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NON-RESPONSE BEHAVIOUR IN THE BANK OF ITALY'S SURVEY OF HOUSEHOLD INCOME AND WEALTH

by Giovanni D'Alessio and Ivan Faiella*

Abstract

This paper aims to describe non-respondents in the Bank of Italy's Survey of Household Income and Wealth (SHIW) and to measure the underestimation of income and wealth attributable to non-response. The evidence confirms that non-response is not random, since it is more frequent among wealthier households. Therefore exclusive use of post-stratification procedures based on demographic characteristics only, which are commonly employed, cannot properly adjust for the selection process observed in the SHIW. As to the estimates of average aggregates, the bias seems to be greater for financial assets (the adjusted estimates are from 15 to 31 per cent higher than the unadjusted) than for income (for which the adjustments vary from 5 to 14 per cent, probably owing to a greater asymmetry in the distribution of wealth.

JEL classification: C42, C81, C93, D31.

Keywords: Non-response, non-sampling errors, sample surveys, income, wealth.

Contents

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1 Introduction[1]

In sample surveys on income and wealth it is quite common to observe a severe underestimation of sample estimates compared with those derived from the national accounts or flow of funds (Antoniewicz, 2000; Davies and Shorrocks, 2000; Wolff, 1994; Avery et al., 1988; McNeil and Lamas, 1989; Hayashi et al., 1988).

Several studies have shown that in the Bank of Italy's Survey of Household Income and Wealth (SHIW), some sample estimates also fall short of corresponding out-of-sample aggregate figures.

A study of the surveys conducted up to 1995 (Brandolini, 1999) suggests that they understate income from interest and dividends and self-employment income more than they do income from transfers and salaried employment. The percentage of understatement varies from one survey to the next. On average, the survey estimates are about 70 per cent lower than the corresponding national accounts figure for interest income, 50 per cent lower for self-employment income and 20 per cent for income from salaried employment. By contrast, actual and imputed rents appear to be about 10 per cent overstated.

As to wealth, previous studies (Cannari and D'Alessio, 1990) indicate that the value of dwellings is understated by about 20 per cent. This appears to be mainly due to a failure to report second homes. Financial assets seem to be under-reported by a larger amount. Overall, the estimate that emerged from the 1998 survey was only 22 per cent of the corresponding item in the financial accounts, although the latter also includes assets of non-profit institutions[2]. The underestimation of cash and bank or postal deposits is smaller than that of shares, bonds and investment fund units (Cannari and D'Alessio, 1993; Cannari, D'Alessio,

[1] We wish to thank Andrea Brandolini, Luigi Cannari, Luigi Federico Signorini and an anonymous referee for their valuable suggestions.

[2] The aggregate figures are themselves subject to measurement errors and the aggregate financial balance sheet is especially uncertain for the household sector, which is typically calculated "residually" by deducting the holdings of all other institutional sectors from the total (Banca d'Italia, 2002).

Raimondi and Rinaldi, 1990).

Most of the studies mentioned show much of the gap between sample estimates and known totals is attributable to mis-reporting by households, that is, the interviewees fail to report partially (under-reporting) or totally (non-reporting) a certain item. Evidence of this phenomenon also emerged from the analysis of interviewers' opinions regarding the reliability of income and wealth data as provided by the SHIW respondents. Although satisfactory on average (7.6 on a scale ranging from 1 to 10), 25.2 per cent of the interviews are given a reliability score of less than 6. Presumably, figures provided by those households are seriously under-reported[3].

However, unit non-response, i.e. the failure of a selected sample unit to participate in the survey, is presumably also responsible for this underestimation[4]. Sample surveys on income and wealth, as well as other surveys on sensitive topics, are seriously affected by non-response (see Davies and Shorrocks, 2000). It is likely that non-response produces samples in which the wealthiest segments of the population are under-represented, thus generating biased estimates (see Cohen and Carlson, 1995).

Knowledge of the characteristics of non-respondents is not only useful for evaluating the quality of the survey and representativeness of the sample. The information can also be used to estimate the process leading from the selected (ex ante) to the observed (ex post) sample, making it possible to measure the bias ascribed to non-response and to produce adjusted estimates.

[3] Data provided by households judged unreliable by interviewers are not adjusted nor are those households removed from the sample.

[4] In general terms, non-response includes both unit and item non-response, the latter being the failure to obtain information on one or more specific questions. The present paper deals with unit non-response only.

Although, in general, it is not easy to obtain data for households who do not participate in the surveys, in recent years several studies have been devoted to analyzing of non-response in a large number of surveys. It is difficult to draw general conclusions from these studies as the extent of non-response and the way it affects different segments of the population is peculiar to each survey, reflecting the topics investigated and the operational aspects of data collection[5]. However, the great majority of published studies regarding social surveys shows that non-response cannot be assumed to be random, since it is correlated to characteristics such as age, educational level and social status[6].

As to the SHIW, Cannari and D'Alessio (1992), analyzing the attrition in the panel sub-sample, found that non-response characterizes households living in urban areas (mainly the 3 Italian cities with more than 1 million inhabitants) and those residing in the North. The participation rates decline as income rises and household size decreases. The relationship with the age of the head of the households is more ambiguous because the not-at-homes decline sharply with age while refusals and other forms of non-participation rise.

In this paper we will investigate non-response in the SHIW more closely, focusing on the impact of unit non-response on the estimates of income and wealth. After a brief description of the theoretical framework (section 2.1), measures of unit non-response for the SHIW are provided (section 2.2). In section 3, different estimates of a non-response function are presented and the corresponding adjusted estimates are thus compared with the

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[5] The non-response rate clearly depends on the number of call backs for the households not-at-home, the techniques employed for the refusal conversion and the methods used by interviewers to contact households. Moreover, different specific aspects are likely to have an impact on the non-response behaviour of households, such as the sensitiveness of the questions, the perceived usefulness of the survey, the notoriety of the institution conducting the survey and that of the company collecting the data.

[6] De Maio (1980) emphasizes that, most of the time, non-respondents are people living in urban areas, the elderly, the less educated and those belonging to a lower social class. These results are broadly confirmed by Elliot (1991) who shows that lower response rates are observed for single-person households, households living in London and that the response rate declines with age. As to the relation between participation and income, Kennickell and McManus (1993) observed a negative correlation between financial income and response propensity.

unadjusted ones. Finally, we deduce some preliminary results concerning the impact of the different strategies on the estimates. Section 4 concludes.

2 Unit non-response

2.1 The theoretical framework

In a sample design (municipalities and households), with unequal probabilities of selection of the second stage unit (households), it is quite common to use the Horwitz-Thompson (HT) estimator of the population mean:

$$\bar{y} = \frac{\sum_{i=1}^{N_r} w_i y_i}{\sum_{i=1}^{N_r} w_i} \tag{1}$$

where w_i is the inverse of the probability of selection of the i-th unit (p_i) and N_r is the number of responding units. This estimator is unbiased, since E(y) = m.

This simple scheme requires some adjustments when considering non-response.

Let us consider the case when some units, although sampled with a known probability of selection, do not participate in the survey. Denote y_r the values assumed by the variable y on the group of N_r respondents and y_{nr} the values assumed by the same variable on the unobserved group of N-N_r non-respondents. In this case the estimator (1) can be written as:

$$\hat{\bar{y}} = \frac{N_r}{N}\bar{y}_r + \frac{N - N_r}{N}\bar{y}_{nr} \tag{2}$$

whose expected value is:

$$m = l\,m_r + (1 - l)\,m_{nr} \tag{3}$$

where l is the response rate, i.e. the share of responding units in the population, and m_r and m_{nr} are the population means of the responding and the non-responding units respectively.

Equations (2) and (3) show that the estimator $\bar{y}_r$ commonly used ignoring the non-

response (i.e. the first term of equation (2)), is a biased estimator of m, with an approximate bias (Little and Rubin, 1987):

$$E(y_r) - m = (1 - l)(m_r - m_{nr}) \tag{4}$$

The magnitude of non-response error depends both on the non-response rate 1-l and on the difference between m_{r} and m_{nr}. When non-response occurs, the estimator $\bar{y}_r$ computed on respondents is biased unless the assumption that $m_{\mathrm{r}} = m_{\mathrm{nr}}$ (equivalent to a random pattern of non-response) holds. It is only under such a hypothesis that non-response does not affect the estimate although it always affects the sample size.

In household surveys, however, we can seldom assume that non-respondents are totally random. Therefore, it is necessary to investigate who they are.

If the probability of responding of each household p_i were known, an unbiased estimator of the population mean could be obtained by extending the Horwitz-Thompson estimator (Little and Rubin, 1987):

$$\bar{y} = \frac{\sum_{i=1}^{N_r} w_i^* y_i}{\sum_{i=1}^{N_r} w_i^*} \text{ where } w_i^* = \frac{1}{p_{\,i}\, p_i} \tag{5}$$

to include both the probability of being included in the sample (p_i) and the actual propensity to participate in the survey (p_i)[7].

