

# Methods and Sources: Methodological Notes

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For further information: [statistiche@bancaditalia.it](mailto:statistiche@bancaditalia.it)  
[www.bancaditalia.it/statistiche/index.html](http://www.bancaditalia.it/statistiche/index.html)

## The Survey on Household Income and Wealth

The Survey on Household Income and Wealth (SHIW) has been run by the Bank of Italy since the 1960s in order to gather information on the earnings and savings of Italians.

The reasons for instituting the survey were explained in one of the earliest reports:

“The importance of households in our economy, and in most market economies, becomes clear when one considers that they hold, either directly or indirectly, almost all our national wealth, that they receive almost all our national income, and that in Italy today they account for about three quarters of global domestic demand. Financially, too, households play a considerable role as they generate a substantial share of financial flows and possess a substantial share of financial assets. [...] In order to understand this role and to provisionally estimate some of the aggregates relating to the household sector, the Bank of Italy has instituted a new series of sample surveys on the income, consumption and saving of Italian households.<sup>1</sup>

Over the years, the survey has grown in scope and now it includes wealth and other aspects of households' economic and financial behaviour, such as the payment methods they employ.

As part of its institutional duties, the Bank of Italy also collects, processes and publishes statistics. The survey microdata provide information to complement that obtained from macro sources (e.g. the national accounts) as they can be used for the economic analysis of specific subpopulations of interest, such as wealthy or poor, low or high income households, households that are (heavily) in debt or those that are financially vulnerable.

This paper<sup>2</sup> summarizes the main methodologies used in the survey, particularly those relating to the statistical processes and data handling. Its purpose is to provide a solid background for users of the survey microdata.

### 1. Sample design

The purpose of the survey has always been to represent the population (officially) resident in Italy. The target population therefore does not include people living in institutions (convents, hospitals, prisons, etc.) or those who are in the country illegally.

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<sup>1</sup> Banca d'Italia (1966), *Reddito, risparmio e alcuni consumi delle famiglie italiane nel 1965*, Bollettino n. 4.

<sup>2</sup> Latest update: July 2022.

The sample for the survey is drawn in two stages, with municipalities and households as, respectively, the primary and secondary sampling units.<sup>3</sup> Before the primary units are selected, they are stratified by region and population size (primary sampling unit stratification).<sup>4</sup>

Within each stratum, the municipalities are selected to include all those with a population of more than 40,000 (*self-representing* municipalities), while the smaller towns are selected on the basis of *probability proportional to size* sampling (PPS). The households to be interviewed are then randomly selected from the civic register.

Before 1987 the survey was based on independent observations made at more or less yearly intervals. This frequency then became every two years (except for 1998 and 2020). The size of the sample has gradually increased reaching about 8,000 households.

In order to facilitate the analysis of changes in the investigated phenomena, since 1989 part of the sample has comprised households already interviewed in previous waves (panel households). In the last editions the panel share represents about 50 percent of the sample. The panel component of the sample consists of all households participating from at least two waves and an additional part randomly extracted from those interviewed only in the previous edition.<sup>5</sup> Non-panel households are instead randomly extracted from the demographic register.

Starting from the 2020 survey, secondary sampling units are stratified based on household income and indebtedness (secondary sampling unit stratification). This change has entailed a structural break and required the adoption of specific weighting techniques allowing historical comparison with the previous editions (see Section 8).

## 2. The questionnaire and data collection

The questionnaire used in each year is fully available on the web page “Documentation for the microdata” of the section dedicated to the survey of the Bank of Italy website.<sup>6</sup> The questionnaire has a modular structure and it is composed of a general part addressing aspects relevant to all households and a series of additional sections containing questions relevant to specific subsets of households.

Starting from the 1998 survey, data are collected mainly with the aid of computers (over 90 percent in the latest editions of the survey), using the Computer-Assisted Personal Interviewing program (CAPI). This electronic questionnaire, which is essentially a computer program, in addition to storing data also performs a number of checks, making it possible to remedy any inconsistencies in the data directly in the presence of the household.<sup>7</sup> The remaining interviews are conducted using paper-based questionnaires (PAPI, *Paper- And-pencil Personal Interviewing*), which the survey company subsequently transfers to a computer using the CAPI program as the input screen.

Starting from the 2020 survey, data are exclusively collected through CAPI<sup>8</sup>, using a tablet that automatically gathers metadata, such as the user’s position (GPS) and interview duration.

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<sup>3</sup> In the most recent editions of the survey, the number of first-stage units varied between 350 and 450 municipalities.

