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The series is available online at www.bancaditalia.it.

ISSN 1972-6627 (print)

ISSN 1972-6643 (online)

Printed by the Printing and Publishing Division of the Bank of Italy

HOW THE TIME OF INTERVIEWS AFFECTS ESTIMATES OF INCOME AND WEALTH

by Giovanni D'Alessio* and Stefano Iezzi*

Summary

In the Survey of Household Income and Wealth (SHIW) conducted by the Bank of Italy, the flow variables (income and consumption) refer to the year preceding the interview while the stock variables (household composition and net wealth) refer to the end of the year. However, there are some exceptions that may produce effects on the estimates but that are not usually taken into account. What is more, the time of year of the interviews may affect the composition of the sample (wealthier families may be less available in summer or during holiday periods). We quantify the possible effects of these factors on the estimates of household income and wealth and propose an adjustment method.

JEL Classification: D10, D31.

Keywords: income, wealth, household, non-response.

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1. Introduction¹

In the Bank of Italy's Survey of Household Income and Wealth (SHIW) the time when the interview is conducted has some features that are relevant to the quality of the estimates. The questionnaire asks about flow variables, such as income and consumption, in the entire calendar year preceding the date of the interview, but stock variables, such as family composition and wealth, refer to the situation at the end of that calendar year.

There are exceptions to this rule, such as property values and imputed rents, which are elicited by hypothetical questions that would be too complex to apply to the past and accordingly refer to the time of the interview. The time lag between reference period and interview is not taken into account, but it could have an effect on the estimates of the aggregates, especially in periods when these values are changing rapidly. In Section 3 we estimate the possible effect of this factor. In addition, the time of year when the interview is conducted may influence sample composition (Durrant, D'Arrigo, Steele, 2011). The SHIW interviews are generally conducted between January and June of the year following the reference year, but in some cases the survey could not begin until after January, so the interviews were prolonged beyond June, thus bringing them into the traditional holiday months of July and August.

Conducting interviews in the summer months generally means greater difficulty in obtaining interviews (Vigderhous 1981; Losch, Maitland, Lutz, 2002) and a greater risk of sample selection, potentially under-representing the segments of the population that most frequently go away on vacation (likely to be wealthier). This potential bias needs to be addressed in order to deal with the effects of non-participation (section 4).²

2. The collection of data in SHIW

Since 1962 the Bank of Italy has conducted a survey on household budgets (Bank of Italy, 1966). In recent years the survey is carried out within the framework of the Household Finance and Consumption Survey (HFCS), designed to harmonize the euro-area countries' sample surveys of household finances (European Central Bank, 2013; Gambacorta et al., 2013).

The sample consists of about 8,000 households, selected by a two-stage sample design (Bank of Italy, 2014). In the first stage about 300 municipalities are randomly selected, within appropriate strata defined by region and population size. In the second stage the sample of households is extracted from the registry lists of the municipalities selected. Starting with the 1989 survey, a panel of about 50 per cent of the households in each survey have participated in a previous one.

¹ The authors would like to thank Corrado Abbate, Luigi Cannari, Romina Gambacorta, Giuseppe Ilardi and Andrea Neri for the many comments received during the writing of the work. We also thank the participants to the Seminar "*L'indagine sui bilanci delle famiglie italiane. Metodi, problemi e linee evolutive*" held in Rome on the 11th December 2014.

² A data collection occurred in long time span may imply, for a significant proportion of cases, further effects on the quality of data, mainly due to memory problems, that tend to produce less accurate answers as time goes on. Some preliminary evidence seems to confirm this hypothesis which, however, deserves to be further examined.

The questionnaire collects information on a broad range of characteristics, notably household composition, socio-demographic characteristics of the members, household income, consumption, savings, wealth, and the dwelling.

Data collection is carried out by a private company through face-to-face interviews conducted by about 200 professional interviewers selected on the basis of experience with surveys of similar size. Participation in the survey is voluntary. Since 1998 the interviews are conducted via Computer Assisted Personal Interviewing methodology.

One or more municipalities and their corresponding list of names randomly drawn from the municipal registers are assigned to each interviewer, who must contact the households in the order shown in the list. Each contact may result in an interview, a refusal, a not-at-home, or an appointment.

