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Abstract

This report summarises the methodologies used in the fourth wave of the Eurosystem Household Finance and Consumption Survey, which provides household-level data collected in a harmonised way in all 19 euro area countries, as well as in the Czech Republic, Croatia and Hungary. The total sample size is composed of more than 83,000 households. Although the survey does not refer to the same time period in all countries, the most common reference period for the data is 2021. The report presents the methodologies applied in areas such as data collection, sample design, weighting, imputation, and variance estimation. It also addresses statistical disclosure control issues and analyses issues that may have an effect on the comparability of the survey data across countries and across waves.

Keywords: Household-level data, wealth, survey methodology

JEL codes: D12, D14, D31

1 Introduction

The Household Finance and Consumption Survey (HFCS) is a joint project among all national central banks of the Eurosystem, the central banks of two European Union (EU) countries that have not yet adopted the euro and various national statistical institutes.[1] The HFCS provides detailed household-level data on various aspects of household balance sheets and related economic and demographic variables, including income, private pensions, employment, and measures of consumption.

The HFCS is conducted in a decentralised manner, in the sense that each institution participating in the Household Finance and Consumption Network (HFCN), namely the national central bank (NCB) and/or national statistical institute (NSI), is responsible for conducting the survey. The ECB works alongside the HFCN in coordinating the whole project, ensuring that a common methodology is followed, pooling and assuring the quality of country datasets and disseminating the survey results and microdata through a single access gateway.

While the fourth wave of the HFCS was initially planned for 2020, the fieldwork was disrupted by the outbreak of the coronavirus (COVID-19) pandemic. It was ultimately conducted throughout 2020 and 2021, with the most common reference period for assets and liabilities being 2021. Table 1 provides a snapshot of the fieldwork periods in the various countries. As different reference periods have an effect on comparability, the figures between the survey waves in individual countries have been adjusted for inflation using the Harmonised Index of Consumer Prices.[2] Although this adjustment is not able to fully address the comparability issues caused by the differences in the fieldwork periods, no further modifications have been made to the data in order to correct for these differences. The adjustment factors between the two latest survey waves are shown in the right-hand column of Table 1. An adjustment factor of, for example, 1.074 indicates that inflation between the two survey waves was 7.4%. For countries that had yet to adopt the euro at the time of the survey, results in local currency were converted into euro at the prevailing exchange rate.

1 The first wave (2010) of the HFCS was conducted in 15 euro area countries, the second wave (2014) in 18 euro area countries, as well as in Hungary and Poland, and the third wave (2017) in all 19 euro area countries, as well as in Croatia, Hungary and Poland. The fourth wave (2021) was conducted in all 19 euro area countries, as well as in Croatia, the Czech Republic and Hungary. Poland did not participate in the fourth wave.

2 The values of assets, debt, income and consumption have been adjusted for by multiplying the first-, second- and third-wave figures with the ratio between the yearly averages of the price level in the reference years for the survey waves.

Table 1

Fieldwork and reference periods of the 2021 wave and inflation adjustment factor

Country	Fieldwork period	Assets and liabilities	Income	Inflation adjustment factor between the 2017 and 2021 waves
Belgium	July 2020 – June 2021	Time of interview	2019	1.074
Czech Republic	February 2020 - February 2022	Time of interview	Last calendar year	-
Germany	April 2021 – January 2022	Time of interview	Last calendar year	1.070
Estonia	January 2021 – August 2021	Time of interview*	2020	1.098
Ireland	July 2020 – January 2021	Time of interview	Last 12 months	1.004
Greece	October 2021 – April 2022	2021	Last 12 months	0.998
Spain	November 2020 – July 2021	Time of interview	2019	1.022
France	September 2020 – March 2021	Time of interview	2020***	1.061
Croatia	September 2020 – December 2020	Time of interview	Last 12 months	1.024
Italy	March 2021 – December 2021	31 December 2020**	2020	1.031
Cyprus	March 2021 – November 2021	Time of interview	2019	1.025
Latvia	August 2020 – December 2020	Time of interview	2019	1.055
Lithuania	September 2020 – February 2022	Time of interview	Time of interview	1.150
Luxembourg	October 2021 – December 2021	Time of interview	2020	1.052
Hungary	October 2020 – December 2020	Time of interview	Last 12 months	1.100
Malta	November 2020 – February 2021	31 October 2020	2020	1.054
Netherlands	May 2021 – June 2021	Time of interview	2020	1.085
Austria	May 2021 – February 2022	Time of interview	2020	1.080
Portugal	October 2020 – February 2021	Time of interview	2019	1.014
Slovenia	June 2020 – December 2021	Time of interview	Last calendar year	1.055
Slovakia	July 2021 – October 2021	Time of interview	2020	1.105
Finland	January 2020 – June 2020	31 December 2019	2019	1.032

Source: HFCS metadata.
Note: The periods mentioned in the "Assets and Liabilities" and "Income" columns refer to the reference periods used in the country-specific questionnaire for the respective variables.
* Time of interview for variables collected at the interview; 30 April 2021 for variables derived from register data.
** Time of interview for value of dwellings.
*** The reference year for the income data for France is based on 2019 administrative data (fiscal data) adjusted statistically to reflect household income in 2020 as much as possible.

The HFCS is designed around a common set of methodological principles, which enhances the comparability of results. When compared with other international data on household wealth surveys (such as the Luxembourg Wealth Study), one of the most distinctive features of the HFCS is that the constituent country wealth surveys

follow an **ex-ante harmonised methodology**. In particular, all country-level HFCS datasets provide a set of core output variables that follow common definitions and descriptive features according to an output-oriented approach.

Household samples have been designed in each country to ensure representative results at both the euro area and national level. More than 83,000 households were surveyed in the fourth wave, with sample sizes varying across countries. All country surveys have a **probabilistic sample design**, meaning that each household in the target population has an ex-ante defined non-zero probability of being part of the sample. Given the unequal distribution of household wealth and the fact that certain financial instruments are almost exclusively held (and in large quantities) by the wealthiest households, most countries apply some type of **oversampling of wealthy households**.

Several country surveys include a **panel component**, where some households in the sample are interviewed over subsequent waves, thus allowing the analysis of changes over time. In the 2021 wave, 13 countries had a panel component. In these countries, the panel component was supplemented with a newly selected sample, known as a refresher or refreshment sample.