[7] This approach rests on the hypothesis that non-response is the outcome of a random variable. If non-response were an attitude of individuals, non-respondents could never be observed (at least in sample surveys) and stronger hypotheses should be made to overcome this lack of information.

In practice, household surveys cannot be replicated several times to obtain individual probabilities of responding. At best, one can rely on a few contacts with the same household under approximately the same conditions[8]. In that case the response probabilities can be estimated by grouping the units into cells or by applying models to derive a probability for certain kinds of household (see Oh and Scheuren, 1983)[9].

It must be mentioned however that, especially when a model for the estimation of the response probability is employed, the estimator (5) may have an extremely high variance because units with a very low probability to participate have a large non-response weight, with the risk of an unduly strong effect on estimates.

2.2 Unit non-response in the SHIW

The Bank of Italy has carried out a sample survey on household income and wealth since the 1960s to gather information on households' economic behaviour at a microeconomic level[10].

The sample consists of about 8,000 households, selected with a two stage stratified sample design. In the first stage, municipalities are stratified by size and region; they are then drawn with a PPS (Probability Proportional to Size) selection method (with the exception of the provincial capitals and all the municipalities with more than 50,000 inhabitants which are all included in the sample). In the second stage, households are randomly selected from

[8] The interviewers are requested to contact the assigned household at different times and on different days.

[9] Of course, the modified estimator (5) is unbiased only if the grouping (or the model) fully explains the non-response behaviour or, in other words, if the difference between the means m_r^g and m_{nr}^g within the g-th group (or conditioned to the model) can be assumed to be negligible.

[10] A broader description of the characteristics of the SHIW can be found in Banca d'Italia (2000).

administrative records in each municipality[11].

To properly analyze households' economic behaviour over time and improve the efficiency of estimates of both levels and changes, since 1989 a share of the sample (from 30 to 45 per cent) has consisted of households already interviewed in the previous survey (panel sample).

For each household the probability of selection p_{hi} can be calculated, ex-post, according to the municipality (i) and stratum (h) to which it belongs. The weight w_{hi} is the inverse of the corresponding selection probability p_{hi}. A post-stratification process is then applied both to take into account the attrition in the panel and to ensure consistency between the sample estimates of the main demographic characteristics and the corresponding known totals (Banca d'Italia, 2000).

The extent of unit non-response in the SHIW is high. Table 1 shows that, even with a high variability mainly due to different operational procedures adopted over time, the net response rate rises some concerns about the unbiasedness of estimates, as it ranges from 33 to 58 per cent in the years between 1989 and 1998. In the last three surveys, increasing efforts to contain unit non-response[12] has greatly improved the rate although it still remains quite low.

Information on the characteristics of non-responding households can be inferred by analyzing the effort devoted to obtaining the interview from responding household. Table 2 shows the number of contacts needed to obtain an interview in the 1998 survey according to the characteristics of the households[13].

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[11] In order to reduce the variability of weights, the sample size is almost constant within the secondary units, with the exception of municipalities with more than 400,000 inhabitants.

[12] Households who refuse the interview are re-contacted by the market research company to try to convince them to participate in the survey; panel households are also traced in case they have changed address.

[13] The interviewers were asked to fill in a 'contact sheet', providing some information about non-respondents and the attempts made to obtain response from interviewed households.

Table 1

RESPONSE RATE IN THE SHIW (1987-1998)
(percentages)

Year	Response rate (a)
1987	64.3
1989	38.4
1991	33.2
1993	57.8
1995	56.9
1998	43.9

Sources and notes: Brandolini (1999) and Banca d'Italia (2000); (a) Ratio of responses to selected households net of ineligible units.

On the whole, in order to conduct the 7,147 interviews, interviewers made a total of 10,712 contact attempts, including 8,358 personal visits and 2,354 telephone calls (the latter were made solely to fix an appointment). The difficulty of obtaining an interview increased with income, wealth and the educational qualification of the head of the household. It was less difficult to obtain interviews in smaller municipalities, with households of small size and where the head of the household was retired or female (Table 2)[14].

In order to provide more reliable estimates of the effects of unit non-response on sample estimates, a specific experiment was carried out in the 1998 SHIW. A supplementary sample of about 2,000 households, clients of a leading commercial bank, were contacted for the interview and 513 of them were actually interviewed[15].

For those out-of- sample households, data on financial assets were acquired. In order to allow a more precise comparison between survey and out-of-survey data, the questionnaire included a special section designed to provide more detailed information on the distribution of financial assets among household members.

[14] Similar results were obtained in the 1995 survey.

[15] The supplementary sample was drawn from a list of clients following a stratified random sample method; in order to allow more efficient estimates, the sampling rate was higher for richer households.

Table 2

CONTACTS AND INTERVIEWS IN SHIW 1998

(number, minutes, score on scale of 1-10)

Characteristics*	Phone contacts	Visits	Total contact attempts	Households	Contact attempts per 100 households	Average length of interview	Response reliability
Gender							
male	1,835	6,329	8,164	5,411	150.9	54.7	7.6
female	519	2,029	2,548	1,736	146.8	48.2	7.5
Age							
up to 30 years	66	381	447	318	140.6	49.8	8.0
31 to 40	416	1,464	1,880	1,218	154.4	53.5	7.9
41 to 50	584	1,871	2,455	1,582	155.2	55.6	7.8
51 to 65	774	2,641	3,415	2,259	151.2	55.5	7.5
over 65	514	2,001	2,515	1,770	142.1	48.3	7.3
Education							
none	77	603	680	522	130.3	42.5	7.1
elementary school	535	2,268	2,803	1,964	142.7	50.2	7.4
middle school	759	2,656	3,415	2,270	150.4	54.1	7.6
high school	719	2,144	2,863	1,811	158.1	56.4	7.9
university degree	264	687	951	580	164.0	58.6	7.9
Work status							
Employee							
blue-collar worker	347	1,339	1,686	1,148	146.9	53.5	7.8
office worker or school teacher	499	1,434	1,933	1,217	158.8	54.8	8.1
cadre or manager	152	411	563	352	159.9	59.5	8.1
total	998	3,184	4,182	2,717	153.9	54.9	8.0
Self-employed							
sole proprietor, member of arts or professions	167	558	725	454	159.7	59.5	7.6
other self-employed	185	722	907	596	152.2	57.9	7.1
total	352	1,280	1,632	1,050	155.4	58.6	7.3
Not employed							
retired	822	3,160	3982	2,763	144.1	50.1	7.4
other	182	734	916	617	148.5	49.8	7.3
total	1,004	3,894	4,898	3,380	144.9	50.1	7.4
Household size							
1 member	306	1,308	1,614	1,141	141.5	44.0	7.6
2 members	576	2,055	2,631	1,783	147.6	51.4	7.5
3 members	585	2,002	2,587	1,684	153.6	55.1	7.6
4 members	614	2,117	2,731	1,798	151.9	56.7	7.7
5 members or more	273	876	1,149	741	155.1	58.5	7.5
Number of earners							
1 earner	854	3,440	4,294	2,966	144.8	48.6	7.5
2 earners	1,096	3,623	4,719	3,119	151.3	54.4	7.7
3 earners	301	998	1,299	810	160.4	60.6	7.5
4 earners or more	103	297	400	252	158.7	67.2	7.7
Real net wealth							
up to 40 million lire	609	2,407	3,016	2,075	145.3	48.9	7.7
from 40 to 100 million	170	750	920	637	144.4	48.3	7.4
from 100 to 200 million	423	1,672	2,095	1,436	145.9	51.6	7.5
from 200 to 400 million	606	2,005	2,611	1,729	151.0	54.8	7.6
more than 400 million	546	1,524	2,070	1,270	163.0	62.1	7.8
Household income							
up to 20 million lire	217	1,221	1,438	1,046	137.5	43.4	7.2
from 20 to 40 million	612	2,641	3,253	2,285	142.4	48.8	7.5
from 40 to 60 million	609	2,039	2,648	1,762	150.3	55.2	7.7
from 60 to 80 million	412	1,232	1,644	1,028	159.9	58.6	7.8
more than 80 million	504	1,225	1,729	1,026	168.5	63.9	8.0
Town size							
up to 20,000 inhabitants	444	2,228	2,672	1,908	140.0	50.7	7.5
from 20,000 to 40,000	386	1,814	2,200	1,534	143.4	52.3	7.5
from 40,000 to 500,000	1,121	3,329	4,450	2,864	155.4	54.3	7.6
more than 500,000	403	987	1,390	841	165.3	56.4	7.9
Geographical area							
North	1,164	3,493	4,657	2,996	155.4	54.8	7.7
Centre	436	1,851	2,287	1,524	150.1	56.7	7.6
South and Islands	754	3,014	3,768	2,627	143.4	49.2	7.5
Total	2,354	8,358	10,712	7,147	149.9	53.2	7.6

(*) Referred to the head of household.