<sup>4</sup> Municipality size classes: up to 20,000 inhabitants, 20,000-40,000, and over 40,000.

<sup>5</sup> In order to gather useful information for intergenerational analyses, we have also contacted for the interview all the new households that were formed by old components of the panel units included in the sample (typically those formed by the children who constitute a new household).

<sup>6</sup> <https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-impres/bilanci-famiglie/documentazione/index.html>.

<sup>7</sup> There are many possible causes of inconsistencies: the respondent may not understand the question correctly, may recall certain information erroneously, or may even be reluctant to provide information regarded as confidential. The most common mistakes made by interviewers are coding errors or entering values in a different unit of measurement from that required by the questionnaire.

<sup>8</sup> In the 2020 survey, in order to limit the impact of COVID-19 restrictions, some interviews were conducted using the Computer-Assisted Telephone Interviewing (CATI) programme.

In the most recent editions, interviews last on average 50 minutes. However, there are considerable variations within the sample, which are positively correlated with income and the number of household members, especially if income-earners.

The interview stage is preceded by a series of meetings at which officials from the Bank of Italy and representatives of the company give instructions directly to the interviewers and by a pilot survey in which the new questions in the questionnaire are tested.

### **3. The processing of personal data**

The households invited to take part in the survey are selected by Istat from the population records, the names are chosen randomly and sent to the Bank of Italy for the survey. Data are used by the Bank of Italy for statistical purposes and for the analysis of the households' economic conditions. The transmission of personal data from Istat to the Bank of Italy is regulated by Article 21(2) of Regulation (EC) No. 223/2009, which explicitly authorizes 'the transmission of confidential data' from a European Statistical System authority to a member of the European System of Central Banks', provided that this transmission is necessary for the efficient development, production and dissemination of European statistics or for increasing the quality of European statistics'.

Households participate voluntarily and therefore any information provided is optional.<sup>9</sup> The questionnaires are first subjected to a quality control to separate those that are eligible. For instance, if a large number of questions are left unanswered or if a questionnaire is filled in by a household other than the one invited to take part to the survey that interview is eliminated.<sup>10</sup>

All data are processed in compliance with current data protection law<sup>11</sup> (European Regulation GDPR 679/2016 and Legislative Decree 196/2003 as amended) and are used by the Bank of Italy only for the purposes stated. The data processing is done by the Sample Survey Division members, who are authorized by the Head of the Statistical Analysis Directorate of the Bank of Italy and by the members of the company in charge of collecting data on behalf of the Bank of Italy, acting as data processor.

The data may be processed in conjunction with data obtained from administrative sources (incomes database, integrated property ownership database, register of current accounts and securities accounts, Infocamere, Central Credit Register, COVIP, INPS archives, Sistema Informativo Integrato di Acquirente Unico SpA). For record linkage, only the names of those chosen to take part in the survey are shared with the bodies that hold the administrative data. The names are processed only by the personnel of these bodies, who are expressly authorized to carry out necessary, relevant and appropriate processing. No information of a financial nature gathered in the course of the interview is passed on to such bodies in conjunction with the names. The integrated database (combining all the survey information with the administrative data) is managed only by authorized personnel of the Bank of Italy's Statistical Analysis Directorate. Were it to become necessary to share the integrated data with the bodies above, for instance to improve quality, that data would first be anonymized and would only be available for research purposes.

The microdata published on the Bank of Italy's website contain only sample information and have been anonymized to prevent any tracing back to the person concerned. Finally, statistical tables are provided, in Excel format, which analyse, for the reference year and in a historical series, a large set of economic phenomena studied in the survey.

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<sup>9</sup> The households invited to take part receive a booklet explaining the purposes of the survey and giving some examples of how the data are used. The participants do not receive any payment; when the survey results are published they are sent a thank you letter with copies of some of the press articles commenting on the survey.

<sup>10</sup> The section 'Data editing and imputation' provides more information on data control procedures.

<sup>11</sup> Data protection laws for each of the survey editions were: Legislative Decree 196/2003 as amended from 2002 to 2014; Regulation (EU) 679/2016 (GDPR) and Legislative Decree 196/2003 as amended since 2016.

Under Article 7 of Legislative Decree 196/2003 and Regulation (EU) 679/2016 (GDPR), every household interviewed has the right to (i) access their personal information; (ii) ask for it to be corrected, updated or removed; and (iii) object, for legitimate reasons, to its processing. The respondents can exercise these rights by making a request to the person assigned. Respondents may exercise their rights against the Data Controller – Bank of Italy, Organization Directorate, via Nazionale 91, 00184 Rome, e-mail: [org.privacy@bancaditalia.it](mailto:org.privacy@bancaditalia.it). The Data Protection Officer for the Bank of Italy can be contacted at Via Nazionale 91 – 00184 Rome, or at [responsabile.protezione.dati@bancaditalia.it](mailto:responsabile.protezione.dati@bancaditalia.it).