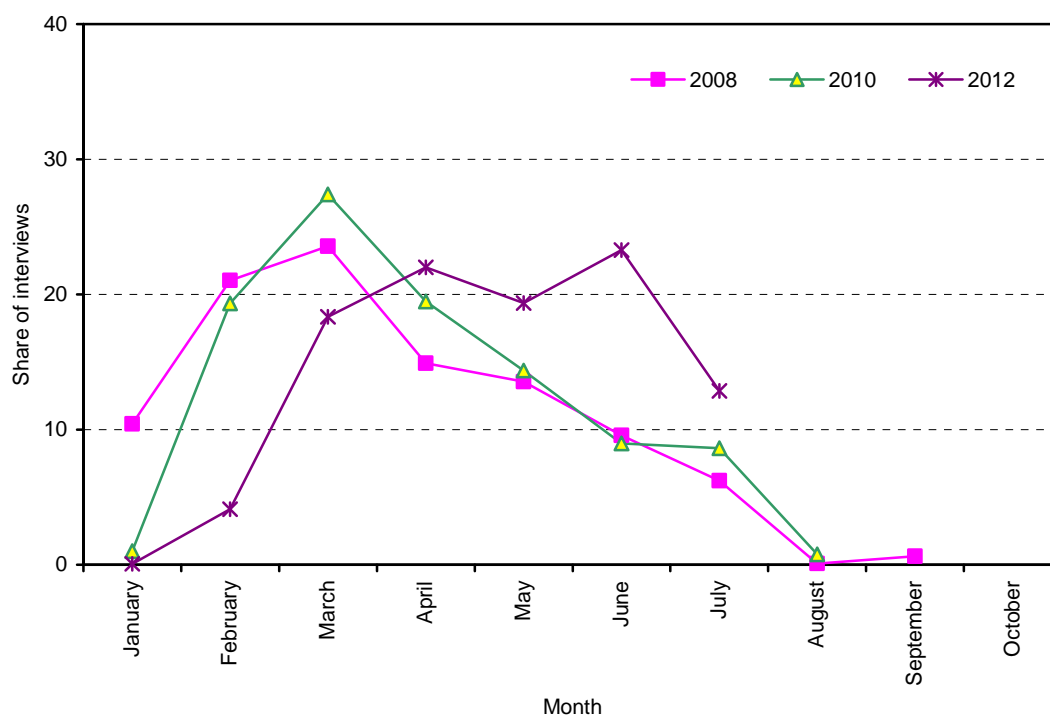
A household on the list is classified as "fallen" in the case of explicit refusal, non-cooperation in completing the questionnaire, or lack of adult member at home on three visits at different times on three different days of the week, including necessarily one during the weekend.

Data collection is usually early in the year. As is shown in Figure 1, in the last three surveys there has been some variability in the period of the interviews. In 2012, they were concentrated in the spring months, but with some carried out in the second half of July. The other two surveys show similar patterns, the number of interviews peaking in March and declining thereafter. The share conducted in July and August, months when it may be harder to trace some families for the interview, was 6.3 per cent in 2008, 9.4 per cent in 2010 and 12.9 per cent in 2012 (but in this latter case there were no interviews in August).

There are operational reasons why the interviews in the field may take several months to complete and extend into the summer months. There is a definite trade-off between quality and duration: with a limited number of highly skilled interviewers, we get better data quality but a longer time to completion. Furthermore, in some municipalities it can be hard to find good interviewers; in such cases, interviewers resident in neighboring municipalities are employed, but this tends to slow down the data collection.

Figure 1

SHIW interviews by month, 2008-2012
(percentages)



3. The reference period for the questions

As noted, data collection takes a number of months, given the large number of interviews and the need for trained interviewers. In some cases, the start of data collection has been delayed, requiring interviews to be conducted in the months of July and August. In order to gauge how the lag between time of interview and reference year may affect the estimates, we must examine how the survey questions are phrased.

All the survey data, both stock and flow, refer to the household members at the end of the previous calendar year.³ Variable stocks, such as these members' financial wealth and real estate, refer to the end of the year; the flows, such as income and consumption, are collected with reference to the whole calendar year preceding the interview.

This procedure is subject to exceptions as regards some of the questions bearing on the total value of wealth and income. In particular, the value of homes and other property refers to the moment of the interview, as follows:

³ The survey polls "households", defined as all persons who, at the end of the reference year, normally lived in the home, sharing at least part of their income. The households also include any temporarily absent members, such as people on vacation, and any other non-relatives who at the end of the year were co-habiting. The survey does not count the income earned by persons who left the household during the year; on the other hand, it does count the income earned before their entry by those who joined the household during the year. If a member exits from the household (moving out or dying) between the end of the year and the date of the interview, the data on that person is still requested from the remaining members and counted in household data. If no members survive, the household is counted as a non-response.

