5	0.930	-0.57
Helsinki region	1.528***	3.51	ISCED 6	0.797	-1.38
Other main cities	1.276**	1.96	ISCED 7	0.794	-1.44
Male	1.129	1.49	ISCED 8	0.568	-1.28
Age: 16-24	0.438***	-5.06	Debt decile 5	0.914	-0.69
25-34	0.750**	-2.07	Debt d6	0.672***	-2.92
35-44	1.108	0.82	Debt d7	0.838	-1.23
55-64	0.858	-1.15	Debt d8	0.714**	-2.23
65-74	0.712	-1.54	Debt d9	0.849	-1.05
75+	0.578***	-2.29	Dividend decile 7	0.813	-1.16
			Dividend d8	0.672**	-2.20
			Dividend d9	0.670**	-2.20

Source: Statistics Finland, Wealth Survey 2004. Authors' calculations. Logit regression of non response on other variables; out of scope persons were excluded; design weights were used. An odds-ratio above one indicates that persons with this characteristic have a higher probability of not responding, other things being equal; since all variables in this table are indicator variables, marginal effects can be computed by taking the natural logarithm of the odds ratio. Number of obs.: 5,155. The sign \* (respectively \*\*, \*\*\*) indicates that the coefficient is significant at the 10% level (respectively, 5%, 1%). Omitted category: Households in stratum 1 (households with wages and salaries), in rural areas, whose selected person is female, 45 to 54 years old, speaks Finnish, has education level ISCED 3, no debt and receives no dividends. Additional variables not presented in this table and not significant: other strata, household size, and deciles for total income, wealth, capital income and other income.

The only wealth-related variables to be significant in the logit regression are indebtedness and the existence of dividend income; *ceteris paribus*, indebted households and those receiving some kind of dividend income tend to participate more in the survey. However, the logit regression is only marginally successful in explaining non-response, as the percentage of variance explained is low.

The propensity score, calculated as the predicted probability of participating in the survey, is shown in Figure 1 for the respondents and the non-respondents. The support of this distribution is [0.1;0.8], and the propensity score of the respondents strictly dominates the score of non respondents at all levels. Although this propensity score could be used to adjust the design weights to compensate for non-response, in practice this approach may not be that common in the HFCS surveys. Therefore, in this paper the weights are only adjusted on the basis of homogenous response groups.

<sup>17</sup> Stratification: 1-4 = wages and salaries (four income categories); 5-6 = self-employed; 7-8 = farmers; 9-10 = pensioners; 11-12 = other income sources



**Figure 1: Kernel density estimate of the predicted probability of not responding**

#### 4.2 Non-response bias in sample means of income, debt and wealth

Within a survey, different estimates may have variation in their unit non-response bias depending on the correlation between variables and response probabilities. Some of the important outputs of the euro area survey are expected to be debt, wealth and income levels as well as their ratios (leverage ratios) by population subgroups. Table 6 shows the means of register-based disposable income, debt, and taxable wealth<sup>18</sup> for respondents, the difference between respondents and non-respondents, and the relative difference with respect to design-weighted estimates of the whole eligible sample, which is labelled here as “relative bias”.

**Table 6. Disposable income, debt and taxable wealth: weighted means (euro / household) for respondents and non-respondents; relative bias due to unit non-response**

Age	Non-response	Disposable income			Debt			Wealth		
		Weighted share	R	R-NR	Relative bias	R	R-NR	Relative bias	R	R-NR
All	34%	28,913	-680	-1%	14,119	477	1%	26,784	2388	3%
16-24	30%	25,096	-5,265**	-6%	4,949	2,391**	15%	2,510	-108	-1%
25-34	32%	30,122	2,796**	3%	27,824	5,358**	6%	14,346	3,529**	8%
35-49	38%	35,847	93	0%	25,632	1615	2%	27,166	2555	4%
50-64	34%	32,169	1099	1%	9,931	947	3%	39,400	5341	5%
65-	31%	19,563	-114	0%	1,419	-499	-11%	35,178	2813	2%

Source: Statistics Finland Wealth Survey 2004, authors' calculations.