#### **4. Data editing and imputation**

The CAPI survey method greatly reduces the need for post-survey consistency checks of data quality. However, the standard checking procedure is used for interviews conducted with the paper-based questionnaire (less than a tenth), for which the CAPI program is used as an input screen in order to exploit its ability to flag inconsistencies.

Once the checks have been completed, work begins on imputing missing answers, which could be due to reticence on the part of the respondents or difficulties in replying to the question. It is necessary to impute answers for all the elementary variables that make up the aggregate (see Section 7), since the absence of even one component would prevent calculation of the aggregate (for example, it is necessary to impute fringe benefits such as lunch coupons in order to calculate income from payroll employment).

The amount of imputed data is generally small and mainly concerns the variables for which it is possible for households not to provide a timely response, such as the fringe benefits of employees, the value of financial assets (within the class of values provided by the households) and some monetary information on occupational pension plans and insurance policies.

Regression models are used to estimate the values to assign to the missing answers on the basis of other available information. In order to avoid an excessive concentration around average values, a random component is added, extracted from a normal variable with a mean of zero and a variance equal to that of the residuals in the regression model. This preserves the mean and the variance of the data actually measured.<sup>12</sup>

#### **5. Unit non-response**

The sample of households interviewed consists of some 8,000 families, about half of which are panel households. To obtain these interviews it was necessary to contact around 15,000 households during recent surveys. The participation rate in the survey is just over 50 per cent and is historically higher among panel households (about 80 per cent) than among the others (about 35 per cent).<sup>13</sup>

The most common reason for non-participation is unwillingness on the part of the household. In about a quarter of the cases, the households could not be contacted by telephone and were not at home on any of the three occasions the interviewers called, on different days and at different times.

Non-participation can be a problem in statistical surveys because it may produce samples in which the less co-operative sections of the population become under-represented, causing a selection bias. The estimators are based only on the information provided by the participants in the

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<sup>12</sup> See section 10.6 in *Survey Methodology*, edited by R.M. Groves, F.J. Fowler, M.P. Couper, J.M. Lepkowski, E. Singer and R. Tourangeau, New York, Wiley, 2004.

<sup>13</sup> The 2020 survey has been strongly influenced by the difficulties related to the COVID-19 pandemic, which has affected households' participation in the survey. The 2020 sample includes about 6,240 households, with a participation rate of 30 per cent (60 per cent for panel households and 20 per cent for non-panel households).



survey and their distortion increases with non-response and with the widening of the gap between the expected value of the variable for respondents and that for non-respondents.<sup>14</sup>

Several measures have been taken to reduce the effects of non-participation.<sup>15</sup> First, the households are sent an advance letter to inform them about the aims and the importance of the survey and to reassure them about the confidential use of their data. Second, respondents are given a toll-free number and the contacts of people taking care of the survey in the Bank of Italy for clarifications. Moreover they are given leaflets and other documents showing the main uses of the survey. Third, ever-greater care is taken in selecting the interviewers among those with more experience. Fourth, the number of addresses each interviewer is given to reach his/her target has been gradually reduced in the years.

In order to limit the effects of unit non-response, the households that cannot be contacted are replaced by others selected randomly in the same municipalities. The substitution is based on a strict protocol which is intended to limit the interviewer's influence over such a process. Moreover, at the end of the survey the sample is post-stratified on the basis of certain individual characteristics of the respondents in order to rebalance the various segments of the population within the sample (see Section 8).

The difficulty of obtaining an interview increases with the head of household's income wealth and educational qualification.

## 6. Data quality

Although non-response can be a major cause of data quality problems in surveys of income and wealth, the literature identifies a large number of other factors that are also potentially distorting the results.

The quality of estimates may be affected by the reluctance of households to report their sources of income or the real and financial assets they hold. Although participation is voluntary and respondents are informed at the outset about the content of the survey, they may not always be entirely truthful in their responses to the more 'sensitive' questions, such as those regarding income or wealth.