- *In your opinion, how much is your house/flat worth (unoccupied)? In other words, what price could you ask for it today (including any cellar, garage or attic)? Please give your best estimate.*
- *How much do you think the property could be sold for if it were unoccupied?*

Similarly, for the primary residence owned by the household and any other properties owned and not leased, the value of the imputed rent is asked:

- *Assuming you wanted to rent this dwelling, what monthly rent do you or your household think could be charged? Do not include condominium charges, heating or other sundry expenses.*
- *If you wanted to let the property, what annual rental could the household obtain?*

If a household is interviewed in July, and between January and July house prices have fallen by 5 percent, presumably the respondent will give the home a lower value than would have been reported in the first few days of January. The duration of data collection could therefore produce significant bias in the estimated value of the property. In the same way, a change in the rental market prices during the course of the survey could bias income estimates.

The statistical evidence from the survey data on 2012 confirms this hypothesis. If we regress the house price per square meter on a set of relevant variables (surface area, year of construction and number of bathrooms) and on the house price index for the month in which the interview was conducted in 2013⁴ we find - as expected - that the value is influenced by the house price dynamics.⁵ At a time of falling house prices like the first half of 2013, the values given were - *ceteris paribus* - relatively higher in interviews early in the year and lower later on.⁶

As we observed above, rewording the questions to overcome this difficulty does not seem to be a workable solution. It compounds the inherent difficulty of the hypothetical question by referring it to a time in the past. Accordingly, we need to design an adjustment procedure to take account of the different times when the answers are given. One simple way is to deflate the property values reported by households using the monthly house price index; and assuming the rental market follows the same trend, this index can also be used to deflate imputed rentals and bring them back to the average value for the reference year.

This type of adjustment can be useful when the questions ask for an estimate as of the date of the interview and the data are collected over a substantial period of time, like the financial asset data in most HFCS surveys.

⁴ We considered the OMI (Osservatorio del Mercato Immobiliare) price index, supplemented in recent years by the Istat index of house prices (IPAB). As the OMI index is available twice a year since 2002, while the IPAB index is quarterly but only available from 2011, to create a monthly index the series have been interpolated for months where data is missing.

⁵ This analysis is based on the assumption that the respondents' estimates of property values and imputed rents reflect the actual value at the time of the interview (as implicitly required by the questions). We have evaluated this hypothesis against the alternative hypothesis that the declared values react to changes in actual values with a lag of a month or more. To this end, we compared the model's goodness of fit, measured by the R^2 and the Bayesian Information Criterion (BIC and AIC) with that of a model in which the house price index was lagged by 1, 2, 3 or 6 months. The results show no better fit compared to the contemporary index. This may be due both to the regularity in the dynamics of the price index during collection period, and to the further amplification of regularity by the linear interpolation of the index for the months with no data.

⁶ The result remains valid even excluding the interviews conducted in the summer, which might yield lower values due to the selection of the households.

Table 1 shows the mean total value of the real estate owned by the surveyed households and that of imputed rents. Since the adjustments of real estate and imputed rents affect both net wealth and income, the means of these two variables are also reported in the table.

The adjustment significantly affects the average values of property and imputed rents, lowering them by between 0.1 and 0.8 per cent in the 2008 and 2010 surveys, when house prices were nearly stationary. But in 2012, the adjustment increases the two values by 1.9 and 5.2 per cent respectively. The impact on imputed rents tends to be greater because these are flow values and consequently relate to the average for the reference year and not, as for stocks, the end of the year. The impact of the adjustments on the aggregate variables is not negligible: 1 per cent for income and 1.6 per cent for net wealth in 2012.⁷

The adjustment also affects estimates of the variations between two surveys, which depend on price dynamics. The adjustment is larger in 2012, with the average values of property and imputed rents corrected by 5.1 and 2.2 percentage points respectively. The impact on income and wealth aggregates is significant, at 1.1 and 1.8 points, respectively, in 2012.^{8 9}

Table 1

Adjustments using the house price index

	Imputed rents			Income			Real estate wealth			Net wealth		
	Average values (euro) and percentage variations											
	Original	Adj	(A-O)/O	Original	Adj	(A-O)/O	Original	Adj	(A-O)/O	Original	Adj	(A-O)/O
2008	6.338	6.288	-0,8	32.146	32.096	-0,2	206.913	206.791	-0,1	245.693	245.571	0,0
2010	6.984	6.943	-0,6	32.772	32.731	-0,1	220.478	219.675	-0,4	264.144	263.341	-0,3
2012	6.052	6.369	5,2	30.380	30.697	1,0	206.359	210.353	1,9	245.953	249.947	1,6
	Percentage changes and differences											
	ΔO	ΔA	$\Delta O-\Delta A$	ΔO	ΔA	$\Delta O-\Delta A$	ΔO	ΔA	$\Delta O-\Delta A$	ΔO	ΔA	$\Delta O-\Delta A$
2010-2008	10.2	10.4	0.2	1.9	2.0	0.0	6.6	6.2	-0.3	7.5	7.2	-0.3
2012-2010	-13.3	-8.3	5.1	-7.3	-6.2	1.1	-6.4	-4.2	2.2	-6.9	-5.1	1.8

⁷ Even though the lag between the time of the interview and the reference period is larger for income than for wealth, the final effect of the adjustment on the estimate of wealth is greater than on income because the share of real estate in net wealth is greater than that of imputed rents in income.