One feature of survey data is the existence of item non-response, i.e. where a respondent is unable to provide a reliable answer to all questions asked. This is important because missing data renders economic analyses of the information less reliable. **Imputing missing values** – i.e. the process of assigning values to variables that have been collected incorrectly or not at all – is a prerequisite for being able to use the data. For the HFCS, a multiple stochastic imputation strategy has been chosen.[3] The dataset provides five imputed values (replicates) for every missing value of the variables needed to compute household wealth, consumption, or income.

The HFCS consists of representative samples for each participating country and allows for country-level estimates. Note, however, that cross-country differences in survey results should be interpreted with caution. Despite the improvement in HFCS data comparability made possible by a considerable effort in ex-ante harmonisation, the other methodological differences described in this report may account for part of the differences observed across countries. For example, the coverage of the top of the wealth distribution may be affected by differences in sample design and particularly in the oversampling of the most affluent households. Moreover, differences between countries in statistics of interest must be assessed against relevant institutional and socio-demographic differences. The shape of the distribution of income or wealth among households crucially depends on household structure – and hence on the age composition of the population – and on factors affecting household formation, among other things. Institutional and methodological issues affecting cross-country comparability of results are discussed further in Chapter 9.2.

In the 2021 wave, the COVID-19 pandemic had an impact on several methodological aspects of the survey, such as the mode of collection, since interviews in person were

[3] While multiple imputation is used in most countries, there are some exceptions. In the 2021 wave, it was not used in Italy, France, Finland, and Czech Republic. More information on the various imputation methodologies can be found in Chapter 6.3.

not always possible. It is important to account for these aspects when comparing data across waves and countries. This is further discussed in Box 1 at the end of Chapter 3.1.

This document describes the methodologies used to produce the Household Finance and Consumption Survey across countries. It includes detailed descriptions of the HFCS blueprint questionnaire and output variables, data collection, sample design, unit non-response and weighting, editing, item non-response, imputation, and variance estimation. It also includes sections on statistical disclosure control and data comparability across survey waves, across countries and vis-à-vis selected benchmark statistics.

A detailed description of the results of the 2021 wave is provided in a companion publication.[4]

[4] See HFCN (2023), "The Household Finance and Consumption Survey: results from the 2021 wave", *Statistics Paper Series,* No. 46, ECB.

2 The HFCS blueprint questionnaire and list of output variables

The list of core output variables is the reference document for data production and includes the harmonised definitions of the survey variables. To facilitate the collection of the core variables, a blueprint questionnaire has been designed as a benchmark for national surveys. Countries are free to adapt the wording or sequencing of questions to best cater to local conditions. The HFCS blueprint questionnaire consists of an introduction, sections on nine topics with household-level and person-level questions for collecting the core output variables, and interview closure.

2.1 Pre-interview part of the HFCS questionnaire

2.1.1 Interview introduction and selection of main respondent

The HFCS blueprint questionnaire provides a script for establishing contact with the sampled household as well as some introductory information (on the importance of taking part in the survey, measures to ensure data confidentiality, how the survey data will be used, etc.).[5]

An important part of the interview introduction is the selection of the main household respondent, known as the "financially knowledgeable person" (FKP). As the main respondent, the FKP provides financial information for the whole household. This is to minimise response burden and avoid duplication. For a survey like the HFCS, where the main focus is household finances, assets and liabilities, it is vitally important to target the right person, so that the best available information on household finances can be collected during the interview. The interview introduction contains a set of sequential questions used to identify the FKP.

2.1.2 Household listing, HFCS household definition and reference person

The purpose of this part of the questionnaire is to establish a list of household members, i.e. defining the perimeter of the household. The replies given later by the main respondent regarding the household's financial information (assets, debts, consumption, etc.) should thus (only) refer to the household members identified during this initial step.

[5] Certain aspects discussed in the subsequent sections will depend on the survey mode used.

For the definition of household, the HFCS uses a variation of the so-called "housekeeping concept".[6] A household is defined as a person living alone or a group of people who live together in the same private dwelling and share expenditures, including the joint provision of the essentials of living.[7]

The outcome of the screening part is the list of household members verified against the household membership definition. Individual members are then listed according to their relationships with an interview reference person chosen from among the household members. The interview reference person may well be the FKP, although not necessarily. Additionally, the interview reference person defined at the beginning of the interview (i.e. the person around whom the household is drawn) may not be the same as the reference person used to present the survey results. To release survey results for characteristics that can be assigned only at the individual level, such as age, education, or labour status, one person must represent the household as a whole. Such a person must be chosen on the basis of pre-defined objective criteria, as the household will be classified according to this reference person's characteristics. The information needed to apply a set of criteria is not yet available at the start of the interview. The reference person for statistical outputs is therefore constructed ex-post, based on the information about the household collected during the interview.

In HFCS publications showing euro area results, the criteria are based on international standards for household income statistics presented by the Canberra Group (UNECE, 2011). In line with these standards, the reference person is determined by going through the following sequential steps, until a person is selected:

- one of the partners in a registered or de facto marriage, with dependent children;
- one of the partners in a registered or de facto marriage, without dependent children;
- a lone parent with dependent children;
- the person with the highest income;
- the eldest person.

For example, in a household composed of two married adults with children, the reference person will be the adult with the highest income or, in the unlikely situation that both adults have the same income, the older adult.

2.2 The HFCS list of core output variables

The HFCS list of core output variables is split into nine sections. The sections on demographics, employment, and pensions and insurance policies cover information collected at the personal level, i.e. individually for all persons aged 16 or over (certain

[6] As opposed to the dwelling concept, where all persons living in one dwelling are automatically considered as one household. See, for example, UN (2008), p.100 for a more in-depth discussion of these two concepts.

[7] The complete household definition applied for the HFCS is provided in the Appendix.

demographic information is collected for children also). The sections on real assets and their financing, other liabilities and credit constraints, private businesses and financial assets, intergenerational transfers and gifts and consumption cover information collected at the household level. In the section on income, some income components are collected at the personal level (employment-related income, pension income, etc.) and others at the household level (e.g. income from financial investments).

The full list of HFCS core output variables is available on the HFCS web page. Changes to the questionnaire between the third and fourth waves are listed in Table 2 at the end of Chapter 2.3.

2.2.1 Demographics

The demographics section contains a basic set of information collected for all household members, namely age, gender, country of birth, and length of stay in the country (for the foreign born). Information on marital status and the highest level of education attained are collected only for household members aged 16 or over.