In order to assess the extent of such phenomena, which by their very nature are difficult to investigate, interviewers are asked to give a brief assessment of the presumed reliability of responses at the end of the interview, basing their judgement on a comparison between the information provided and objective evidence available to them (neighbourhood and type of dwelling occupied by the household, standard of living implied by the quality of furnishings, etc.).<sup>16</sup> Additional elements to assess the reliability of respondents' replies can be obtained by comparing survey estimates with figures from the national accounts. Such comparisons must be made with caution since at least part of the disparities found may be due to differences in the definitions employed.<sup>17</sup> If these aspects have been taken into consideration, the available studies show that income estimates and household real estate wealth are broadly aligned between the two sources. On the other hand, the components of financial assets are significantly underestimated.<sup>18</sup>

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<sup>14</sup> See section 3.1 in G. D'Alessio and I. Faiella, 'Nonresponse behaviour in the Bank of Italy's Survey of Household Income and Wealth', *Temi di discussione*, 462, Rome, Banca d'Italia, 2002.

<sup>15</sup> The decreasing trend of response rates is common to several countries. See E. de Leeuw and W. de Heer, "Trends in Household Survey Nonresponse: A Longitudinal and International Comparison", in *Survey Nonresponse*, edited by R.M. Groves, D.A. Dillman, J.L. Eltinge and R.J.A. Little, New York, Wiley, 2002, pp. 41-54; see also section 6.5 in R.M. Groves et al., *Survey Methodology*.

<sup>16</sup> The interviewers' evaluations are expressed on a scale from 1 (completely unreliable) to 10 (completely reliable). The interviewers also provide information on the extent to which the interviewees understood the questions and on the general climate in which the interview was conducted.

<sup>17</sup> For an analysis of the inconsistencies between the two sources and for possible reconciliation exercises, see G. D'Alessio and A. Neri, *Income and wealth sample estimates consistent with macro aggregates: some experiments*, Bank of Italy, Occasional Papers, n. 272, 2015.

<sup>18</sup> Apart from non-response and under-reporting, this discrepancy may be partly due to the different value given to items in the various sources, as well as to some items, such as shares, that are estimated as a residual in the flow-of-funds. For a detailed analysis of the

## 7. Aggregate variables

The main aggregates constructed from the items in the questionnaire are shown in the following schemes.

### Aggregation of variables: income account

Variable name	Description <sup>(1)</sup>
Y	Net disposable income
YL	Payroll income
YL1	Net wages and salaries
YL2	Fringe benefits
YT	Pensions and net transfers
YTP	Pensions and arrears
YTP1	Pensions
YTP2	Arrears
YTA	Other transfers (2)
YTA1	Financial assistance (wage suppl., etc.)
YTA2	Scholarships
YTA3	Alimony and gifts
YTA31	received
YTA32	paid (-)
YM	Net self-employment income
YMA1	Self-employment income
YMA2	Entrepreneurial income
YC	Property income
YCA	Income from real-estate
YCA1	Actual rents
YCA2	Imputed rents (3)
YCF	Income from financial assets (4)
YCF1	Interest on deposits
YCF2	Interest on government securities
YCF3	Income from other securities
YCF4	Interest payments (-)

$$Y = YL + YT + YM + YC$$

- (1) A minus sign indicates that the item is included with a negative sign in calculating the aggregate of which it is a component.
- (2) In the 2020 survey there are two further aggregates in YTA: YTA4 (payments related to the COVID-19 pandemic) and YTA5 (minimum income/pension schemes). Moreover, YTA1 is broken into two components: YTA11 (wage supplementation scheme) and YTA12 (other payments).
- (3) Excludes buildings used for self-employment.
- (4) Interest rate \* capital stock.

differences that should be taken into account when comparing the survey micro estimates with the flow-of-funds macro estimates see R. Bonci, G. Marchese and A. Neri, 'La ricchezza finanziaria nei conti finanziari e nell'indagine sui bilanci delle famiglie italiane', Temi di Discussione (Working Papers), 565, Banca d'Italia, 2005. For an analysis of under-reporting see L. D'aurizio, I. Faiella, S. Iezzi and A. Neri, 'L'under-reporting della ricchezza finanziaria nell'indagine sui bilanci delle famiglie', Temi di Discussione (Working Papers), 610, 2006; L. Cannari and G. D'Alessio, 'Non-Reporting and Under-Reporting Behavior in the Bank of Italy's Survey of Household Income and Wealth', *Bulletin of the International Statistical Institute*, LV/3, 1993, p. 395-412. For an analysis of non-response see G. D'Alessio and I. Faiella, 'Nonresponse behaviour in the Bank of Italy's Survey of Household Income and Wealth', Temi di Discussione (Working Papers), 462, Banca d'Italia, 2002. For an examination of both aspects see A. Neri and M.G. Ranalli, 'To misreport or not to report? The case of the Italian Survey on Household Income and Wealth', *Statistics in Transition*, 12, 2011, 281-300.