⁸ Another question we examined is the possibility that answers are influenced by the economic climate in which the survey is carried out. For example, if the survey months are marked by expectations of a worsening economic situation, respondents might tend to state lower than actual values for wealth and income. However, econometric tests offered no significant evidence of this.

⁹ The adjustment of the values of homes and imputed rents could produce different results if we used a geographically disaggregated index of property prices. The data from the Osservatorio del Mercato Immobiliare allow us to build a biannual real estate price index for combinations of region (North, Center, South/Islands) and size of municipality (up to 20,000 inhabitants, 20,000 to 40,000 inhabitants, 40,000 to 500,000 inhabitants, over 500,000 inhabitants). The adjustment with this disaggregated price index (after adequate interpolation to obtain a monthly series) is not significantly different from that obtained with a single national index.

4. Sample selection

4.1 Empirical evidence

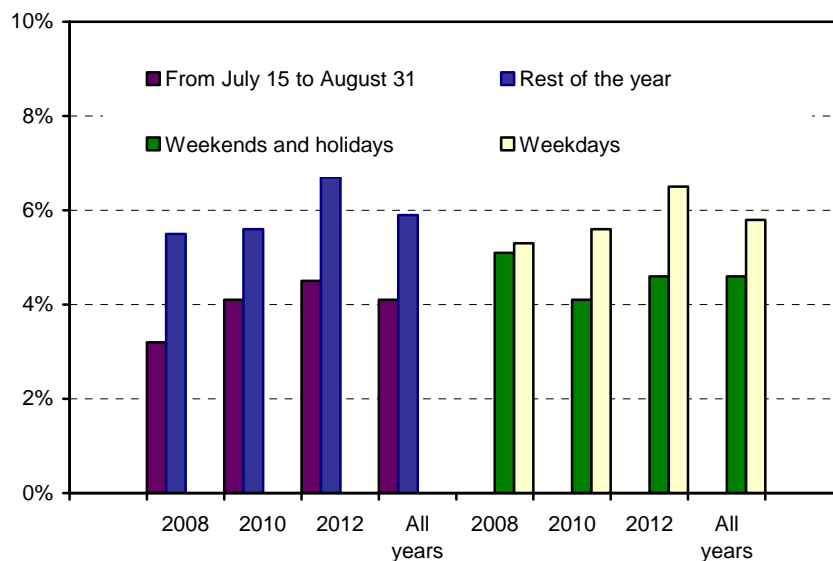
Another question is whether the date of the interview may cause bias owing to the greater difficulty of interviewing specific segments of the population at certain times of year, especially during the traditional vacation months.

Some descriptive evidence seems to confirm the possibility of sample selection bias. This concerns the proportion of households with vacation homes, which is significantly lower among the households interviewed during the traditional vacation period (July 15th to August 31st). The proportion is also lower among households interviewed on weekends and holidays (Figure 2).

Average income and wealth appear to be significantly lower in interviews conducted the summer months (Figure 3): the households interviewed in late spring and especially in summer have, on average, lower values. These results are robust to excluding the panel households, which are usually interviewed before the others, and to using values of income and wealth adjusted as in the previous section.

Figure 2

**Households with vacation homes
by day and date of interview, 2008-2012**
(percentages)



Respondents' characteristics also tend to vary according to the time of the day of the interview. For example, households headed by employed persons are more common in afternoon and especially in evening interviews. Also for self-employed household heads, the best time for interviewing is the evening, while households with retired heads are more easily interviewed in the morning (Figure 4).

These results suggest that the assumption of equal probability of selection of households within each municipality could be untrue. For example, conducting

interviews in summer or on holidays could mean under-representing the wealthiest households, while conducting interviews in the morning could favour the participation of retiree households, whose incomes are lower, on average. Although the rule that at least three contacts must be attempted at different times and on different days before dropping the household should mitigate this type of selection bias, some bias could still affect the estimates.