2.2.2 Real assets and their financing

This section collects information on ownership and current values of real estate assets (household main residence for homeowners (HMR), other real estate properties owned by the household), vehicles (cars, other types of vehicles such as motorbikes, boats, etc.) and valuables (such as jewellery, works of art or antiques). This section is also used to collect information on the purchase of vehicles within the past 12 months, and on house price expectations.

Variables on selected characteristics are collected for the household main residence (manner and year of acquisition, value at time of acquisition, etc.). Owners and tenants alike are asked about the size of the household main residence and the length of stay in the current household main residence. Tenants are also asked to provide information about the monthly amount paid in rent. For other real estate properties, respondents are asked about the type of property they own, its main use, the percentage of the property owned by the household and its current value.

The HFCS applies a collection approach that classifies mortgages by collateral. Selected characteristics or features of the mortgages are obtained, including the purpose of the loan, year in which the loan was taken out, initial and current maturity date, interest rate and the current monthly payment on the loan. These variables are collected for mortgages collateralised by the household main residence and by other real estate properties. In the blueprint questionnaire, questions on each mortgage collateralised by each property are asked immediately after information is collected on the property in question. This reduces the risk of respondents forgetting to disclose specific debts.

2.2.3 Other liabilities, credit constraints

The section on other liabilities contains variables relating to non-mortgage debt instruments – leasing contracts, credit lines/overdrafts, credit cards, private loans from family or friends and other loans not collateralised by real estate. On other loans not collateralised by real estate, individual details such as the purpose of the loan, initial amount borrowed, interest rate and current monthly payments are collected. The remaining part of the section targets questions on loan applications (such as whether the respondent has applied for credit in the last three years) and credit constraints (credit refusal experience, not applying for credit due to perceived credit constraints). In the fourth wave a question on late or missed loan payments was added.

2.2.4 Private businesses, financial assets

The first part of this section covers self-employment private businesses (with questions on sector of activity [NACE[8]], legal form, number of employees and current value of the household's share in the business). These are distinguished from other "passive" investments in non-publicly traded equity, for which only variables on ownership and on total current value of the equity holdings are collected.

The second part then covers financial assets: current accounts, saving accounts, mutual funds, bonds, publicly traded shares, additional assets in managed accounts, money owed to the household, and a residual variable on other financial assets. Selected additional characteristics are collected for bonds, mutual funds, and listed shares. The section also includes a self-assessment question on risk attitudes.

2.2.5 Employment

This section includes variables collected for all household members aged 16 or over, starting with a variable on self-reported current labour status. For employed persons, information on their current job is requested, including their job description (based on the International Standard Classification of Occupations – ISCO), sector of activity (NACE), contract type and hours they work in a week. Employed persons are also asked to estimate the probability of losing their job during the next 12 months. Those currently unemployed or retired are asked questions on their previous work history, and unemployed persons are asked to estimate the likelihood of finding a job within the next 12 months. All persons who are not yet retired and either are currently employed or have been so in the past, are asked at what age they plan to stop working.

[8] See details of the NACE classification.

2.2.6 Pensions and life insurance policies

The HFCS classifies pension wealth as voluntary pension schemes and life insurance contracts, occupational pension plans and public pension plans. This section aims to collect basic information on participation in these types of pension plans among household members aged 16 or over, on the current value of plans with an account balance, on monthly contributions, on the age at which the respondent expects to start receiving benefits and on the percentage of final labour income they expect to receive upon retirement from all public and occupational plans. Voluntary pension schemes and life insurance contracts are included within households' financial wealth in the report of HFCS results, while mandatory pension plans are excluded.

This particular part of the questionnaire is labelled as indicative, meaning that it is open to particular national implementations.

2.2.7 Income

The HFCS is a survey that focuses on collecting information about household wealth. Therefore, the main aim of the income section is to gather the main components needed to construct total gross household income, not including lower-level details of each of these components (such as a further breakdown of income from financial assets or regular transfers).

This section combines personal-level questions (employee income, self-employment income, income from public pensions, income from private and occupational pensions, unemployment benefits) and household-level questions (social benefits other than pensions and unemployment benefits, private transfers received, rental income, income from financial investments, private business or partnership income, other residual sources of income).

The concepts and definitions of the income section were designed along the lines of those of the UNECE Canberra group handbook on household income statistics.[9] Imputed rents and income in kind components are not covered by the HFCS core income section. The target income aggregate is gross, including taxes and social insurance contributions paid by employees.[10]

In addition to the income-component questions, two qualitative supplementary questions are asked on the level of annual income as compared with normal and on income expectations over the following year.

2.2.8 Intergenerational transfers, gifts

This section gathers information on inheritances and substantial gifts received and is aimed at tracing household wealth accumulation patterns. It contains questions on

[9] Canberra Group Handbook on Household Income Statistics, UNECE (2011).

[10] There are certain cross-country differences in the strategies used to collect information on income (see Chapter 3.3 for details).

when transfers and gifts were received, what asset types were received, their value and from whom they were received.

2.2.9 Consumption and saving

This section focuses on selected aspects of household consumption and saving. It collects information on several consumption indicators that, according to the literature[11], may be used to infer an estimate of total consumption. These items are spending on food at home, spending on food outside the home, spending on utilities and expenses on trips and holidays. There is also one question on overall spending on non-durable consumer goods and services. All consumption items refer to spending in a typical month.

Collected items also include regular private transfers made outside the household (alimony, assistance, etc.), comparison of last 12 months' expenditure with the usual level (higher/normal/lower), balance of expenditures and income (expenses higher than/equal to/lower than income), saving motives, and ability to get emergency (financial) assistance from friends or relatives. It also includes a question on how much a respondent would spend from an unexpected windfall gain. In the fourth wave, a new question on the respondent's impatience was added.

2.3 Interview closure and post-interview debriefing/paradata

The last part of the questionnaire asks just one question covering topics and items that the respondent may have forgotten to report in the previous sections.

Following the interview, further set of questions is included to collect feedback from interviewers (known as paradata). The interview paradata section encompasses 16 questions covering aspects surrounding the interview, such as the accuracy of the respondent's calculations, who was present during the interview or perceived trust of the respondent before and after the interview. This information is very valuable when it comes to the ex post treatment of the data, i.e. for data editing and imputation.