### Aggregation of variables: use of income account

Variable name	Description
Y	Net disposable income
C	Consumption
CD	Durables
CD1	Expenditure for transport equipment
CD2	Expenditure for furniture, etc.
CN	Non-durables
S	Saving <sup>(1)</sup>
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Y = C + S	
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(1) Determined as a residual.	

### Aggregation of variables: capital account

Variable name	Description <sup>(1)</sup>
W	Net wealth
AR	Real assets
AR1	Real estate
AR2	Business equity
AR3	Valuables
AF	Financial assets
AF1	Deposits
AF2	Government securities
AF3	Other securities
AF4	Trade credit or credit due from other households
PF	Financial liabilities (-)
PF1	Liabilities to banks and financial companies
PF2	Trade debt
PF3	Liabilities to other households
Memorandum items:	
BD	Durables
BD1	Transport equipment
BD2	Furniture, etc.
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W = AR + AF – PF	
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(1) A minus sign indicates that the item is included with a negative sign in calculating the aggregate of which it is a component.	

## 8. Sample estimates

Given the generic nature of the variable  $y$ , an unbiased estimator<sup>19</sup> of the population mean would be the Horwitz-Thompson-Narain estimator, given by

$$(1) \quad \bar{y} = \frac{\sum_h \sum_i \sum_j y_{hij} w_{hij}}{\sum_h \sum_i \sum_j w_{hij}} \quad j = 1, \dots, n_{hi} \quad i = 1, \dots, a_h \quad h = 1, \dots, H$$

where  $y_{hij}$  is the value of  $y$  observed for household  $j$  interviewed in municipality  $i$  belonging to stratum  $h$ , while  $w_{hij}$  is its sampling weight.

The final weight is the result of the following steps<sup>20</sup>:

- a) an initial weight is computed as the inverse of selection probability (*design weight*  $w^{(0)}$ );
- b) this weight is then adjusted for unit nonresponse ( $w^{(1)}$ ) by multiplying  $w^{(0)}$  by the inverse of response rate in the stratum;
- c) the weight  $w^{(1)}$  is further modified in order to take into account the panel component (obtaining  $w^{(2)}$ );
- d) last,  $w^{(2)}$  is calibrated to account for additional information coming from external surveys (*post-stratification*), obtaining the final weight  $w^{(3)}$ .

In accordance with the sampling design each person in the household is given an initial weight, being the inverse of his/her probability of inclusion in the sample (*design weight*).

The design weight is adjusted for some households' refusal to take part in the survey (unit non-response). This is done by inflating the weights for the ratio of theoretical sample size to actual sample size within each second-stage stratum (weighting class adjustment)<sup>21</sup>. As discussed in Section 1, the survey design assumes a portion of the sample to be made up of households interviewed in previous waves (panel households). Panel household socio-demographics may partly differ from the whole sample, essentially because of panel deterioration resulting from attrition, i.e. unit non-response in subsequent waves. To adjust for this potential estimate distortion, the panel component of the sample is stratified ex-post based on some of the characteristics of the previous survey. More specifically, this adjustment is obtained by combining four income classes and three head-of-household employment status classes.<sup>22</sup> Moreover, the weight will be adjusted to replicate the panel's optimal share (estimated at 50 percent of the sample). Lastly, the weights are calibrated using external information that, in correlation with the surveyed variables, will improve estimate accuracy and further limit non-response distortions. The system was calibrated using Istat data referring to the Italian population on: gender, age group

<sup>19</sup> An estimator is unbiased when its mean is the same as the population parameter. In reality, the estimator (1) is only "approximately" unbiased, i.e. it has a limited bias that tends towards zero as the sample size increases. The maximum bias of this estimator is equal to the coefficient of variation of the weights (usually around 1 per cent for household estimates and 0.7 per cent for individual estimates). See L. Kish, *Survey Sampling*, New York, Wiley, 1995. Chapter 2.

<sup>20</sup> For a detailed description of the weighting scheme adopted until the 2016 survey, see I. Faiella and R. Gambacorta, 'The weighting process in the SHIW', Banca d'Italia, Temi di Discussione (Working Papers), 636, 2007.

<sup>21</sup> The calibration for unit non-response also accounts for households who could not be found at their home addresses due to having moved to a new address, death, or wrong address.