Figure 3

Household income and net wealth by month of interview, 2008-2012
(Average index numbers: May of every survey = 100)

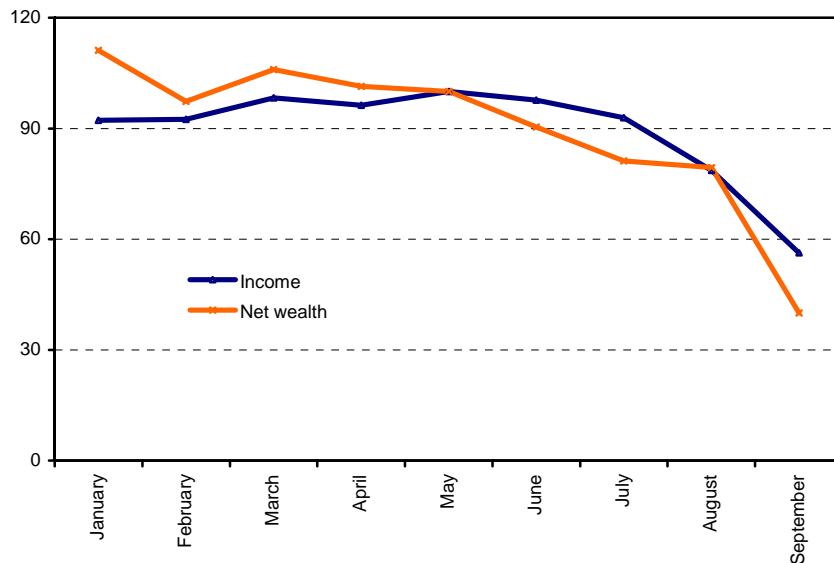
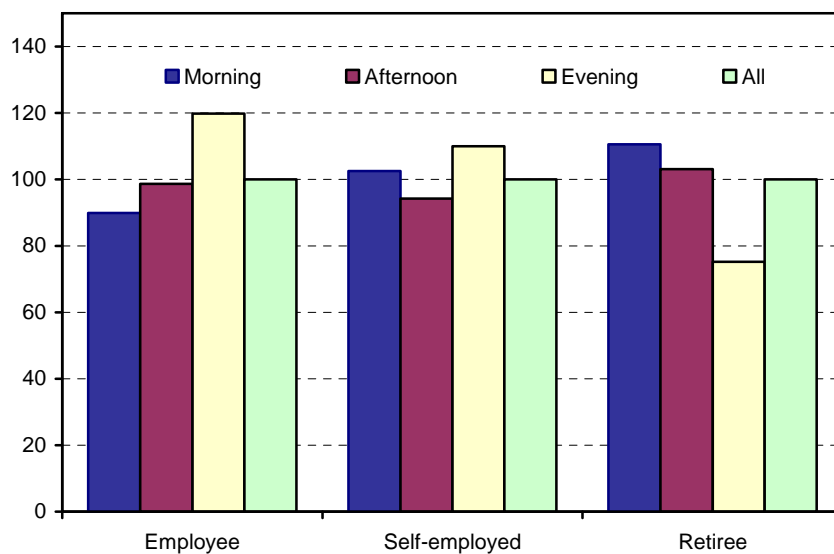


Figure 4

Households interviewed by time of day and occupational status of head
(Index numbers)



Additional evidence of the possible effect of date and time on the probability of obtaining a successful interview comes from an analysis of the preliminary contacts (Table 2).

Table 2

Distribution of contacts by date, time and outcome, 2008-2012
(Percentages)

		From July 15 to August 31	Rest of the year	Weekends and holidays	Weekdays	Morning	Afternoon	Evening	Total
Non panel	Respondents	41.5	34.6	36.3	34.6	35.3	34.5	34.5	34.8
	Refusals	23.6	37.0	42.1	35.9	35.5	36.8	38.1	36.6
	Not at home	34.9	28.5	21.6	29.5	29.2	28.8	27.4	28.7
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Panel	Respondents	58.9	82.0	81.8	81.9	82.9	81.9	79.7	81.9
	Refusals	14.4	12.4	13.8	12.3	11.6	12.6	13.9	12.5
	Not at home	26.7	5.5	4.5	5.8	5.5	5.5	6.4	5.7
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total	Respondents	43.2	52.7	53.1	52.4	53.3	52.4	51.0	52.5
	Refusals	22.7	27.6	31.7	27.0	26.5	27.6	29.2	27.5
	Not at home	34.1	19.7	15.3	20.6	20.2	20.0	19.7	20.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Non panel		3.2	96.8	10.1	89.9	37.0	44.4	18.6	100.0
Panel		0.6	99.4	9.8	90.2	37.4	44.7	17.8	100.0
Total		2.2	97.8	10.0	90.0	37.2	44.5	18.3	100.0

From July 15 to August 31, when summer holidays are most commonly taken, we find about 2 per cent of total contacts, on average. The percentage of successful outcomes is lower than in the rest of the year (43.2 against 52.7 per cent), as there is a higher percentage of not-at-homes during the summer holidays, especially among the panel households. Among non-panel households, by contrast, we find a higher percentage of successful contacts (41.5 per cent, against 34.6 per cent in the rest of the year), as there are fewer refusals.