Note: R = respondents, NR = non-respondents. \*\* = difference statistically significant at 5 % level. Weights: Design weights.

<sup>18</sup> In terms of levels, taxable wealth is not a good proxy of household wealth because of undervaluation of assets in taxation and imperfect coverage of certain asset types (e.g. savings in interest-bearing accounts). The correlation with the survey variables is strongly positive, however. Register-based debts seem to underestimate somewhat the debts recorded in the survey while disposable income is a near perfect proxy of household disposable cash income.

Overall, there appears to be a small downward bias in disposable income and upward bias in debt and wealth levels due to unit non-response, but the differences between respondents and non-respondents are not statistically significant. In the age group 25-34, the differences are statistically significant and there is an upward bias in means of all three variables. In the age group 16-24, we see a downward bias in income and upward bias in liabilities. Note that these age groups have in fact higher response rates than other groups so the bias derives from differences between those who respond and those who do not, i.e. not from non-response levels but rather from non-response selectivity. For the other age groups, the hypothesis of equal means of responding and non-responding households cannot be rejected.

### 4.3 Alternative re-weighting scenarios and non-response bias in the Finnish survey

The table above used design weights for the whole eligible selected sample. We now limit ourselves to register-based debt and compute estimates with alternative weights for the respondents. The reduction in non-response bias due to re-weighting is evaluated as the difference between estimates obtained for the responding sample from those obtained with design weights for the whole eligible sample.

Specifically, we compare the indicators across the different weighting scenarios shown in Table 7.<sup>19</sup>

The first calibration uses basic population level variables that seem to be available in many countries: age and gender, region and household size. This model is here taken to represent the likely minimum set of common variables which potentially could be used in all euro area countries. The second calibration model extends the information set by bringing in education (ISCED of selected respondent), language (Finnish/Swedish/Other), share of indebted households, and total amounts of income, debt, and taxable wealth.

**Table 7. Re-weighting scenarios used in this study**

<b>Weight</b>	<b>Construction</b>
Weights adjusted for non-response at sample level	Non-response correction with within strata response rates (Homogeneous response groups)
Calibrated weights I, “euro area” variables	Age (5-year bands) and gender, region/density (4 categories), household size (6 categories)
Calibrated weights II, extended calibration	Age (5-year bands) and gender, region/density (4), household size (6), education (6), language (3), indebtedness (2), total amount of taxable wealth, total amount of debt, total amount of income

The key question is whether there are substantial differences between the basic “euro area”-model (age and gender, household size, region) and the more extended model – that is, whether the amount of auxiliary information could have some bearing for cross-country comparability of the estimates.

In the re-weighting, the weights are calibrated to marginal distributions derived from the whole eligible sample using the design weights. The aim here is to show whether different information sets help reduce non-response bias. For this reason and because many variables exist for non-respondents as well, taking margins from the design-weighted sample seems a more

<sup>19</sup> The actual weights used in the HWS 2004 use information from three sources: master sample (household size), another survey (age of household head and total number of households from EU-SILC), and administrative and statistical registers (total amount of income and number of recipients for several types of income, total amount of taxable wealth).

transparent choice. In reality, the weights have been calibrated to marginal distributions derived from external sources.<sup>20</sup>

Table 8 presents the results, showing relative bias and estimated standard errors<sup>21</sup> of means for the re-weighting schemes.