<sup>22</sup> In order to account for attrition, statistical models for unit non-response could have been used, as suggested by A. Giraldo, E. Rettore and U. Trivellato, 'Attrition bias in the Bank of Italy's Survey of Households' Income and Wealth', International Conference on Quality in Official Statistics, Stockholm, 14-15 May 2001. It should be noted, however, that using re-weighting models or techniques when adjusting for unit non-response has a substantially similar, and usually limited, impact on sample estimates. See G. Kalton and I. Flores Cervantes, 'Weighting Methods', *Journal of Official Statistics*, vol. 19, no. 2, 2003, pp. 81-97.



(<26, 26-45, 46-65, >65), geographical area (North, Centre, South and Islands), population of the municipality of residence (<20,000, 20,000-40,000, 40,000-500,000, >500,000)<sup>23</sup>.

Starting from the 2020 survey, sampling weight construction was revised to adjust for the introduction of household stratification in the second stage of survey design. More specifically, to make the sample more representative across the income distribution, non-panel households were stratified in ten household income groups per geographical macro-area (North-East, North-West, Centre, South and Islands)<sup>24</sup>. Moreover, in order to improve the usability of the survey for studying financial vulnerability, a sample of indebted households was added to the selected sample and was stratified according to five debt size groups for each type of debt (non-performing and performing loans).<sup>25</sup> As a result, for the 2020 survey the new sample design weights were calculated as follows:

- a) The design weight  $w_{hik}^{(0)}$  is calculated by multiplying the inverse of the probability of selecting municipality  $i$  of stratum  $h$  (i.e. the weight of first-stage units) and the inverse of the probability of selecting a stratum  $k$  household (second-stage stratification)<sup>26</sup> residing in municipality  $i$  of stratum  $h$  (i.e. the weight of second-stage units).

$$w_{hik}^{(0)} = \left( \frac{1}{m_h} \frac{P_h}{P_{hi}} \right) \frac{N_{hik}}{n'_{hik}} \quad h = 1, \dots, H, k = 1, \dots, K$$

where  $P_h$  and  $m_h$  are the resident population and the number of sample municipalities in stratum  $h$  (first stage), respectively,  $P_{hi}$  is the resident population in municipality  $i$  of stratum  $h$ ,  $N_{hik}$  and  $n'_{hik}$  are the number of resident households and the number of selected households (theoretical sample), respectively, in municipality  $i$  of first-stage stratum  $h$  belonging to second-stage stratum  $k$ ;

- b) The adjustment for total non-response  $w_k^{(1)}$  is obtained by multiplying  $w_{hik}^{(0)}$  by the inverse of the response rate of stratum  $k$  to which each household belongs

$$w_k^{(1)} = w_{hik}^{(0)} \frac{n'_k}{n_k}$$

where  $n'_k$  and  $n_k$  are total selected households (theoretical sample) and total respondents (actual sample) in second-stage stratum  $k$ ;

- c) the weight  $w_k^{(1)}$  is adjusted for panel attrition (i.e. non-response from household units who participated in previous surveys) and to replicate the panel's optimal share, estimated at approximately 50 per cent of the sample, resulting in the weight  $w^{(2)}$ <sup>27</sup>;

<sup>23</sup> The chosen technique allows us to simultaneously align sampling weights with the distribution of some data from external sources, considering marginal probabilities only. This approach is known as iterative proportional fitting (or raking). See G. Kalton and I. Flores Cervantes, 'Weighting Methods', *Journal of Official Statistics*, vol. 19, no. 2, 2003, pp. 81-97.

<sup>24</sup> Household income thresholds were identified using an optimization algorithm, which takes account of the approximation of available administrative data to the variable being surveyed. For more details, see G. Barcaroli, G. Ilardi, A. Neri, and T. Tuoto, 'Optimal sampling design for household finance surveys using administrative income data', *Istituto Nazionale di Statistica, Rivista di statistica ufficiale*, 2, 2021.

<sup>25</sup> See A. Di Salvatore, G. Ilardi G. and A. Neri, 'L'uso della Centrale dei rischi per migliorare la qualità delle stime del debito basate sull'indagine sui bilanci delle famiglie italiane', Banca d'Italia, mimeo, 2020.

<sup>26</sup> The strata used for constructing the weights were collapsed compared with those used for sample selection, in order to reduce the final weights' variance. More specifically, households were grouped into six strata based on income and three strata based on level of indebtedness.

<sup>27</sup> For a detailed description of the calibration of the panel component, see I. Faiella and R. Gambacorta, [The weighting process in the SHIW](#), Banca d'Italia, Temi di discussione (Working Papers), 636, 2007.