On weekends and holidays, when about 10 per cent of all contacts take place, there is no significant difference in the percentage of successful contacts compared with weekdays. The percentage of not-at-homes is 5 percentage points lower than on weekdays, but this difference characterizes only the non-panel households.

Finally, as regards the time of day, contacts are mostly made in the morning and in the afternoon, with shares of around 40 per cent, while in the evening we find less than 20 per cent. The highest proportion of positive outcomes is found in the morning, the lowest in the evening. In the evening we also find a slightly higher percentage of refusals among both panel and non-panel households.

Overall, the profile of outcomes during holiday periods differs quite clearly from those of other periods; although only a few households are interviewed in that period, this timing does appear to produce selection bias. There are also small but significant differences in patterns between weekdays and weekends and holidays and between different times of day.

4.2 Sample attrition

In order to interpret the relationship between time of contact and response we estimate a model for the panel households (Cannari, D'Alessio, 1992), that enables us to associate contact data with income, wealth and other information from the previous survey wave (occupational status of household head, presence of spouse or partner, presence of preschool children) that is not usually available for non-respondents. These variables could explain the probability of participation at the moment of contact, so they are considered regressors both as marginal effects and in interaction with the time of day of the contact. The contact data considered are the date and time of the attempt to interview and the outcome (interview done or not).

The estimate indicates that it is harder to get interviews with higher-income and wealthier households; and that for wealthy households the difficulty is relatively more pronounced during the summer and on public holidays (Table 3). Moreover, households headed by self-employed persons are harder to interview and those headed by retirees are easier. As for the time of day, the self-employed are harder to interview in the afternoon and easier in the evening, while households headed by non-employed persons are more difficult to interview in the evening and less so in the afternoon. Having a spouse or a partner who does not work seems to decrease the chance of interview, but the relationship is not statistically significant, nor is the interaction with time of day. Households with preschool children are less likely to participate in the survey, and the time of day with the highest probability of getting an interview with them is the evening, although this interaction is not statistically significant.

These data are not sufficient to produce adjustment estimates, as they refer to panel households only. In what follows we estimate a model on all households contacted, using proxies for the income and wealth of households that are not interviewed.

Table 3**Estimate of the probability of participation in the survey – panel households**

Parameter	Probability of participation	
	Estimate	Pr> t
Intercept	1.7759	<.0001
Summer holidays (July 15 to August 31)	0.4606	0.0353
Weekends and public holidays	0.1922	0.0009
Afternoon	0.1367	0.1418
Evening	0.0513	0.6782
Income	-7.32E-06	0.3663
Net wealth	-5.88E-07	0.3804
Self-employed	-0.0828	0.1028
Non-employed	0.1437	0.0002
Spouse/partner non-employed	-0.00666	0.8832
Preschool children	-0.086	0.0607
Income x Summer holidays	-4.13E-06	0.6002
Income x Weekends and public holidays	-3.80E-06	0.0419
Income x Afternoon	2.15E-06	0.2347
Income x Evening	-1.66E-06	0.4933
Net wealth x Summer holidays	-6.35E-07	0.3373
Net wealth x Weekends and public holidays	3.13E-08	0.7693
Net wealth x Afternoon	-4.51E-08	0.6562
Net wealth x Evening	1.88E-08	0.883
Self-employed x Afternoon	-0.0488	0.4458
Self-employed x Evening	0.0228	0.7876
Non-employed status x Afternoon	0.0302	0.5211
Non-employed status x Evening	-0.0449	0.4899
Spouse/partner x Afternoon	0.0453	0.4291
Spouse/partner non-employed x Evening	0.0487	0.5125
Preschool children x Afternoon	-0.0245	0.671
Preschool children x Evening	0.0522	0.4912
Year 2012	-0.3133	<.0001
Year 2010	-0.3369	<.0001
South and Islands x Municipalities from 40,000 to 500,000	0.0583	0.4006
South and Islands x Municipalities from 20,000 to 40,000	0.047	0.2352
South and Islands x Municipalities up to 20,000	-0.1461	0.0147
Centre x Municipalities from 40,000 to 500,000	0.099	0.2279
Centre x Municipalities from 20,000 to 40,000	-0.0987	0.0328
Centre x Municipalities up to 20,000	0.1181	0.0862
Second contact	0.2959	<.0001
Third contact or more	0.3058	<.0001

4.3 The adjustment

The effect of the time of interview on sample selection can be adjusted by estimating the probability of selection on the basis of the interviewers' contact actions both for the households interviewed and for those not interviewed (owing either to refusal or to unavailability).