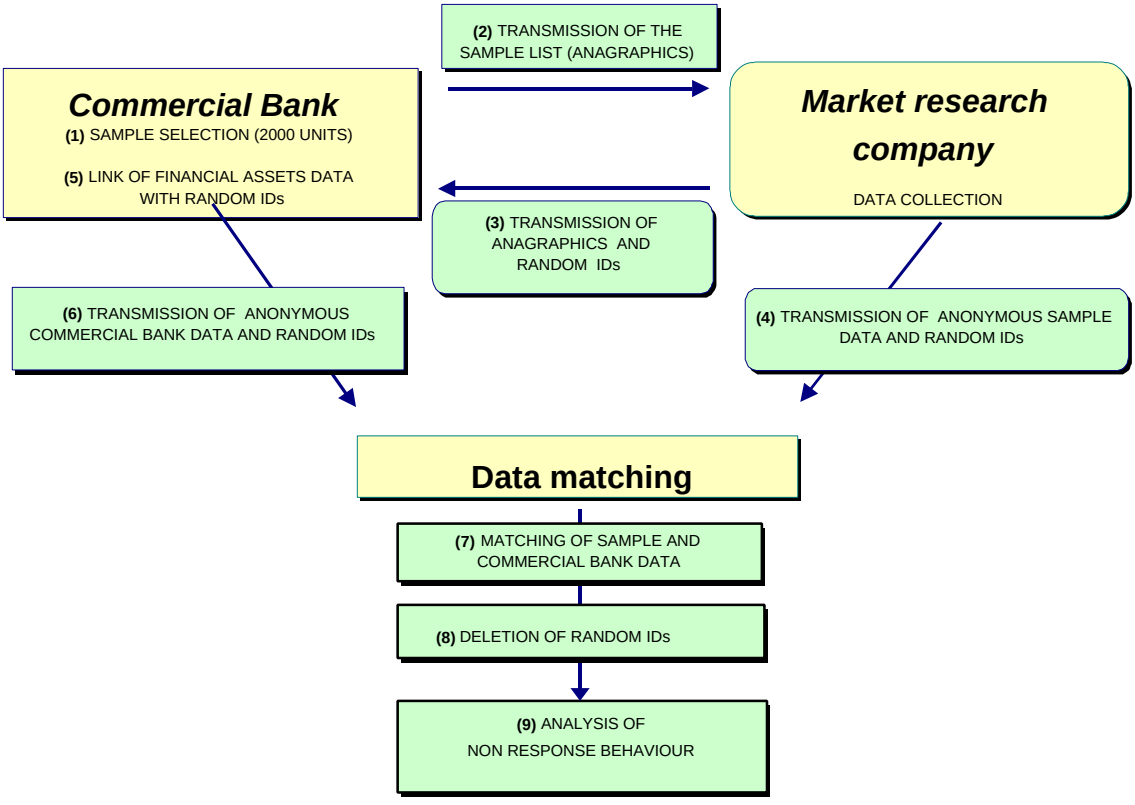
A strict protocol was devised to guarantee full protection of the respondents' confidentiality. The operators involved - the Bank of Italy, the market research company conducting the survey and the commercial bank - exchanged data in such a way that no one was able to identify the respondent (Figure 1).

The comparison between the characteristics of the sample of those who were actually interviewed and those who refused or were not found at home provides interesting information on nonreponse.

The response rate, approximately equal to 25 per cent for clients whose net financial wealth is up to 500 million lire, becomes 20 per cent for those from 500 million to 1 billion lire and 10 per cent for the wealthier clients (Table 3).

Figure 1

OUT-OF-SAMPLE DATA ON FINANCIAL ASSETS:
PROTOCOL TO PROTECT THE CONFIDENTIALITY OF RESPONDENTS



The unbalanced participation in the survey would produce severely underestimated average amounts of net financial wealth if – as is possible in usual surveys – they are computed only on respondents: the net financial wealth of the interviewed clients is significantly lower (58 per cent) than the corresponding amount of those who were not interviewed (Table 4). Although with a different level of significance, all the averages assets considered are underestimated if computed on respondents only, while the average liabilities of interviewed clients are correspondingly overestimated.

The Gini concentration index is also affected by non-response; it is equal to 0.758 for the interviewed clients compared with 0.787 of those who were not interviewed (Table 5).

The above results, although obtained on a sample which can be hardly considered representative of the Italian population, clearly show how non-response can affect estimates of household wealth. In the following paragraph we will try to model the non-response behaviour of households so as to derive adjusted estimates.

Table 3

PARTICIPATION RATE OF SUPPLEMENTARY SAMPLE BY NET FINANCIAL WEALTH

Net financial wealth(*)	Not interviewed	Interviewed	
	(units)	*(units)*	*Response rate (percentages)*
Up a 20 million lire	651	231	26.2
From 20 to 100 million lire	392	125	24.2
From 100 to 500 million lire.....	348	117	25.2
From 500 million to 1 billion lire.....	121	31	20.4
Over 1 billion lire	84	9	9.7
Total	1,596	513	24.3

Table 4

FINANCIAL ASSETS HELD BY HOUSEHOLD

Financial assets and liabilities	Not interviewed (a) *(thousands lire)*	Interviewed (b) *(thousands lire)*	Bias (b/a) *(percentages)*	t statistic (*)	p value
Deposits	35,740	18,186	50.9	2.505	0.0123
Bonds	75,782	44,599	58.9	2.291	0.0221
Shares	42,101	22,264	52.9	3.611	0.0003
Othe securities	30,779	13,431	43.6	3.235	0.0012
Mutual funds	61,311	52,473	85.6	1.179	0.2385
Managed savings	8,978	0	-	1.449	0.1474
Liabilities (-)	980	1,807	184.4	0.952	0.3416
Net financial wealth ...	253,711	149,147	58.8	3.665	0.0003

(*) Test of the difference (b) – (a) computed according to Satterthwaite's (1946) approximation.

Table 5

DISTRIBUTION OF HOUSEHOLD NET FINANCIAL WEALTH

Income tenths	Not interviewed			Interviewed		
	Decile (*'000 lire*)	Share of financial wealth (*percentage*)	Mean financial wealth (*'000 lire*)	Decile (*'000 lire*)	Share of financial wealth (*percentage*)	Mean financial wealth (*'000 lire*)
up to 1st decile	0	0.0	0	0	0.0	0
from 1st to 2nd decile	703	0.0	35	42	0.0	1
from 2nd to 3rd decile	8,526	0.2	4,854	5,450	0.2	3,815
from 3rd to 4th decile	18,976	0.6	13,542	15,484	0.8	11,567
from 4th to 5th decile	36,022	1.1	26,271	29,102	1.4	20,925
from 5th to 6th decile	69,607	2.2	51,383	62,326	2.9	44,536
from 6th to 7th decile	137,721	4.2	97,730	105,975	5.4	82,225
from 7th to 8th decile	331,912	9.9	228,625	235,000	9.5	144,662
from 8th to 9th decile	568,951	18.6	427,935	436,714	21.9	334,485
over the 9th decile	-	63.0	1,442,752	-	57.9	866,500
	Gini coefficient: 0.787			Gini coefficient 0.758		

3 Adjusting for unit non-response

3.1 Adjustment using internal information

A number of measures are usually taken to limit the potentially distorting effects of non-response. In the 1998 SHIW, households that had not been interviewed were replaced by

others randomly selected in the same municipality; moreover the sample was post-stratified on the basis of individual characteristics (sex, age and work status) to align the sampling distribution with external information.

This strategy aims to compensate for the different participation propensity of interviewees linked to the characteristics considered in the post-stratification (Madow, Nisselson and Olkin, 1983). Of course, different (and not correlated) sources of bias are not taken into account.

A first attempt to evaluate the bias in SHIW estimates attributable to non-response was made by Cannari and D'Alessio (1992) who, after analyzing the non-response behaviour on households in the second wave of the panel sub-sample (households interviewed in 1987, contacted for a further interview in 1989), expanded the results to the whole sample. With reference to the 1989 survey, the authors estimate that household income was understated by 5.4 per cent owing to non-participation.