Table 2
Variables added or removed from the list of core variables between the 2017 and 2021 waves

Variable	Label	Section	Change
HDZ0310	Life satisfaction	Demographics	Moved to the list of non-core variables
HC1250	Late or missed payments on loans	Other liabilities/credit constraints	New question (based on an existing non-core variable)
HC1270	Any overdue payments by more than 90 days	Other liabilities/credit constraints	New question (based on an existing non-core variable)
HIZ050x	Impatience	Consumption	New question

11 See for example Browning, Crossley and Weber (2003).

2.4 Data collection approaches

2.4.1 Loops

Loops are sequences of questions that are repeated for each individual item. There are eight items with loops in the HFCS core questionnaire. They are used to gather information on household main residence mortgages, other real estate properties, mortgages on other real estate properties, private loans, non-collateralised loans, self-employment businesses, pensions and gifts/inheritances received. Each loop sequence starts with a question on the number of instances (number of loans, number of other properties, etc.) followed by a set of questions on details that are then repeated for up to three main items[12]. The loop ends with a mop-up question to collect aggregate information on remaining items, for which details are no longer collected (e.g. the total outstanding amount for loans number four and above).[13]

2.4.2 Collection of monetary value questions

A standardised data collection script is used to collect monetary values (called the "Euroloop", as it targets the collection of values in euro, or in national currencies in non-euro area countries). The Euroloop encompasses a set of questions which should be asked in a strict sequence.

First, the exact amount is asked, which respondents may provide either in euro or in national legacy currencies. Only if respondents are unable (or unwilling) to provide the exact amount may the information be provided instead in flexible brackets, i.e. self-reported upper and lower bounds. If the respondent is still unable to answer, there is a third step involving 20 prefilled fixed intervals in euro and corresponding amounts in national legacy currencies. In this last step, the coded amount or interval (lower-upper bound) is confirmed with the respondent.

2.5 HFCS non-core questions

The blueprint questionnaire covers the core HFCS variables. In addition to the core survey content, the HFCN has prepared a supplementary harmonised set of non-core variables, which are mainly used to gather additional information on the topic covered by the existing core questionnaire parts. The recommended question wording is provided in the HFCS non-core variables catalogue, which also provides guidance on how the non-core questions can be inserted into the core national questionnaires.

12 While the default number of loops is three, some countries only have two loops and the section on pensions has seven loops.

13 In the countries with two loops, the mop-up questions cover items three and above.

By their nature, non-core variables are collected only in a subset of the HFCS countries. An overview of non-core variables covered in one or more of the HFCS country files in the 2021 wave is provided in the appendix.

2.5.1 COVID-19 module

In most countries, the fourth wave of the HFCS took place amid the COVID-19 pandemic. Soon after the outbreak began to dissipate, a special module covering its impact on the financial situation of households was designed and added to the questionnaire. Not all countries were able to include these variables in their survey, as some were already conducting interviews or had finalised the questionnaire and were about to begin the fieldwork by the time the COVID-19 module was ready. The variables of this module belong to the non-core list and are listed in the table provided in the appendix.

3 Collection of data and other fieldwork aspects

The HFCS data collection is ex ante output harmonised with a list of core output variables that every country should collect in accordance with a set of common definitions. However, there may be some deviations due to the different data collection modes, or other country-specific reasons. Some of the deviations from the list of core variables can be addressed during the output harmonisation stage, which might include the use of other reliable data sources to complement/complete the survey data. Aside from data collection, this chapter examines various other fieldwork-related issues.

3.1 Survey mode

The type of interaction between the respondent and the survey questionnaire is an important determinant of possible measurement error. The first and most important decision for a household survey is therefore the selection of the mode of data collection (Jäckle, Roberts and Lynn, 2006; Dillman and Christian, 2005). The use of different modes to interview different sample units might affect the comparability between survey results (de Leeuw, 2005). In a multi-national setting, this is also the case when drawing comparisons between different countries using different survey modes. However, the use of one single mode is not always feasible, and there may be a need to use different modes across and also within countries.

In past waves, the main survey mode used in most participating countries was Computer Assisted Personal Interviews (CAPI), i.e. face to face interviews administered by an interviewer using a computer with the programmed questionnaire. Using a computer allows for a smooth and error-free process of routing the questions (which is particularly complex in the HFCS questionnaire). It also means that consistency checks can be run during the interview and the data can be automatically saved and stored. Eliminating errors at the interview stage improves the quality of survey data and may save considerable resources in the subsequent data editing and cleaning phase.

In addition, interviewers play an important role in collecting high-quality income and wealth information, more precisely by: (1) persuading respondents to participate in the survey, increasing response rates, and reducing the risk of response bias; (2) building up trust vis-à-vis respondents, thus lowering the likelihood that a respondent will drop out in the middle of an interview; (3) minimising levels of item non-response by personally assisting (i.e. offering pre-designed prompts) – if required – during the interview; (4) avoiding incomplete responses; (5) providing additional information (interviewers' observations and paradata); etc. (HFCN, 2008a).

Indeed, CAPI was the main survey mode used in the first waves of the HFCS. In the 2017 wave, 19 countries used CAPI interviews, and there were only three countries in which it was not the main data collection method.

However, in the 2021 wave, the choice of data collection method was affected by the COVID-19 pandemic. Several countries that were previously using CAPI as their main survey mode switched to other modes that did not require face-to-face contact, such as computer assisted telephone interviewing (CATI) or computer assisted web interviewing (CAWI). Some countries, such as Ireland, Greece, Spain, Luxembourg, and Portugal, switched completely to other modes, while other countries used other survey modes in parallel with CAPI. Hence, while in the previous HFCS waves there was typically a dominant survey mode used in each participating country, COVID-19 also prompted countries to use multiple modes. This can also be seen in Table 3 and is further described in Box 1.

Overall, CATI was the most used data collection method, with 14 countries conducting at least part of their interviews over the phone and around 56.5% of the total interviews done using CATI.

The median duration of the interview was more than one hour in six countries, while it was less than 40 minutes in a further six countries. The interview lengths are not directly comparable, since there is variation in the number of core and non-core variables collected in the countries (see appendices). Moreover, national variables may be collected, especially in countries in which the HFCS is used as a continuation of an existing wealth survey. In addition, those countries that are able to use register data benefit from a reduced questionnaire length.