For respondents, contact data are linked to those collected in the questionnaire (income and wealth). For households not interviewed but who did participate in earlier surveys, income and wealth are imputed by a linear model starting from the values

given previously. For the remaining uninterviewed households, income and wealth are imputed using information provided by the interviewer about the area of residence (city center, between city center and suburb, suburb, village, countryside; prestigious area, intermediate area, run-down area), the quality of the building (luxury, upscale, mid-range, modest, low income, very low income) in addition to other geographical information.

The probability of getting an interview is estimated through a logistic model whose regressors include contact variables, in particular time of day (morning, afternoon or evening), whether it was on a weekend or a public holiday, and whether it was during the summer holiday period. The model also includes household income and wealth, as well as control variables related to the municipality of residence, to the panel, year of the survey and the contact order number (whether it was the first, second or third contact). Interactions between the contact time variables and the income and wealth variables are also included in order to assess the potential bias due to timing. The logistic model is estimated at the level of contacts, excluding telephone contacts, which by definition cannot result in an interview.

The first results show that there is greater difficulty interviewing higher-income households, as was found for earlier surveys (D'Alessio, Faiella, 2002). The relative difficulty of interviewing these households is greater during the summer holidays and on national holidays. The coefficients of the wealth variables keep the same signs but they are not statistically significant (Table 4).

As for the time of day when the interview is conducted, low-income households are interviewed more easily in the morning, indirectly capturing the greater availability at this time of day of retirees and the non-employed; higher-income households, instead, are more easily polled in the evening; wealthier households are more easily interviewed in the morning. The positive coefficient of the panel variable indicates the higher participation rate of this group of households.

In order to gauge the extent of the bias, the estimated coefficients of the model can be used to determine the probability of selection of the households interviewed. The number of contacts varies: some households are contacted just once, others two or three times. For those interviewed at the third contact, one can calculate the ex-ante probability of interview associated with three contacts by combining the model's estimated probabilities of interview at each contact:

$$\pi_j = p_{1j} + (1 - p_{1j}) p_{2j} + (1 - p_{1j}) (1 - p_{2j}) p_{3j}$$

where p_{ij} is the model's estimated probability for the i -th ($i = 1, \dots, 3$) contact of the j -th household.¹⁰ For those interviewed at the first or second contact, their ex-ante probability must include contacts that did not happen. To generate an estimate, therefore, contacts that would have been made (up to three per household) have been simulated on the basis of the marginal probabilities of contact found at different times of the day and the week, and combined independently.¹¹ The period of observation of the contacts is instead assumed to be constant between the various attempts at contact, so that if one contact is made during the vacation period we assume that the remaining two contacts are made during the same period.

¹⁰ The formula assumes independence between the various attempts to interview, even if in the computation of each probability the order of the contacts is taken into account.

¹¹ The frequencies observed do not differ significantly from the assumption of independence.

Table 4

Estimate of the probability of participation in the survey

Parameter	Probability of participation	
	Estimate	Pr> t
Intercept	0.36610	<.0001
Summer holiday	0.64980	<.0001
National holidays	0.13600	<.0001
Afternoon	-0.07910	0.014
Evening	0.10660	<.0001
Income	-0.00001	<.0001
Net wealth	-5.4E-09	0.977
Income x Afternoon	1.87E-06	0.058
Income x Evening	1.52E-06	0.057
Income x Summer holiday	-8.9E-06	0.001
Income x Weekends and public holidays	-1.9E-06	0.048
Wealth x Afternoon	-4E-08	0.366
Wealth x Evening	-1.2E-07	0.004
Wealth x Summer holiday	-1.4E-07	0.444
Wealth x Weekends and public holidays	-8.9E-09	0.857
Year 2012	-0.02300	0.057
Year 2010	-0.12180	<.0001
South and Islands x Municipalities from 40,000 to 500,000	0.05490	0.065
South and Islands x Municipalities from 20,000 to 40,000	0.05150	0.002
South and Islands x Municipalities up to 20,000	-0.11380	<.0001
Centre x Municipalities from 40,000 to 500,000	0.09550	0.002
Centre x Municipalities from 20,000 to 40,000	-0.08430	<.0001
Centre x Municipalities up to 20,000	0.05770	0.038
Panel	0.77420	<.0001
Second contact	-0.13600	<.0001
Third contact or more	0.38810	<.0001