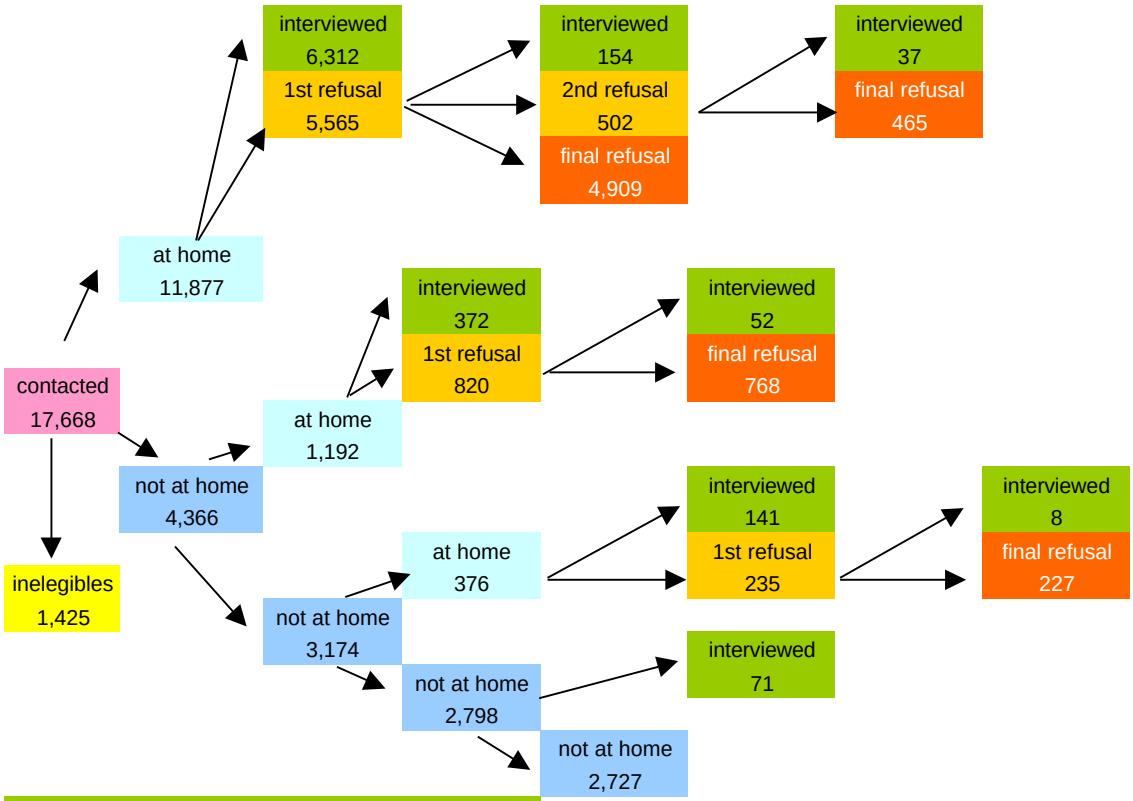
This approach cannot be considered fully satisfactory since it relies on the assumption that the attrition pattern in the panel component can be used to infer non-participation behaviour of households contacted for the first time. Actually, households' decision to participate in the survey may have been influenced by a previous interview and the estimation of the attrition pattern can shed light only on some aspects of non-response.

A different approach for the estimation of non-response behaviour can be adopted by considering the data collection process in the SHIW (Figure 2). From this scheme we observe that 88 per cent of sample households was interviewed at the first visit, while 9 per cent of sample households was interviewed only after they had not been found at home at a first (or a second) visit and 3 per cent of the sample households was interviewed after a refusal.

To shed light on the non-response bias it may be useful to compare income and wealth estimates according to these categories. Although the small sample size of some subgroups must be considered, a positive correlation appears between income and wealth and non-response behaviour: the households not-at-home and above all those who refused seem to have a higher income and wealth (Table 6).

Figure 2

DATA COLLECTION PROCESS IN THE SHIW 1998(*)



(*) Only personal contacts (*visits*) are considered. Minor paths have been re-classified.

An estimate of the bias due to non-response can be derived under the assumption that the households interviewed after not being found at home or after a refusal on a previous visit are a representative sample for the corresponding non-responding group in the first visit. Limiting attention to the first and second visit – so as to avoid both double refusals or double not-at-home and mixed cases such as interviews occurring after a refusal and a not-at-home – the 154 households interviewed after a first refusal are taken to represent the whole group of

5,565 households who gave a refusal at the first contact; the 372 households interviewed after having not been found at home on a first visit represent the group of 4,366 households not found at home on the first visit (Figure 2).

Table 6

INCOME AND WEALTH ESTIMATES OF DIFFERENT SUB-SAMPLES, 1998
(thousands of lire)

Interviewed	N	Income			Wealth		
		mean	standard error	median	mean	standard error	median
At the first contact.....	6,312	47,750	526	38,864	285,258	7,787	163,000
After 1 refusal	154	59,369	3,668	51,581	379,694	52,732	229,500
After 1 not-at-home.....	372	50,388	2,187	41,529	284,608	30,172	168,458
After 2 refusals.....	64	57,041	5,025	52,652	338,720	64,952	152,000
After 2 not-at-home.....	152	51,423	3,518	40,450	355,461	56,506	201,600
More refusals or not-at-home.	93	45,638	2,971	37,723	278,468	57,496	165,500
Total	7,147	48,272	494	39,259	289,328	7,309	165,500

Source: SHIW 1998.

An adjusted estimate can thus be obtained by re-weighting those households to arrive at the not-at-home and refusal rates observed at the first contact.

This sort of procedure would lead to highly variable weights (i.e. the weights of refusals should be multiplied by approximately 36 while those of not-at-home by 12) implying a larger variability of estimates. To avoid this drawback and improve the understanding of non-response behaviour one can estimate a non-response probability function on these data so as to weight the households by the inverse of the estimated propensity to participate, which is a much less variable factor.

In this connection it should be noted that Groves and Couper (1995) suggest modelling separately the not-at-home and the refusals to improve both the fit of the propensity to participate and the comparability of findings across different studies. The limited number of households interviewed after the refusal conversion was a serious constraint in adopting such an approach. We therefore estimated the probability of non-response as a whole, considering together the refusals and the not-at-home's (although re-weighted, as mentioned above, to

preserve the relative importance of the two factors). Due to the sample size, only the non-response behaviour at the first visit was considered (first three columns of Table 7).

The model fitted was of the form:

$$\log\left(\frac{q_i}{1-qi}\right) = a + b'x_i \qquad (6)$$

where q_i is the probability of not participating in the survey (at the first visit), x_i is a vector of characteristics, a is the intercept and b' is the vector of parameters.

Table 7

ESTIMATE OF NON-RESPONSE PROBABILITY, 1998

Variable	Model 1			Model 2		
	Parameter estimate	Standard error	Odds ratio	Parameter estimate	Standard error	Odds ratio
Intercept	-0.1462	0.4001	.	-0.5367	0.4047	.
Poorly educated°	-0.1338	0.0651	0.8750	-0.1260	0.0652	0.8820
Highly educated*	0.2757	0.1060	1.3170	0.2880	0.1064	1.3340
North*	0.6489	0.0716	1.9140	0.6300	0.0718	1.8780
South*	0.2591	0.0815	1.2960	0.2539	0.0816	1.2890
Small municipalities*	0.6209	0.0736	1.8610	0.6391	0.0740	1.8950
Age*	-0.0607	0.0120	0.9410	-0.0610	0.0120	0.9410
Squared age*	0.0005	0.0001	1.0010	0.0005	0.0001	1.0010
N. Of hh members*	0.0959	0.0241	1.1010	0.0932	0.0242	1.0980
Log of income*	0.1177	0.0323	1.1250	0.1096	0.0317	1.1160
Log of real wealth	0.0040	0.0062	1.0040	0.0066	0.0063	1.0070
Log of financial wealth*	0.0215	0.0066	1.0220	0.0180	0.0066	1.0180
Reliability score*	-	-	-	0.0640	0.0133	1.0660

N. of obs. 6838. ° Significant at a 5 per cent confidence level; * significant at a 1 per cent confidence level.

The estimated coefficients[16] show that non-response rises with school attainment, household size, income and wealth (although the coefficient of real wealth[17] is not significant)

[16] In the present and in the following analyses, the variables and the categories whose parameters were not significant have been dropped. For example, the models do not include among the covariates any work status dummy that ex-ante could be expected to influence non-response behaviour.

[17] Real wealth is defined as the amount of real assets (i.e. real property, business equities and valuables) net of liabilities.

and it is higher in the North, whereas it decreases with municipality size. As to age, non-response decreases up to 60 years and then increases.

The results seem to confirm that, *ceteris paribus*, wealthier households have a lower propensity to participate in the SHIW[18].

In this connection it should be observed that income and wealth could not be correctly measured owing to non-reporting and under-reporting behaviour. To control for this effect we can introduce into the model the score attributed by the interviewer to the reliability of income and wealth figures declared by households (model 2).

We observe a substantial stability of the coefficients considered in the previous model while the coefficient of the reliability score, which is highly significant, has a positive sign, i.e. a lower participation probability is associated with a higher degree of reliability (last three columns of Table 7). This suggests that households adopt non-response and non-reporting as alternative strategies to face a survey about sensitive topics.