Table 3

Share of interviews by 2021 survey mode in HFCS countries and length of interviews

Country	CAPI	CATI	CAWI	CASI	PAPI	Median length of interview (minutes)
Belgium	65.1	34.9	0	0	0	58
Czech Republic	100	0	0	0	0	48
Germany	8.2	91.8	0	0	0	68
Estonia	4.1	69.2	26.7	0	0	50
Ireland	0	100	0	0	0	37
Greece	0	47.8	7.8	44.5	0	58
Spain	0	100	0	0	0	91
France	30.6	69.4	0	0	0	75
Croatia	100	0	0	0	0	38
Italy	48.1	51.9	0	0	0	62
Cyprus	81.2	18.7	0.2	0	0	65
Latvia	43.1	56.5	0	0	0.4	40
Lithuania	96.9	3.1	0	0	0	41
Luxembourg	0	0	100	0	0	49
Hungary	70.5	0	29.5	0	0	38
Malta	0	100	0	0	0	35
Netherlands	0	0	100	0	0	NA
Austria	100	0	0	0	0	54
Portugal	0	85.9	14.1	0	0	71
Slovenia	100	0	0	0	0	38
Slovakia	100	0	0	0	0	60
Finland	0.7	99.3	0	0	0	31

Notes: CAPI: computer assisted personal interviewing; CATI: computer assisted telephone interviewing; CAWI: computer assisted web interviewing; CASI: computer assisted self-interviewing; PAPI: paper-and-pencil interviewing.
NA: Not available.

Box 1

Impact of the coronavirus COVID-19 pandemic on Household Finance and Consumption Survey fieldwork

The coronavirus (COVID-19) pandemic affected Household Finance and Consumption Survey fieldwork in various ways, firstly by pushing the various countries off track in terms of their schedules and timelines. In some countries the fieldwork had to be interrupted, whereas in others it was postponed to 2021.

The pandemic also had an impact on the response rates of the HFCS. Besides the government measures restricting contact between individuals, there was a rampant fear of the disease, together with uncertainty about the course the pandemic would take and its impact on the economy. In some cases this seemed to make people less willing to participate in a survey. In the majority of the countries there was a drop in the response rates relative to the third wave, particularly among households that were being asked for the first time to take part in the HFCS (Chart A, panel a). Response rates also dropped for panel households, although the drop was relatively smaller for the most part. Hence, for the countries with a panel component this went some way to containing the fall in the overall response rates (Chart A, panel b), relative to the rates reported for the third wave. The

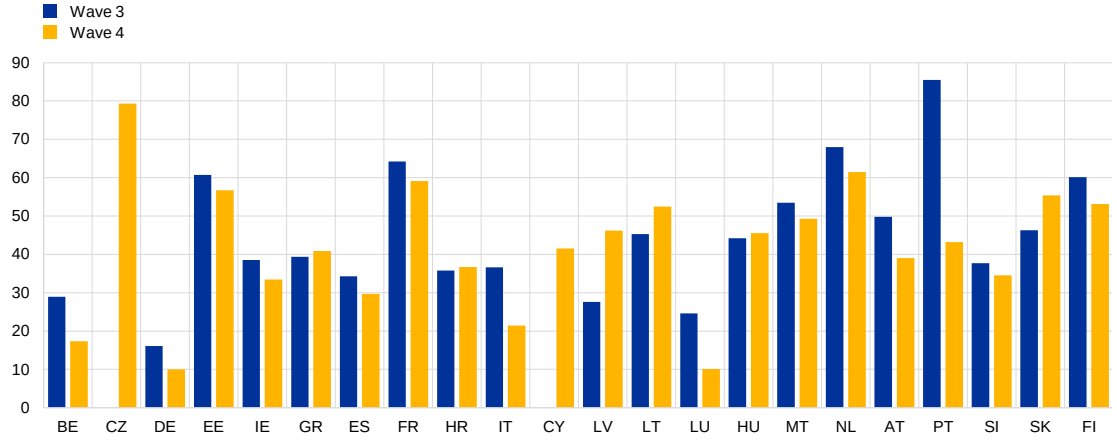
introduction for the first time in Ireland of a panel component (households being re-interviewed for the first time) led to a small increase in overall response rates.

Chart A

Response rates

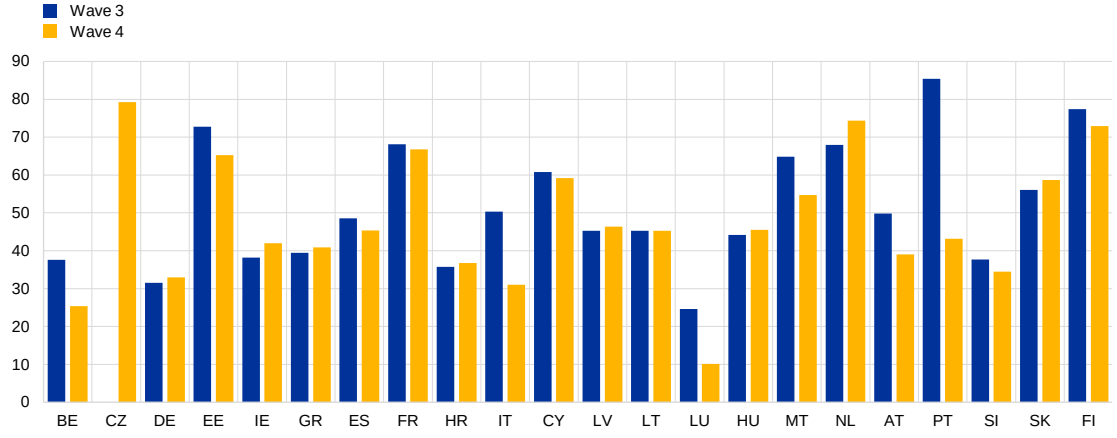
a) Response rates for first time participants (non-panel households only)

(percentages, interviewed households/eligible units)



b) Overall response rates

(percentages, interviewed households/eligible units)



Note: For comparability reasons, only first-time participants are considered in panel a). As such, the response rates in the two panels will differ only for those countries with a panel component.