An unbiased estimator for income and wealth can then be obtained by computing the probability of inclusion of each household, not only on the basis of the sample design, but also taking account of the household's propensity to participate as a function of the time of the interview (Little, 1986; Groves et al., 2002). The unbiased estimator then uses a sampling weight w_j , obtained as the inverse of the product of the probability of inclusion in the sample, p_j , and the propensity to participate as a function of the time of the interview, π_j :

$$w_j = \frac{1}{p_j \cdot \pi_j}$$

Given that because of outliers the use of income and wealth in continuous form results in an excessive increase in the variability of the weights, we estimate a new model using income and wealth quintiles. The weights so obtained are then calibrated using external information, on the pattern of the SHIW weighting method.

The weights are calibrated by imposing the sample alignment on the characteristics of the population with regard to sex, age, geographical area, size of municipality and panel participation (Bank of Italy, 2014).

Table 5 shows the average values of income and wealth (adjusted for the effect of house prices) estimated with the original SHIW sample weights and with the sample weights that take account of the estimated propensity to participate. The adjustment increases both income and wealth. For income, the adjustment is around 2 per cent in 2010 and 2012 and 1.6 per cent in 2008; for net wealth, between 2.9 and 4.4 per cent. On changes in income and wealth between two consecutive survey waves, the adjustments are positive, between 0.4 and 0.5 percentage points for income and between 0.6 and 0.8 points for wealth.

These revisions, which take account both of the time of contact and of the generally lower participation rate of the wealthier households, are obtained with weights that are more variable than the original by about 2 per cent; but the standard errors of income and wealth are not larger than with the original estimates.

Table 5

Adjustment for time of contact						
	Income			Net wealth		
	Average values (euro) and percentage variations					
	C*	C**	(C** - C*)/C*	C*	C**	(C** - C*)/C*
2008	32,096	32,611	1.6	245,571	252,741	2.9
2010	32,731	33,416	2.1	263,341	273,093	3.7
2012	30,697	31,460	2.5	249,947	260,908	4.4
	Percentage variations and differences					
	ΔC^*	ΔC^{**}	$\Delta C^{**} - \Delta C^*$	ΔC^*	ΔC^{**}	$\Delta C^{**} - \Delta C^*$
2010-2008	2.0	2.5	0.5	7.2	8.1	0.8
2012-2010	-6.2	-5.9	0.4	-5.1	-4.5	0.6

C* = Values adjusted using house prices index; C** = Values adjusted using both house price index and time of contact.

5. Conclusion

We have shown that the time when interviews are conducted can significantly affect the survey estimates of average household income and wealth and that some adjustment procedure is accordingly needed.

The fact that respondents estimate property values and imputed rents at the time of the interview and not at the end of the previous year suggests that estimates of average net wealth should be adjusted by between 0.3 and 1.6 per cent and income by between 0.2 and 1 percent, depending on the year considered. The problem also affects the estimates of the changes in income and wealth from one survey to the next, with adjustments that can be as large as 2 percentage points. The magnitude of the adjustment is of course directly related to the dynamics of property prices and rents.

Since it is unreasonable to ask respondents to refer their estimates of property values and imputed rents to some past time, the estimates could continue to be adjusted as proposed. For imputed rents, an alternative could be a method based on hedonic regressions referred to actual rentals.¹²

¹² This method is more consistent with that used in the national accounts and would have the additional advantage of being less sensitive to price changes on the rental market.

The selection effects associated with the time of interview, and especially with summer holidays, are also significant. The estimated adjustments to income range from 1.6 to 2.5 percent and to wealth from 2.9 to 4.4 percent. Given that the adjustments are always upward and quite uniform from year to year, the survey-to-survey changes are affected less strongly, with an adjustment than ranges from 0.4 to 0.8 percentage points.

The adjustment methods based on inclusion probabilities can be applied to past data and replicated in future surveys. Nevertheless, the best solution here is to complete all the interviews before the summer vacation months, even at the cost of a small reduction in sample size.

Overall, considering both effects, the average values are always revised upwards, mainly because of the sample selection effect. In addition, changes in income and wealth in the period examined are revised upwards, less substantially between 2008 and 2010 (0.5 percentage points) and more significantly between 2010 and 2012 (1.5 points for income and 2.4 points for net wealth).

A more general consideration bears on the relationship between the reference time for the survey and the time of the interview. In most of the HFCS surveys the questions on income and wealth refer to the time when the interview is conducted. On the one hand, by reducing recall bias this may result in better quality responses, but on the other hand it extends the problems of time lag examined in this paper to other components, with a trade-off that is difficult to assess.

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