Once the model has been fitted, it is possible to derive the weights w_i^* of the modified HT estimator and the non-response adjusted estimates[19].

As expected, income and wealth adjusted estimates are higher than unadjusted estimates; the correction effect is smaller for income and real wealth (7 and 8 per cent) and is greater for financial assets (15 per cent). (Table 9). These results are similar to those obtained by Cannari D'Alessio (1992), where income underestimation due to non-response was evaluated at 5.4 per cent (for SHIW 1987).

Although in a different form from the approach applied by Cannari and D'Alessio (1992), this method also has a number of limitations stemming from the hypothesis that

[18] Similar results are obtained by Kennickell and McManus (1993) who observed a negative correlation between financial income and response propensity. The authors also observed a positive effect on response of non-taxable income; this result suggests a relation between non-response and tax evasion.

[19] Adopting the same procedure used in the standard estimates, the adjusted weights are post-stratified so as to align the sampling distribution of certain individual characteristics (sex, age and work status) with the distributions of the population derived from external sources.

households interviewed after they were found not at home in the first visit or after they refused are representative of non-response households as a whole.

An alternative estimate can be obtained by adopting a model similar to that proposed by Thomsen and Siring (1983)[20]. The rationale behind the model is the following. Let p_i be the household probability to participate once contacted for the interview. Under the assumption that the propensity to participate does not change from one contact to another but for a fixed effect d depending on operational aspects, the probability to participate at the second contact can be written as $(1-p_i)d\,p_i$. Information on non-response behaviour can therefore be derived from a comparison between the group of those who responded at the first contact and those who responded at the second contact. The ratio of the probability of belonging to the second group to the probability of belonging to the first group of households is thus an estimate of d times the probability of non-response and can be modelled as follows:

$$\log\left(\frac{(1-p_i)d\;p_i}{p_i}\right) = a + b'x_i \qquad (7)$$

Knowledge of the coefficient d, which is unnecessary for the analysis of the relative non-response attitude among the units, is required for the estimation of the individual participation probabilities.

It is worth noting that the coefficient d is related to the response ratios obtained in the first two contacts. Let us define the response rates in the first and the second contact respectively as:

$$R_1 = \frac{\sum_i p_i}{n} \text{ and } R_2 = \frac{\sum_i dp_i(1-p_i)}{\sum_i (1-p_i)} \qquad (8)$$

Given that:

[20] In the remaining part of the paper this approach will be labelled the Thomsen and Siring (TS) method.

$$R_2 = d\,\frac{\sum_i p_i / n - \sum_i p_i^2 / n}{(1 - R_1)} \text{ and } \sum_i p_i^2 / n = VAR(p_i) - \left(\sum_i p_i / n\right)^2 = VAR(p_i) - R_1^2$$

the response rate at the second contact can be written as:

$$R_2 = d\left(R_1 - \frac{VAR(p_i)}{1 - R_1}\right), \tag{9}$$

where $VAR(p_i)$ is the variance of probabilities among households.

From the equation (9) it follows that, in absence of a fixed effect (i.e. $d = 1$), R_1 is always greater than R_2 unless all households have the same probability of participating ($VAR(p_i) = 0$). In that case $R_1 = R_2$. More in general, for given d and R_1, the higher the variance the lower is the value of R_2. In the extreme case in which the variance reaches its maximum value $VAR(p_i) = R_1(1-R_1)$ (i.e. households have only probabilities equal to 0 or 1), R_2 becomes 0 (i.e. only households with probability equal to 0 remain in the second contact).

The parameters a, b and d of the model (7) have been jointly estimated through an iterative procedure allowing the constraint in the equation (9) to be respected[21].

Starting with $\hat{d} = 1$, a non-response model provides the estimate $VAR(\hat{p}_i)$, i.e. the explained sum of squares of the model, which in turns provides a new estimate of $\hat{d}$ until a convergence between the estimate of $VAR(\hat{p}_i)$ and $\hat{d}$ - compatible with the observed response rates R_1 and R_2 - is achieved[22].

The process leads to an estimated $\hat{d} = 0.167$, with the parameters shown in Table 8, and to the corresponding participation probabilities whose variance, compatible with the observed response ratios R_1 and R_2, is $VAR(\hat{p}_i) = 0.0436$.

[21] From equation (9) it follows that the parameter d cannot be estimated since $VAR(p_i)$ is unknown and, on the other hand, $VAR(p_i)$ cannot be estimated without knowing d.

[22] The estimates of $VAR(p_i)$ through the explained portion of variance only should not influence the estimates of the means of income and financial assets because the model residual sum of squares are, by definition, orthogonal to the explanatory variables included in the model.

The adjusted estimates are higher than those computed with the previous procedure: the magnitude of the correction is 14, 21 and 31 per cent for income, real and financial assets respectively (Table 9).

Table 8

ESTIMATED PROBABILITY OF NON-RESPONSE, 1998
(Thomsen and Siring model)

Variable	Parameter estimate	Standard error	Wald χ^2	Pr > χ^2	Standard. estimate	Odds ratio
Intercept	-1.1360	0.3403	11.1466	0.0008	.	.
Poorly educated	-0.1137	0.0567	4.0205	0.0450	-0.033995	0.893
Highly educated	0.1760	0.0909	3.7495	0.0528	0.030016	1.192
North*	0.4878	0.0648	56.7509	0.0001	0.157081	1.629
South*	0.3263	0.0720	20.5587	0.0001	0.098217	1.386
Small municipalities*	0.5061	0.0621	66.4538	0.0001	0.113419	1.659
Age*	-0.0418	0.0103	16.3548	0.0001	-0.426566	0.959
Squared age*	0.000349	0.000094	13.8636	0.0002	0.400484	1.000
N. Of hh members*	0.0969	0.0206	22.0373	0.0001	0.082039	1.102
Log of income °	0.0626	0.0263	5.6689	0.0173	0.047260	1.065
Log of real wealth °	0.0156	0.00568	7.5782	0.0059	0.049903	1.016
Log of financial wealth	0.0115	0.00574	4.0198	0.0450	0.033584	1.012

Response rates: $R_1 = 0.39$ $R_2 = 0.055$

Further parameters: $\hat{d} = 0.167$; $VAR(\hat{p}_i) = 0.0436$

N. of obs. 6838. ° Significant at a 5 per cent confidence level; * significant at a 1 per cent confidence level.

The higher adjustments obtained by this model compared with the other models presented in this section area attributable to the different role played by the households who refused or that were not found at home after the first visit. While the other models consider these households representative of all the non-responding households, the latter model takes into account the fact that they provide only an partial image of all the non-respondents because, after all, they have participated in the survey; the effects of the corresponding adjustments are therefore stronger.

Table 9

INCOME AND WEALTH: ADJUSTED AND UNADJUSTED ESTIMATES, 1998
(thousands lire)

	Unadjusted	Internal information (model 2)		Thomsen and Siring model	
		Adjusted	Ratio	Adjusted	Ratio
	(a)	(b)	(b) / (a)	(c)	(c) / (a)
Income	48,272	51,747	1.07	55,019	1.14
Real assets	253,855	272,965	1.08	306,457	1.21
Financial assets.....	46,784	53,979	1.15	61,338	1.31

3.2 Adjustment using external information

An alternative estimate of non-response behaviour can be based on the information of the supplementary sample. On a sample of about 2,000 clients of a leading commercial bank contacted for the interview (for whom the amount of financial assets held at that bank was available), 513 were actually interviewed with their households. For the respondents, all the information collected in the SHIW was also available; for non-respondents only financial assets held are available.

In order to estimate the probability of non-response, conditional on the financial assets held by the household, a logit function was estimated:

$$\log\left(\frac{q_i}{1-qi}\right) = a + b\ FA_i \qquad (10)$$

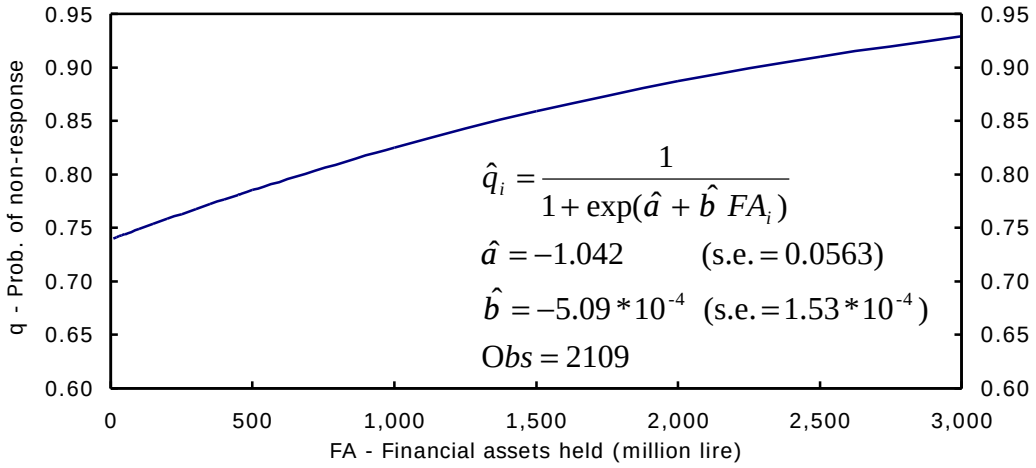
where q_i is the probability of not participating in the survey, a is the intercept and FA_i is the amount of financial assets held by the household[23].