**Table 8: Impact of re-weighting on register-based debt, relative bias and standard errors**

	Design weights, unadjusted		HRG adjusted weights		Calibration: "euro area" variables		Calibration: extended model	
	Mean, eligible sample	Relative bias, respondents	Relative bias	Standard error, %	Relative bias	Standard error, %	Relative bias	Standard error, %
All	13,835	1.3%	0.6%	3.4%	1.9%	3.2%	0.0%	0.0%
16-24	4,110	13.6%	13.3%	16.7%	14.2%	16.9%	10.3%	16.2%
25-34	26,090	6.2%	5.8%	5.9%	6.4%	5.9%	6.1%	5.0%
35-49	24,899	2.7%	2.0%	5.1%	0.8%	4.9%	-0.3%	3.8%
50-64	9,559	3.4%	3.2%	7.8%	5.4%	8.0%	1.5%	7.7%
65+	1,561	-10.5%	-11.9%	17.3%	-10.9%	17.6%	-19.0%	17.6%
<i>Properties of sample and weights</i>								
Sample size	5,226	3,455	3,455		3,455		3,455	
Sum of weights	2,387,166	1,592,592	2,455,425		2,387,166		2,387,166	
CV of weights	74.1	74.1	75.1		78.0		79.2	

The results are not particularly encouraging in terms of removing unit non-response bias observed in the age groups 16-24 and 24-34 years. Simple adjustment with within-strata response rates seems to perform even better than calibration to basic key variables; calibration to the “euro area” variables does not improve the estimates and does not bring any efficiency gains in this sample. Likewise, the extended model is unable to remove the bias within the age groups although it does perform somewhat better than the other weighting alternatives.

The extended calibration uses total debt amount and household size distribution in the calibration. Consequently, by definition, there is neither bias nor variance in the estimate of mean debt for all households – with this re-weighting scheme the results would always be the same, irrespective of the sample at hand. Within age groups, the gains in efficiency are considerably smaller.

## 5. Conclusions

Given the importance of wealthy households for the analysis of the wealth distribution and their overall lower tendency to participate in surveys, non-response in wealth surveys is an issue that needs to be carefully addressed. We have discussed how good interviewing practices can be put in place during the fieldwork to increase participation. The effectiveness of such practical recommendations may be limited though in the absence of an external source of micro-level information on wealth supporting the sample design (at a moment in which wealth taxes are being abolished in most European countries) that could permit adopting differentiated contact strategies vis-à-vis different household groups (e.g. the wealthy).

After data have been collected, the impact of non-response can be reduced by re-weighting the sample in order to correct for the differential response rates across sample frame categories or

<sup>20</sup> Re-weighting was done with Calmar 2 SAS-macro using the raking ratio method (M=2).

<sup>21</sup> Standard errors are based on 1000 bootstrap re-samples. Weights of every resample were calibrated according to the appropriate calibration model.

by calibrating on external information. In the context of the Eurosystem Household Finance and Consumption Survey, this external information is likely to be limited to age, gender, household size, and some geographical information, and it is unclear whether this limited information will be sufficient to correct for non-response bias affecting wealth variables.

To provide an insight, we use data from the Finnish Wealth Survey 2004, which contains register data on income, taxable wealth, debts and other personal data, and analyse non-response process and different re-weighting strategies. The key messages from this case study can be summarised as follows. First, in this sample and for these indicators, and in contrast with results from other wealth surveys, unit non-response did not increase with wealth, after controlling for demographic characteristics. Second, non-response bias was perhaps smaller than expected; in the case of people below 35 years, there is a statistically significant non-response bias in income and debt even though non-response rates are actually lower for this age group. Third, the standard adjustment procedure, i.e. making first naïve adjustment at sample level and then calibrating to population margins, did not do much to reduce the non-response bias observed in certain age groups. Finally, the different calibration approaches shown here using different levels of auxiliary information did not bring forward sizeable differences. For the specific case of a cross-national survey such as the HFCS, these results may suggest that different country approaches as to the number of variables used for calibration may not have substantial effects on cross-country comparability.

Re-weighting in the case study did not lead to a significant non-response bias reduction. However, the exercise itself was only possible because register information was available that enabled measuring non-response bias and analysing possible adjustments. In turn, this paper illustrates the value of maximising the amount of information available beforehand to design the sample as well as of disposing of accurate external information to calibrate survey results ex-post. Such supporting information ultimately become essential for assessing the relevance and the precision of the collected data, and this may hold especially true in the context of a cross-national survey such as the HFCS.