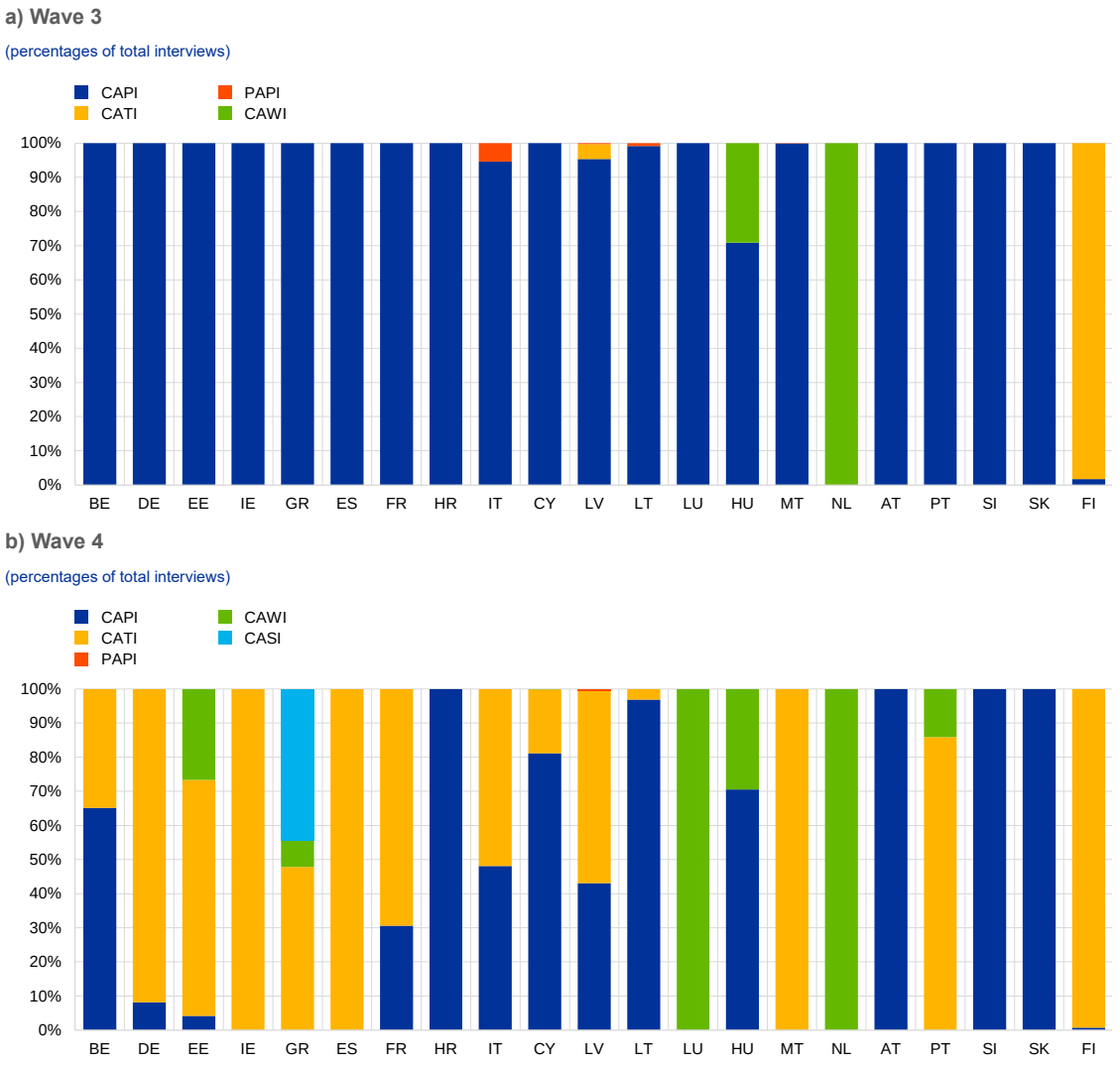
Perhaps the most striking impact was on the mode of the survey. In almost all countries there were changes in the survey mode, with several countries switching from face-to-face to telephone or web surveys, or a combination of modes. Most notably, whereas CAPI (computer assisted personal interviewing) had been the most prevalent mode in the first three waves of the HFCS, in the fourth wave the majority of interviews across all countries were conducted through CATI (computer assisted telephone interview).

Chart B below depicts the modes employed in each country in the third and fourth waves. As shown in panel a), in the third wave almost all countries employed exclusively CAPI for their interviews. The main exceptions were the Netherlands, which always used a web survey, and Finland, where most interviews took place via CATI. In three other countries, namely Hungary, Ireland, and Latvia, only a small percentage of interviews was implemented in modes other than CAPI.

The fourth wave presents a very different picture: as shown in panel b) of Chart B only four countries had exclusively CAPI interviews, namely Austria, Croatia, Slovenia and Slovakia, while a fifth, Lithuania, had a CAPI rate above 97%. CATI became the exclusive mode for Spain, Finland, and Ireland, and it was the mode chosen for most of the interviews that took place in Estonia, France, Germany, Italy, Latvia, Portugal, and Malta. Overall, CATI was the most used data collection method, with 14 countries conducting at least part of their interviews over the phone, and it accounted for around 56.5% of the total interviews across countries. In Greece, besides CATI, an equally large percentage of interviews was carried out through CASI (computer assisted self-interviewing), in which an interviewer visited the respondent's home but because of the COVID restrictions the respondent filled in the questionnaire on the computer themselves, often in a separate room. Luxembourg, as with the Netherlands, employed a full web survey. For a small part of the interviews, web surveys were also implemented in Hungary, Estonia and Portugal.

Chart B

Interview mode



Note: CAPI: computer assisted personal interviewing; CATI: computer assisted telephone interviewing; CAWI: computer assisted web interviewing; CASI: computer assisted self-interviewing; PAPI: paper-and-pencil interviewing. For comparability reasons, the chart only includes the countries that participated both in waves 3 and 4 of the HFCS.

It is unclear at this stage whether the changes described above also had an impact on the main results of the survey. In conducting cross-country or cross-wave comparability studies, the aspects above should be considered as possible contributors to any differences found.

3.2 Fieldwork

In ten countries, the NSI was in charge of data collection (see Table 4). In all other countries, the organisation responsible for conducting interviews was an external survey agency selected by the NCB in charge of the survey. In the Netherlands, a research institute was responsible for collecting the HFCS data through a web survey.

Interviewers were either employees of the survey agency or the NSI tasked with the data collection, or freelancers directly recruited by the survey agency. Before the start of the fieldwork, nearly all countries organised training sessions for interviewers.

Fieldwork periods in the fourth wave of the HFCS varied from two months in Luxembourg and the Netherlands to 25 months in Czech Republic. However, as fieldwork had to be interrupted in some country surveys due to COVID-19 related restrictions, the longer periods noted for some countries may be due to such interruptions.

Shorter fieldwork periods are beneficial for data comparability, either because the reference periods for income or balance sheet items are closer or, in the case of a fixed reference period, because they minimise the risk of bias. Conversely, longer fieldwork periods allow for more opportunities to increase the number of contact attempts and thus obtain a higher number of interviews. The number of interviewers varied across countries, to a large extent depending on the sample size. The number of language versions of the questionnaire varied from one to four.