[23] The amount of financial assets held by the client's household was estimated inflating the financial assets held by the client by a factor estimated on the 513 clients for which survey data – allowing a comparison of individual to household wealth – were available.

Figure 3 shows the estimated participation rate of the supplementary sample, as a function of the households' net financial wealth known from out-of-sample data. As expected, wealthier households present lower participation rates, confirming that non-response is (at least partly) responsible for the underestimation of wealth[24].

Figure 3

PROBABILITY OF NON-RESPONSE BY FINANCIAL ASSETS HELD



Adopting the same HT estimator as in the previous paragraph, one could try to obtain a measure of the underestimation of financial wealth attributable to non-response. However financial asset data collected in the SHIW are presumably affected by under-reporting and it seems incorrect to apply an adjustment measured on the true value of financial wealth to the underestimated part declared by households.

This calls for a previous adjustment for under-reporting of financial assets declared by households. A function of the form below was then estimated:

$$\log(FA_i) = f\left(\log(FA_i^d), X_i\right) + e_i \qquad (11)$$

where FA_i is the amount of financial assets held by the i-th household, FA^d_i is the

[24] It must be mentioned that wealth has an extremely skewed distribution: following the estimates provided by the Merryl Lynch Gemini Consulting (2000), the top 1 per cent of households holds the 14 per cent of financial assets, and the top 7 per cent holds the 44 per cent of financial assets. In such a case even a small gap between poor and rich households response rate may have a great impact on average values.

underestimated amount of financial assets declared by the same household, X_i is a vector of characteristic and e_i is the error term. The parameter estimates of the equation are shown in Table 10.

Table 10

FINANCIAL ASSETS HELD BY HOUSEHOLDS

Variable	Parameter estimate	T for H0: parameter=0	Pr > !T!	Std error of estimate
Intercept*	9.16829	28.82000	0.00010	0.31808
Log of fin. Wealth declared*	0.30690	12.64000	0.00010	0.02429
Age class				
up to 30 years°	-1.98949	-2.31000	0.02130	0.86133
31 to 40*	-0.94765	-2.75000	0.00610	0.34440
41 to 50	-0.41414	-1.40000	0.16230	0.29590
51 to 65	-0.44943	-1.88000	0.06030	0.23872
Poorly educated°	-0.54303	-2.29000	0.02270	0.23756
Small municipal.°	-1.05256	-2.03000	0.04330	0.51951

° Significant at a 5 per cent confidence level; * significant at a 1 per cent confidence level.

R-Square	C.V.	Root MSE	F Value
0.306099	19.3919	2.201741	31.82 (Pr>0=0.001)

In order to preserve the conditional distribution of the estimated "true" financial assets, we added the bootstrapped residuals to the predicted values of this model[25]. Once the "true" financial assets have been obtained, one can adopt the modified HT estimator to derive a measure of the bias due to non-response.

According to this estimate, underestimation attributable to non-response is quite low for income and real wealth (5 and 6 per cent) and greater (20 per cent) for financial assets declared by households. However, if data on financial assets were not affected by under-reporting, the bias attributable to non-response would have been even greater (30 per cent)

[25] In order to limit the effect of the outliers on the estimates the bootstrapped residuals were bottom-coded at the 10th percentile and top-coded at the 90th percentile.

(Table 11)[26]. The extent of the underestimation appears more in line with that derived by means of the internal data models rather than of the Thomsen and Siring model.

Table 11

INCOME AND WEALTH: ADJUSTED AND UNADJUSTED ESTIMATES, 1998
(external data)

	Unadjusted (a)	Adjusted (b)	Ratio (b) / (a)
Income	48,272	50,502	1.05
Real assets	253,855	269,752	1.06
Financial assets declared.....	46,784	56,296	1.20
Financial assets held.....	167,617	217,943	1.30

Of course, the extension of the non-response behaviour observed in the sample to the whole population is based on the assumption that, conditional to the actual financial assets held, the sample and the population have similar behaviour. This assumption is not negligible, although the lack of information on this phenomenon renders even approximate results precious.

3.3 Some comments on the adjustments

The results obtained in the previous sections confirm that non-response behaviour is not at random, characterizing specific segments of the population.

Table A1 shows how the estimated composition of the population varies according to each model employed in the previous paragraphs.

Compared to unadjusted estimates, non-response adjusted estimates present smaller percentages of households with 1 member only or with 1 earner or households whose head is

[26] According to the financial accounts, in 1998 the total financial assets detained by households and non-profit institutions serving households amounted to 4,260,120 billion lire. After we get rid of some secondary items (insurance technical reserves and other accounts receivable/payable) the average amount of financial assets held by households can be estimated at around 190 million lire.

female, not employed, or with low educational attainment; higher percentages are observed for households whose head is self employed, male or with a high educational level (Table A1).

The adjusted estimates of household income, net wealth and financial assets (Tables A2-A4) are higher than the unadjusted ones. The extent of the discrepancy varies according to the method employed and the variable considered. The internal and external adjustments provide similar measures of the underestimation attributable to non-response: 5-7 per cent for income (in line with the previous estimate obtained by Cannari and D'Alessio), 6-8 per cent for real assets and 15-20 per cent for financial assets. The Thomsen and Siring model provides instead stronger adjustments (14, 21 and 31 per cent respectively). All the methods show that non-response has a greater impact on wealth than on income estimates.

The adjusted estimates are higher than unadjusted estimates even in the analysis of smaller domains. The adjustments are greater for households whose head is self-employed than for those whose head was employee, both across the methods used and the variables considered. Weaker or ambiguous indications emerge for other sub-classes.

It is worth noting that the adjusted estimators, unbiased under the assumption that the models applied are "true", have higher standard errors than the unadjusted estimator. However, once the different average levels are taken into account, the increase in the variability of the adjusted estimators is much less marked (Table 12).

The impact of adjustments on the concentration of income, wealth and financial assets is not negligible; following the Thomsen and Siring model and the external model, the Gini coefficients computed on data adjusted for non-response are substantially higher than unadjusted. The internal model, however, provides increases in the Gini coefficients (Table 13 and Figure 4) that are smaller (income) or virtually nil (wealth and financial assets).

Table 12

STANDARD ERRORS OF ADJUSTED ESTIMATORS (*)

(Index: unadjusted = 100)

	Unadjusted	Internal adjustment Mod. 2	Internal adjustment Mod. TS	External adjustment
	Household income			
Standard error	100.0	108.1	119.1	108.5
Relative standard error	100.0	100.9	104.5	103.7
	Household net wealth			
Standard error	100.0	110.5	127.6	109.5
Relative standard error	100.0	101.1	103.5	102.7
	Household financial assets			
Standard error	100.0	112.8	131.1	123.6
Relative standard error	100.0	97.8	100.0	100.7
Standard deviation of the weights.....	100.0	100.5	107.9	101.9

(*) Computed under the assumption that the corresponding models are “true”, without taking into account the sample design.

Table 13

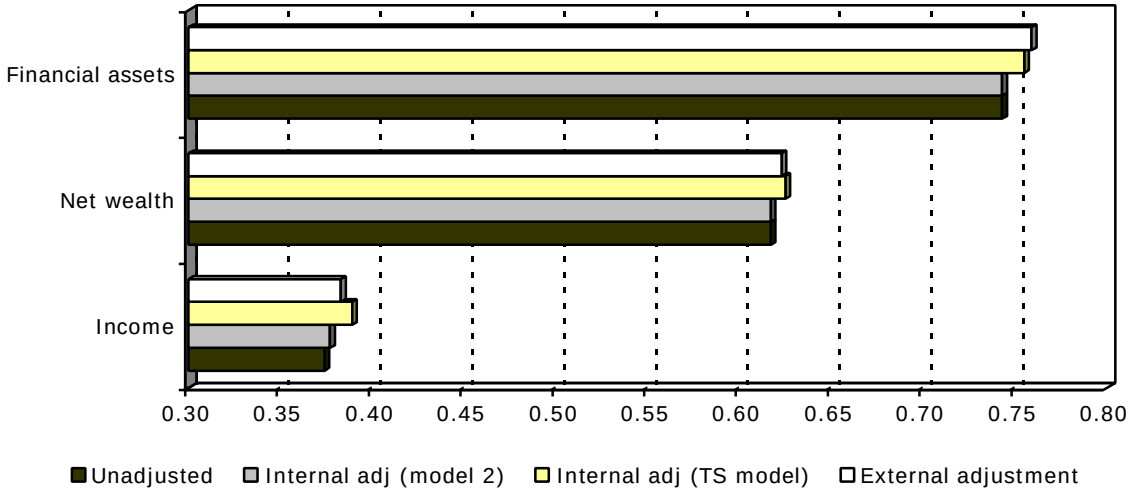
CONCENTRATION OF INCOME, NET WEALTH AND FINANCIAL ASSETS

(percentages)