## REFERENCES

- Bover, O. (2008) “The Spanish Survey of Household Finances: Description and methods of the 2005 Wave”, Occasional paper No 803, Banco de España  
<http://bankofspain.net/informes/be/ocasional/do0803e.pdf>
- Banca d'Italia (2008) “Household Income and Wealth in 2006”; Supplements to the Statistical Bulletin, Sample Surveys, Volume XVIII Number 7, 28 January 2008
- D'Alessio, G. and I. Faiella, “Non-response behaviour in the Bank of Italy's and Wealth”, Temi di discussione, Banca d'Italia n°462, 2002
- Fessler, P., P. Mooslechner, M. Schürz and K. Wagner (2009) “Housing Wealth of Austrian Households”, In: Monetary Policy & the Economy Q2/09. Vienna: OeNB. 104–124.  
[http://www.oenb.at/en/img/mop\\_2009\\_q2\\_analyses05\\_tcm16-141274.pdf](http://www.oenb.at/en/img/mop_2009_q2_analyses05_tcm16-141274.pdf)
- Household Finance and Consumption Network (2008.a) “Oversampling the wealthy: eye for an eye, euro for a euro”, supplementary document 1.b of the HFCN report to the Governing Council  
<http://www.ecb.europa.eu/home/pdf/research/hfcn/Oversampling.pdf?f48e61056501e86404f80dcd0298d020>
- Household Finance and Consumption Network (2008.b) “Reducing non-response bias”, supplementary document 1.c of the HFCN report to the Governing Council  
<http://www.ecb.europa.eu/home/pdf/research/hfcn/Nonresponse.pdf>

- INSEE (2007), La méthodologie de l'enquête Patrimoine 2004  
<http://www.insee.fr/fr/methodes/sources/pdf/Patrimoine.pdf>
- Kennickell, A. B. (2009), "Getting to the Top: Reaching Wealthy Respondents in the SCF", Paper prepared for the 2009 Joint Statistical Meetings, Washington, DC  
<http://www.federalreserve.gov/Pubs/oss/oss2/papers/asa2005.5.pdf>
- Niemeläinen, S., T. Sandström, M. Säylä, V.-M. Törmälehto (2006) "Housing Wealth in Finland", 29th General Conference of The International Association for Research in Income and Wealth, Joensuu, Finland, August 20 -26, 2006 [http://www.iariw.org/papers/2006/sami\\_paper.pdf](http://www.iariw.org/papers/2006/sami_paper.pdf)
- Office for National Statistics (2009), "Wealth in Great Britain: Main Results from the Wealth and Assets Survey 2006/08" [http://www.statistics.gov.uk/downloads/theme\\_economy/wealth-assets-2006-2008/Wealth\\_in\\_GB\\_2006\\_2008.pdf](http://www.statistics.gov.uk/downloads/theme_economy/wealth-assets-2006-2008/Wealth_in_GB_2006_2008.pdf)
- Von Rosenblatt, B., N. Sigel, S. Stimmel and F. Strutz (2007) "SOEP 2006 Erstbefragung der Ergänzungsstichprobe H.", Methodenbericht TNS Infratest. June.  
[http://www.diw-berlin.de/documents/dokumentenarchiv/17/83169/meth\\_2006\\_h.pdf](http://www.diw-berlin.de/documents/dokumentenarchiv/17/83169/meth_2006_h.pdf)
- Kroh, Martin (2009): "Short-Documentation of the Update of the SOEP-Weights. 1984-2008".  
[http://www.diw.de/documents/dokumentenarchiv/17/diw\\_01.c.342852.de/soep\\_weights\\_shortdocu.pdf](http://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.342852.de/soep_weights_shortdocu.pdf)
- Statistics Finland (2007): "Kotitalouksien varallisuus 1998-2004". (Household Wealth 1998-2004, in Finnish with English summary). Official Statistics of Finland, Income and Consumption.