- d) Lastly,  $w^{(2)}$  is adjusted based on additional information (calibration), using external data that are correlated to key economic variables in order to improve estimator accuracy. More specifically, weights are adjusted to replicate the population demographics in terms of gender, age (seven classes), geographical area (three classes), municipality size (four classes), level of education (two classes) and household composition (five classes), resulting in the final weight  $w_j^{(3)}$

$$w_j^{(3)} = w^{(2)} \gamma_j$$

where  $\gamma_j$  is the adjustment factor for class  $j$  of the stratification variable  $\gamma$ .

For the purposes of historical data comparison under the new survey design, a historical comparison weight was constructed. In terms of new weight creation, a further step has been added before calibration at stage d), where weights are adjusted to reduce the difference in household selection probability in the new sample design as opposed to in the previous one, and to make the 2020 sample distribution as similar as possible to the distribution that would have been obtained before revising the sample design in terms of income and debt distribution (to that end, the 2016 survey data were also incorporated into the same administrative records used for 2020). To achieve this result, an iterative weight rebalancing technique was used (raking)<sup>28</sup>.

## 9. Standard errors

The purpose of analysing the survey data is to obtain estimates of one or more population parameters (e.g. mean, total and regression coefficients), and an assessment of the variability of the sample is necessary in order to build confidence intervals for the estimates and to conduct hypothesis tests.<sup>29</sup>

The actual variability of the estimators can be determined only with techniques that take account both of the sample selection procedure and the nature of the estimators.<sup>30</sup> Analytical methods for the evaluation of the standard errors are unsuitable since they do not properly account for both the complexity of the sample design and the non-linearity of most of the estimators, including those obtained through variance linearization techniques.

This problem can be overcome with replication methods that consist in obtaining information on variability by repeating the estimation on 'replicates' of the original sample. Therefore, for the variance estimation the jackknife replication method was used, which obtains information on variability by reproducing the estimation phases on replicas of the original sample.<sup>31</sup>

In order to calculate the standard error a design must be chosen that is consistent with the sample unit selection process but does not create computational difficulties.<sup>32</sup> In the first place, all municipalities with more than 40,000 inhabitants (*self-representative* municipalities) are placed in a separate stratum because they make no contribution to the randomization of the sample in the first stage. The sample households in each of these municipalities are then divided into two random

<sup>28</sup> For more details on the variables and re-weighting method used for comparison with previous survey editions, see R. Gambacorta and E. Porreca, 'Bridging techniques in the redesign of the Italian survey on household income and wealth', Banca d'Italia, Questioni di economia e finanza (Occasional Papers), forthcoming.

<sup>29</sup> A confidence interval is a range of values that includes, with some degree of probability, the unknown parameter. Basically, it measures the reliability of the most likely location of the estimate obtained by applying the estimator to a given sample. Given the size of the present sample, a confidence interval for the mean could be: *mean of variable*  $\pm 1.96 * \text{standard error of the mean}$ .

<sup>30</sup> The inference problems associated with complex sample designs and the variance estimation model used are described in detail in I. Faiella, "Accounting for sampling design in the SHIW", Banca d'Italia, Temi di discussione, 662, 2008.

<sup>31</sup> The most common replication techniques employed for this purpose are random groups, bootstrap, balanced repeated replications and jackknife. The last two methods are reputed to have better statistical properties when it is taken into account the structure imposed on the data by the complex nature of the sample design (stratification and two-stage sampling). See K.M. Wolter, *Introduction to Variance Estimation*, Berlin, Springer Verlag, 1985; J. Shao and J. Tu, *The Jackknife and Bootstrap*, Berlin, Springer Verlag, 1995.

<sup>32</sup> For example, the strata with a single first-stage unit have to be collapsed and it is best if each stratum contains sufficient numbers to produce stable estimates.

groups. The remaining municipalities are grouped in their original stratum to give two municipalities per stratum. At the end of this process there are about 350 “pseudo” strata containing two “pseudo” first-stage units.

The variance is calculated with the jack-knife method:

1. the number  $c$  of replications is equal to the number of “pseudo” strata;
2. in each replicate the weight of the first “pseudo” primary sampling unit is set equal to zero and the sampling weight of the other is raised by a factor to compensate the weight of the cancelled unit;
3. this weight is used to calculate, for each replicate, the relevant estimators  $\hat{\theta}_{(i)}$ ;
4. since the design for variance estimation contains two units per stratum, the estimate of the standard error is calculated as the square root of the sum of the square deviations between the estimate of the replications and the estimate on the total sample  $\hat{\theta}$  :<sup>33</sup>

$$(2) \quad stderr_j = \sqrt{\sum_{i=1}^c (\hat{\theta}_{(i)} - \hat{\theta})^2}$$

A useful way of assessing how far the estimation variance calculated to take account of the complexity of the sample design diverges from the one assuming simple random sampling is to measure the ratio between the two: for the generic estimator  $\hat{\theta}$  the design effect (*deff*) is:

$$(3) \quad deff(\hat{\theta}) = \frac{V(\hat{\theta})_{compl}}{V(\hat{\theta})_{cxs}}$$

The estimates of these coefficients for the main economic variables used in the survey are reported in the cross-sectional statistical tables on the reference year.