Tenths	Unadjusted			Internal adj. (model 2)			Internal adj. (TS model)			External adjustment		
	Income	Net wealth	Financial assets	Income	Net wealth	Financial assets	Income	Net wealth	Financial assets	Income	Net wealth	Financial assets
up to 1st decile	2.0	0.1	0.0	2.1	0.1	0.0	2.0	0.1	0.0	2.0	0.1	0.0
from 1st to 2nd decile ...	3.8	0.4	0.2	3.8	0.5	0.3	3.7	0.5	0.3	3.7	0.4	0.2
from 2nd to 3rd decile ...	5.0	1.4	0.8	5.0	1.5	0.9	4.9	1.7	0.9	4.9	1.4	0.8
from 3rd to 4th decile	6.2	3.1	1.7	6.1	3.2	1.7	6.0	3.2	1.6	6.1	3.1	1.6
from 4th to 5th decile	7.5	5.0	2.7	7.4	4.9	2.7	7.3	4.8	2.5	7.4	4.8	2.5
from 5th to 6th decile	8.9	6.7	3.9	8.8	6.6	3.7	8.7	6.3	3.5	8.8	6.5	3.5
from 6th to 7th decile	10.6	8.8	5.4	10.5	8.7	5.3	10.3	8.2	5.0	10.5	8.6	5.0
from 7th to 8th decile	12.7	11.7	8.4	12.5	11.4	8.2	12.4	10.8	7.9	12.5	11.4	7.8
from 8th to 9th decile	15.7	16.9	14.4	15.6	16.8	14.4	15.5	16.4	13.9	15.6	16.8	13.9
over the 9th decile	27.5	45.9	62.5	28.1	46.3	62.8	29.3	47.9	64.5	28.4	46.8	64.8
Gini coefficient.....	0.374	0.617	0.743	0.377	0.617	0.743	0.389	0.625	0.755	0.383	0.623	0.759

Figure 4

CONCENTRATION OF INCOME, NET WEALTH AND FINANCIAL ASSETS



4 Concluding remarks

In this paper we have tried to describe the non-respondents in the Bank of Italy's Survey of Household Income and Wealth (SHIW) and to measure the underestimation of income and wealth attributable to non-response. The evidence confirms that non-response is not random, and is more frequent among wealthier households. This implies that the post-stratification techniques traditionally employed on a few already known demographic characteristics of the population cannot fully account for the non-response bias.

As to the estimates of average aggregates, the bias seems to be greater for financial assets (the adjusted estimates are from 15 to 31 per cent greater than the unadjusted) than for income (for which the adjustments vary from 5 to 14 per cent), probably owing to a greater asymmetry in the distribution of wealth.

The adjustments also affect the comparison among the population sub-classes; stronger adjustments of income and wealth averages are provided for households whose head is self-employed and weaker for households whose head is an employee.

Non-response also seems to affect the concentration of income and wealth; the results obtained with two out of three models employed suggest substantial increases in Gini

coefficients once non-response behaviour is taken into account.

Although it has an important effect on the estimates of averages, non-response does not seem able to fill the gap between survey estimates and the corresponding figures derived from national accounts and flow of funds. Different sources of errors, such as the under-reporting behaviour of households, need to be investigated further.

Appendix A: Statistical tables

Table A1

HOUSEHOLDS BY SOCIAL AND DEMOGRAPHIC CHARACTERISTICS
(percentages)

Characteristics*	Unadj. (a)	Int. adj. Mod. 2 (b)	Int. adj. Mod. TS (c)	External adj. (d)	(b) – (a)	(c) – (a)	(d) – (a)
Gender							
Male	72.5	73.6	74.1	72.9	1.1	1.6	0.4
Female	27.5	26.4	25.9	27.1	-1.1	-1.6	-0.4
Age							
up to 30 years	4.9	5.4	5.5	4.6	0.5	0.6	-0.3
31 to 40	17.7	18.1	18.3	17.8	0.4	0.6	0.1
41 to 50	20.7	20.6	20.4	20.9	-0.1	-0.3	0.2
51 to 65	27.9	27.1	27.2	27.9	-0.8	-0.7	0.0
over 65	28.8	28.8	28.7	28.8	0.0	-0.1	0.0
Education							
none	8.8	8.3	8.2	8.5	-0.5	-0.6	-0.3
elementary school	29.0	27.3	26.2	28.1	-1.7	-2.8	-0.9
middle school	32.2	30.5	28.5	32.0	-1.7	-3.7	-0.2
high school	22.9	24.6	25.7	23.6	1.7	2.8	0.7
university degree	7.1	9.3	11.3	7.9	2.2	4.2	0.8
Work status							
Employee	36.0	37.2	36.5	35.8	1.2	0.5	-0.2
Self-employed	14.1	14.6	16.0	14.6	0.5	1.9	0.5
Not employed	49.9	48.1	47.5	49.6	-1.8	-2.4	-0.3
Household size							
1 member	19.5	18.4	17.6	19.0	-1.1	-1.9	-0.5
2 members	26.0	26.1	25.8	26.1	0.1	-0.2	0.1
3 members	23.6	23.3	22.9	23.8	-0.3	-0.7	0.2
4 members	22.3	22.6	23.0	22.3	0.3	0.7	0.0
5 members or more	8.7	9.5	10.6	8.9	0.8	1.9	0.2
Number of earners							
1 earner	44.0	42.0	40.6	43.3	-2.0	-3.4	-0.7
2 earners	42.0	43.4	43.9	42.5	1.4	1.9	0.5
3 earners	10.9	11.1	11.4	11.0	0.2	0.5	0.1
4 earners or more	3.1	3.5	4.1	3.2	0.4	1.0	0.1
Town size							
up to 20,000 inhabitants	48.4	48.3	48.7	48.3	-0.1	0.3	-0.1
from 20,000 to 40,000	12.6	12.6	11.7	12.7	0.0	-0.9	0.1
from 40,000 to 500,000	25.5	25.5	25.8	25.6	0.0	0.3	0.1
more than 500,000	13.5	13.6	13.8	13.4	0.1	0.3	-0.1
Geographical area							
North	48.0	47.8	46.7	47.9	-0.2	-1.3	-0.1
Centre	19.1	19.3	20.0	19.1	0.2	0.9	0.0
South and Islands	32.9	32.9	33.2	33.0	0.0	0.3	0.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**0.0**	**0.0**	**0.0**

(*) Referred to the head of household.

Table A2

HOUSEHOLD INCOME
(thousands of lire, percentages)

Characteristics*	Unadj. (a)	Int. adj. Mod. 2 (b)	Int. adj. Mod. TS (c)	External adj. (d)	(b) / (a)	(c) / (a)	(d) / (a)
Gender							
male	53,609	57,176	60,555	56,119	106.7	113.0	104.7
female	34,192	36,628	39,208	35,368	107.1	114.7	103.4
Age							
up to 30 years	36,237	38,439	41,870	36,292	106.1	115.5	100.2
31 to 40	47,587	51,112	57,195	49,664	107.4	120.2	104.4
41 to 50	57,156	61,268	66,216	58,717	107.2	115.9	102.7
51 to 65	56,155	60,440	62,433	58,244	107.6	111.2	103.7
over 65	36,727	39,624	41,149	39,870	107.9	112.0	108.6
Education							
none	24,508	25,198	25,099	24,602	102.8	102.4	100.4
elementary school	37,149	38,556	38,797	37,767	103.8	104.4	101.7
middle school	44,934	46,379	47,392	45,707	103.2	105.5	101.7
high school	63,461	66,939	69,579	65,666	105.5	109.6	103.5
university degree	89,206	91,701	100,321	97,469	102.8	112.5	109.3
Work status							
Employee	53,156	55,440	57,850	54,266	104.3	108.8	102.1
Self-employed	70,666	77,561	86,274	75,873	109.8	122.1	107.4
Not employed	38,401	41,043	42,316	40,316	106.9	110.2	105.0
Household size							
1 member	27,217	29,144	29,711	28,321	107.1	109.2	104.1
2 members	45,518	48,410	49,486	48,670	106.4	108.7	106.9
3 members	55,255	58,583	60,343	56,744	106.0	109.2	102.7
4 members	58,193	61,545	66,196	59,636	105.8	113.8	102.5
5 members or more	59,365	64,707	74,784	63,877	109.0	126.0	107.6
Number of earners							
1 earner	32,967	35,727	38,247	34,452	108.4	116.0	104.5
2 earners	54,406	57,098	59,747	56,984	104.9	109.8	104.7
3 earners	73,502	76,602	78,868	75,098	104.2	107.3	102.2
4 earners or more	93,564	97,953	103,267	97,487	104.7	110.4	104.2
Household income							
up to 20 million lire	13,043	13,362	13,331	13,064	102.4	102.2	100.2
from 20 to 40 million	29,692	29,771	29,816	29,721	100.3	100.4	100.1
from 40 to 60 million	49,357	49,458	49,494	49,438	100.2	100.3	100.2
from 60 to 80 million	69,025	69,268	69,264	69,186	100.4	100.3	100.2
more than 80 million	122,588	125,771	130,473	126,584	102.6	106.4	103.3
Town size							
up to 20,000 inhabitants	43,979	46,727	48,900	45,442	106.2	111.2	103.3
from 20,000 to 40,000	47,819	51,353	61,298	49,618	107.4	128.2	103.8
from 40,000 to 500,000	52,252	56,664	59,247	55,266	108.4	113.4	105.8
more than 500,000	56,582	60,729	63,389	60,465	107.3	112.0	106.9
Geographical area							
North	54,891	59,113	64,680	57,879	107.7	117.8	105.4
Centre	53,559	56,056	56,188	55,817	104.7	104.9	104.2
South and Islands	35,536	38,524	40,729	36,684	108.4	114.6	103.2
Total	**48,271**	**51,746**	**55,018**	**50,501**	**107.2**	**114.0**	**104.6**