Table 4
Fieldwork indicators

Country	Organisation responsible for fieldwork	Number of interviewers conducting the survey	Language versions of the questionnaire	Length of fieldwork period (months)*	Adaptation of existing survey
Belgium	SA	78	French, Dutch, English	12	N
Czech Republic	NSI	252	Czech	25	Y
Germany	SA	247	German	9	N
Estonia	NSI	60	Estonian, Russian	8	N
Ireland	NSI	90	English	7	N
Greece	SA	44	Greek	7	N
Spain	SA	65	Spanish	9	Y
France	NSI	560	French	6	Y
Croatia	SA	61	Croatian	3	N
Italy	SA	301	Italian, English	10	Y
Cyprus	SA	28	Greek, English	8	N
Latvia	NSI	33	Latvian, English, Russian	4	N
Lithuania	SA	Not available	Lithuanian	18	N
Luxembourg	SA	Not applicable	English, French, German, Portuguese	2	N
Hungary	NSI	256	Hungarian, English	3	N
Malta	NSI	27	English, Maltese	3	N
Netherlands	SA	Not applicable	Dutch	2	N
Austria	SA	47	German	10	N
Portugal	NSI	145	Portuguese	4	N
Slovenia	SA	29	Slovenian	18	N
Slovakia	NSI	131	Slovak	3	N
Finland**	NSI	145	Finnish, Swedish, English	5	Y

Notes: SA: Survey agency: NSI: National statistical institute
* The total length may include interruptions due to COVID-19.
** Parts of the data were collected from the EU-SILC survey, selection of target variables based on the HFCS and previous wealth surveys by Statistics Finland.
*** Parts of the data were collected from the EU-SILC and HBS survey.

Of the 22 countries participating in the fourth wave of the HFCS, 21 had already taken part in the third wave, 19 in the second and 15 also in the first wave of the survey. Czech Republic joined the HFCS in the fourth wave while Croatia and Lithuania joined in the third wave and Estonia, Ireland, Latvia, Poland, and Hungary started in the second wave.

In five countries, the HFCS was adapted from an existing national survey. In two of them, the national central banks added harmonised HFCS output variables to an existing wealth survey. These countries and their respective surveys were Italy (Indagine sui Bilanci delle Famiglie Italiane – Survey on Household Income and Wealth, SHIW), and Spain (Encuesta Financiera de las Familias, EFF). In France, the HFCS was a joint effort between the NCB and the NSI (Insee), and an adaptation of the Enquête Patrimoine previously conducted by Insee. In Finland, the HFCS was integrated with EU-SILC by adding selected HFCS variables to the questionnaire and using administrative data on assets and liabilities, replacing the former separate

Statistics Finland's household wealth survey (Kotitalouksien varallisuustutkimus). In the Czech Republic, the HFCS was integrated with the EU-SILC and the HBS by adding selected variables to the household questionnaire following the successful completion of the EU-SILC questionnaire.

In the Netherlands, the samples for the third and fourth waves were based on the Longitudinal Internet Studies for the Social Sciences (LISS) panel, and the questionnaire follows the wording of the HFCN questionnaire. In the first two waves, information about assets and liabilities was retrieved from existing Dutch surveys (see Chapter 9.1 on data comparability between survey waves).

In Portugal, the HFCS replaced the Household Wealth Survey (Inquérito ao Património e Endividamento das Famílias, IPEF), which was already a joint project of Banco de Portugal and Statistics Portugal (INE).

3.3 Collection of income variables

The core output variables on income are defined as gross of taxes and social contributions. However, different approaches were taken to the collection of data on income. In eight countries, income data were collected in gross terms only. In Italy, net income was collected, and gross income constructed by estimating the amount of taxes and social contributions with the help of legislative and institutional parameters. In several countries, respondents had the option to provide net income for all or some income components. In these cases, gross income was estimated (see Table 5).

Estonia, Ireland, France, Latvia, Lithuania and Finland derived income data from administrative registers to a varying extent. In France, income data were based on registers only, while in Latvia, register data was used in combination with interview-based data. In addition to gross income variables, Italy and Finland provided income taxes and social contributions, and Belgium, Italy and Portugal provided net income variables.

Table 5

Exceptions in the collection of income variables

Country	Information
Estonia	Regular state social transfers, unemployment benefits, wages and salaries, self-employment income and pension income received from Estonia were derived from registers. Income received from abroad was part of the questionnaire.
Ireland	Register data on income, including employee income, profits and social transfers such as unemployment benefits and pensions, were used in the derivation of income.
France	Income data derived from registers. Income defined as gross of taxes but net of social contributions. Gross income from private business other than self-employment and gross income from other sources not collected.
Italy	Net income collected and gross income estimated with a tax-based model. Income from financial investments not directly collected but calculated using average interest rates and information collected on households' financial assets. Gross income from private business other than self-employment not collected.
Lithuania	Income variables were collected net of taxes. Administrative data was used to adjust them to gross values.
Latvia	Income data derived from registers (State Revenue Service) were used to edit survey values if respondent declined to report, did not know, or under-reported the amount of income.
Finland	Income data derived from registers, except for private inter-household transfers and interest received, which were based on interview data.
Belgium, Germany, Greece, Croatia, Latvia, Luxembourg, Hungary, Austria, Portugal, Slovenia	Gross income collected, although respondents had the option to provide net income figures for all or some income variables. Where provided, net income figures were converted to gross income with tax-based model.

Source: ECB – HFCS metadata.

3.4 Other deviations from the data collection framework: other data sources

The ex ante output harmonisation of HFCS data enables data collection methods other than a survey to be used whenever they are considered to provide better quality. In particular, register data can be used to replace or correct survey data if the sources are reliable and the definitions used by the register sources are identical to the definitions of the corresponding target variables.

In the majority of countries, though, most variables were collected directly from the respondents in the survey. Table 6 shows a summary of cases in which data other than interview data were used for assets and liabilities (see Table 5 for income variables). In the fourth wave of the HFCS, Estonia, Ireland, Latvia, Lithuania and Finland used register data to derive wealth components. Registers were used extensively in Estonia and Finland. In Ireland, they played an important role in populating debt data, while in Latvia, register data were used mainly for editing interview-based data and filling in missing values.