## 10. Data dissemination

Microdata from the Surveys of Household Income and Wealth conducted between 1977 and 2020 are available on the Bank of Italy’s website at the address: [www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/bilanci-famiglie](http://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/bilanci-famiglie).<sup>34</sup> The information needed to make use of the data (questionnaires of the latest surveys, names of variables, notes on using the data, etc.) is given in the documentation. Data are available in SAS and STATA formats and in “comma separated” ASCII files (CSV).

Two types of database can be accessed. The **annual database** contains for each wave virtually complete information relating to the surveys from 1989 wave (including the focus topics covered in each survey). The **historical database** contains homogeneous information from 1977 wave for the subset of variables needed for longitudinal analyses.

The annual databases may be weighted differently from the corresponding historical database. The weighting of the annual databases is not revised, while that of the historical database is aligned to the demographic statistics on the Italian population issued by Istat (e.g. between-census reconstructions) when the latter are revised. A revision of the sample weighting may cause discrepancies between the statistics derived from the present version of the historical database and those based on earlier versions. Moreover, as of the 2020 edition, the weight of the annual database is the sampling weight obtained with the new design and does not allow for comparison with previous years, while the weight of the historical database is the sampling weight obtained using the rebalancing technique that allows for comparison with previous editions.

<sup>33</sup> See Kish L and M. Frankel, “Inference from complex samples”, *The Journal of the Royal Statistical Society*, Series B, 1974, 36 (1), pp. 1-37.

<sup>34</sup> Publications and documentation are available in both Italian and English.

## 11. Data utilization

The survey is an important source of information on the financial situation of households and contributes significantly to social and political debate on this subject. The main findings are published in the *Statistics series of the Bank of Italy* and are widely reported in the main national daily newspapers, as well as frequently cited in television debates.

The microdata are also used in research projects as part of the Bank of Italy's institutional activities. Such projects include studies of the effects of monetary policy measures on household consumption, income and wealth distribution, the operation of the financial markets, and aspects of taxation or pension reform. One particularly important use is in assessing the impact of specific economic policy measures by means of a micro-simulation model.

The survey data are anonymized before they are made available to external users from public and private research institutes. The main scientific publications based on the survey number around 800.<sup>35</sup>

## 12. The survey in the international context

In recent years the survey has been integrated into international research projects that allow a cross-country comparison of the economic condition of households between the main western countries.

The first two projects are the Luxembourg Income Study and the Luxembourg Wealth Study, whose aim is to produce comparable cross-national data archives on household income and wealth ([www.lisdatacenter.org/](http://www.lisdatacenter.org/)). The harmonization process takes place "a posteriori" by identifying the economic variables measured in a comparable manner and by creating a unique documentation for the various surveys in order to make their use easier. Microdata are made available through both a remote processing system and a web tabulator.

Starting from 2008, the survey has also been part of a project conducted by the European Central Bank to produce a harmonized survey on household finances and consumption in the euro area (Household Finance and Consumption Survey - HFCS). The survey collects all the variables needed to construct the household budgets both in terms of stocks and flows, with particular attention to the components of wealth, and provides information on the economic behaviors of households useful for a better understanding of the transmission mechanisms of monetary policy and for the evaluation of financial stability profiles. Anonymized micro data are available to researchers for research purposes ([www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher\\_hfcn.en.html](http://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html)). The main advantage of this project is the harmonization of the methodologies and definitions used by the various countries to conduct the various surveys that form the HFCS.<sup>36</sup>

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<sup>35</sup> See the list of references to the main research studies that use the survey database at <http://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-impresa/bilanci-famiglie>

<sup>36</sup> For understanding the main differences between SHIW data and those of the HFCS, the reader can see Gambacorta R., Ilardi G., Locatelli A. Pico R., Rampazzi C., *Main results of the Household Finance and Consumption Survey: Italy in the international context*, Banca d'Italia, Questioni di Economia e Finanza, n. 161, 2013.