(*) Referred to the head of household.

Table A3

HOUSEHOLD NET WEALTH
(thousands of lire, percentages)

Characteristics*	Unadj. (a)	Int. adj. Mod. 2 (b)	Int. adj. Mod. TS (c)	External adj. (d)	(b) / (a)	(c) / (a)	(d) / (a)
Gender							
male	325,001	353,829	399,514	354,322	108.9	122.9	109.0
female	195,224	211,975	234,426	208,398	108.6	120.1	106.7
Age							
up to 30 years	155,426	166,570	203,223	156,645	107.2	130.8	100.8
31 to 40	233,242	260,331	327,924	260,907	111.6	140.6	111.9
41 to 50	319,598	353,609	417,543	335,786	110.6	130.6	105.1
51 to 65	370,094	400,597	429,685	391,580	108.2	116.1	105.8
over 65	246,767	273,530	291,902	284,108	110.8	118.3	115.1
Education							
none	100,233	104,478	104,992	101,033	104.2	104.7	100.8
elementary school	213,633	223,229	230,896	220,485	104.5	108.1	103.2
middle school	247,383	256,026	269,729	257,416	103.5	109.0	104.1
high school	405,127	436,303	458,021	431,250	107.7	113.1	106.4
university degree	648,771	660,457	818,562	762,189	101.8	126.2	117.5
Work status							
Employee	230,078	243,853	260,927	239,835	106.0	113.4	104.2
Self-employed	608,336	680,733	808,553	671,710	111.9	132.9	110.4
Not employed	241,592	261,600	278,312	263,931	108.3	115.2	109.2
Household size							
1 member	189,327	210,504	221,489	206,717	111.2	117.0	109.2
2 members	283,883	299,884	315,567	321,812	105.6	111.2	113.4
3 members	317,124	339,974	362,370	330,540	107.2	114.3	104.2
4 members	316,707	337,096	379,202	328,425	106.4	119.7	103.7
5 members or more	384,379	460,085	619,867	450,244	119.7	161.3	117.1
Number of earners							
1 earner	233,087	263,502	306,569	258,093	113.0	131.5	110.7
2 earners	301,340	321,157	354,635	329,086	106.6	117.7	109.2
3 earners	417,031	432,218	463,800	428,563	103.6	111.2	102.8
4 earners or more	474,867	519,798	573,519	503,970	109.5	120.8	106.1
Household income							
up to 20 million lire	83,632	80,514	86,355	83,731	96.3	103.3	100.1
from 20 to 40 million	150,642	152,789	158,611	152,750	101.4	105.3	101.4
from 40 to 60 million	268,857	269,282	277,119	276,030	100.2	103.1	102.7
from 60 to 80 million	360,163	365,722	375,633	370,555	101.5	104.3	102.9
more than 80 million	905,745	940,151	1,027,497	973,406	103.8	113.4	107.5
Town size							
up to 20,000 inhabitants	280,781	307,265	354,167	302,051	109.4	126.1	107.6
from 20,000 to 40,000	294,260	319,344	382,429	315,095	108.5	130.0	107.1
from 40,000 to 500,000	295,813	324,962	352,149	323,473	109.9	119.0	109.4
more than 500,000	303,128	329,679	352,256	344,054	108.8	116.2	113.5
Geographical area							
North	333,493	365,350	429,643	366,412	109.6	128.8	109.9
Centre	339,868	359,088	361,623	367,138	105.7	106.4	108.0
South and Islands	195,510	220,149	251,172	209,416	112.6	128.5	107.1
Total	**289,327**	**316,343**	**356,698**	**314,819**	**109.3**	**123.3**	**108.8**

(*) Referred to the head of household.

HOUSEHOLD FINANCIAL ASSETS
(thousands of lire, percentages)

Characteristics*	Unadj. (a)	Int. adj. Mod. 2 (b)	Int. adj. Mod. TS (c)	External adj. (d)	(b) / (a)	(c) / (a)	(d) / (a)
Gender							
male	54,283	62,182	71,167	65,953	114.6	131.1	121.5
female	27,000	31,141	33,268	30,278	115.3	123.2	112.1
Age							
up to 30 years	20,003	20,882	24,834	20,172	104.4	124.2	100.8
31 to 40	39,067	46,240	61,230	45,638	118.4	156.7	116.8
41 to 50	46,090	53,047	67,235	51,242	115.1	145.9	111.2
51 to 65	58,959	66,810	69,457	66,405	113.3	117.8	112.6
over 65	44,821	53,615	56,495	62,562	119.6	126.0	139.6
Education							
none	11,007	12,595	12,261	11,450	114.4	111.4	104.0
elementary school	33,530	36,172	37,142	36,802	107.9	110.8	109.8
middle school	35,945	38,681	39,905	40,354	107.6	111.0	112.3
high school	64,902	71,591	74,278	74,993	110.3	114.4	115.5
university degree	135,735	147,138	177,336	181,811	108.4	130.6	133.9
Work status							
Employee	33,844	37,124	39,989	37,002	109.7	118.2	109.3
Self-employed	99,796	118,319	146,741	120,623	118.6	147.0	120.9
Not employed	41,081	47,447	49,023	51,295	115.5	119.3	124.9
Household size							
1 member	34,775	41,611	43,040	41,049	119.7	123.8	118.0
2 members	52,191	59,331	62,046	70,250	113.7	118.9	134.6
3 members	52,530	60,019	64,834	57,229	114.3	123.4	108.9
4 members	45,385	50,146	58,940	49,756	110.5	129.9	109.6
5 members or more	45,509	57,587	87,615	61,892	126.5	192.5	136.0
Number of earners							
1 earner	36,741	44,420	54,546	44,162	120.9	148.5	120.2
2 earners	51,192	57,494	62,623	63,984	112.3	122.3	125.0
3 earners	63,820	68,096	72,612	67,446	106.7	113.8	105.7
4 earners or more	69,630	79,844	83,089	80,207	114.7	119.3	115.2
Household income							
up to 20 million lire	8,418	8,943	8,953	8,637	106.2	106.4	102.6
from 20 to 40 million	16,767	17,411	17,515	17,330	103.8	104.5	103.4
from 40 to 60 million	36,947	38,710	39,348	39,598	104.8	106.5	107.2
from 60 to 80 million	57,269	60,286	59,745	61,329	105.3	104.3	107.1
more than 80 million	186,624	197,575	214,205	225,504	105.9	114.8	120.8
Town size							
up to 20,000 inhabitants	42,351	48,463	55,708	49,898	114.4	131.5	117.8
from 20,000 to 40,000	41,681	47,814	58,980	48,551	114.7	141.5	116.5
from 40,000 to 500,000	51,856	61,023	67,329	64,679	117.7	129.8	124.7
more than 500,000	57,892	66,082	72,038	70,660	114.1	124.4	122.1
Geographical area							
North	61,632	72,383	85,295	75,364	117.4	138.4	122.3
Centre	50,651	54,232	54,824	60,396	107.1	108.2	119.2
South and Islands	22,855	27,105	31,580	26,173	118.6	138.2	114.5
Total	**46,784**	**53,979**	**61,338**	**56,295**	**115.4**	**131.1**	**120.3**

(*) Referred to the head of household.

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