Table 6

Other data sources used for assets, liabilities and other non-income variables

Country	Information
Estonia	Only register data: non-collateralised loans, leasing, and Estonian pension plans. Mix of register and interview data: mortgage loans, deposits, mutual funds, bonds, managed accounts, credit lines, credit card debt and foreign pension plans.
Ireland	The register on residential properties is used for edit checks, to fill missing values, and to find households who did not report owning another property in the interview. Register data from the Central Credit Register was used to supplement information related to household debt.
Latvia	Register data used to identify missing answers and to edit values of corresponding variables on real estate properties, mortgage/loans/leasing contracts, and participation in pension schemes (private voluntary pension schemes, funded and unfunded state pension schemes), financial assets (sight accounts, saving accounts, deposits, mutual funds, bonds, stocks, etc) and private businesses.
Lithuania	Information on households' liabilities is based on registers
Finland	Register data: mortgages, (most) non-mortgage loans, ownership of other real estate properties and vehicles, ownership and values of business wealth, forest assets, listed shares, mutual funds and bonds. Register-estimated data: value of household main residence and other real estate properties, value of vehicles, ownership and values of voluntary pension schemes Combination of registers and interview data: non-mortgage loans, loan payments. Except for food outside home, consumption variables are to a large extent statistically matched from the Household Budget Survey (HBS). Demographic variables (age, gender etc.) and level of education are based on register data.

Source: ECB – HFCS metadata.

In Estonia, person-level data were collected from credit institutions, leasing and life insurance companies, the Estonian Central Securities Depository, the Land Register, the Construction Works Register, the Vehicle Register, the Tax and Customs Board, the Health Insurance Fund, the Social Insurance Board and the Unemployment Insurance Fund. Data for non-collateralised loans, leasing and Estonian pension plans were taken solely from registers. For deposits, mutual funds, bonds, managed accounts, credit lines and credit card debt, register data were used for Estonian assets while assets held abroad were based on interview data. Register data were mainly used to obtain information on collateralised loans (household main residence and other property mortgages).

In Ireland, administrative data on residential rental properties were used for edit checks and to fill in missing values for the size of the main residence, tenure status and rents paid, as well as to obtain values on other properties. The answers to the debt questions of the survey were complemented with administrative data retrieved from the Central Bank of Ireland’s Central Credit Register (CCR).

In Latvia, administrative data were used to edit interview-based data. Data from the Land Cadastre were used for real estate properties, credit register data for mortgages, loans and leasing contracts, and State Revenue Service data for participation in voluntary pension funds. Data on participation in state pension funds were not collected directly from the respondents but taken from the State Social Insurance Agency. Two new data sources were introduced for the 2021 wave. The four largest banks provided information on financial assets such as current accounts, savings accounts, deposits, mutual funds, bonds and stocks, while the NSI provided data on private businesses.

In Lithuania, information on household liabilities was based on register data.

In Finland, numerous types of register data and register-estimation methods were used, as well as statistical matching. For the household main residence, ownership was based on survey data, although the values were estimated using transaction price data. For other properties and vehicles, values were estimated, and ownership was based on registers. Stocks, mutual funds, bonds and business wealth were record-linked from registers, while voluntary pensions were estimated using longitudinal tax data. Loan information was retrieved from registers but supplemented with interview data in the case of consumption loans and credit card debt. Demographic variables and level of education were also taken from registers.

In some countries, legislative and institutional information may have been used to construct pension variables. Such information includes, for instance, the percentage of current gross earnings contributed to the main public pension plan.

4 Sample design

This chapter analyses the main features of the sample designs and sampling frames chosen by the countries participating in the HFCS. Since the distribution of wealth is very unequal, all participating countries are encouraged to explore methods for oversampling the wealthiest households. The chapter also provides a description of the oversampling approaches applied in different countries.

4.1 General features

A good sampling design should provide the most efficient and unbiased representation of the relevant population (Kennickell, 2005). Sampling design and implementation is a central component of the potential errors in estimation related to survey data (Verma and Betti, 2008), including errors on coverage, sample selection and also sampling errors and estimation bias.

The first and probably most important feature of the HFCS sample design is the use of probability sampling. This means that each household in the target population has a non-zero probability of being selected in the sample, and this probability should be known beforehand (HFCN, 2008a). The sample size is defined to ensure representativeness both at the country and the euro area level.

Another relevant feature of the sample design for any survey is whether it is intended to introduce a panel component, i.e. whether (at least a portion of) the same households will be interviewed again over subsequent waves. In such a case, survey compilers need to take care to ensure the representativeness of both the cross-sections and the longitudinal component, and to ensure proper refreshment coverage for sample attrition. All this may substantially add to the complexity of the sample design.

4.2 Main country features

While all countries applied probability sampling in the fourth wave,[14] the approaches adopted in their sampling designs differ. The methodologies are largely dependent on the external data (population registers, postal addresses, dwelling registers, etc.) available for building the sample.

[14] Probability sampling was also used by all countries in the second and third waves. In the first wave, probability sampling was used in 14 out of 15 countries; only Slovakia used quota sampling.

4.2.1 Sampling designs applied

In household surveys, stratification of the population prior to sample selection is a commonly used technique. In a stratified sample, various strata are constructed on the basis of auxiliary information that is known about the population, and sample units are selected independently from each stratum in a manner consistent with the survey's measurement objectives (UN, 2005). Units to be interviewed can be selected in one or multiple stages. In a multiple stage design, the first stage (or stages) involves a selection of geographical areas, from which individual households are then chosen during the final stage.

Table 7 shows the sampling designs used in various countries. Six countries used one-stage stratified sampling, while 15 countries had a multi-stage stratified sampling design. In the Netherlands, no stratification was applied. In all countries, the sample size was chosen to be representative also at the country level.

Table 7
Sampling designs in the HFCS

Type of sampling design	Countries adopting
1-stage stratified sampling	BE, EE, CY, LU, MT, FI
2-stage stratified sampling	CZ, IE, GR, ES*, FR, HR, IT*, LV, LT, HU*, AT, PT, SI, SK
3-stage stratified sampling	DE**
1- stage sampling, not stratified	NL

* In Spain and Italy, one stage for households living in municipalities with over 100,000 and 40,000 inhabitants respectively, two stages for others. In Hungary, one or two stages depending on the locality.
** In Germany, three stages for households living in municipalities with over 100,000 inhabitants, two stages for others.

Table 8 shows the stratification criteria in various countries. The sampling frames involved data on regions in the first stage (in multi-stage designs) and information on persons, households, or dwellings in the second stage (or in the first stage in one-stage designs)

Region and population size of regional units were the most frequently used stratification variables, and in several cases regions were further divided by the degree of urbanisation. Lithuania, Luxembourg, and Finland were the only countries that did not use any geographic stratification. Other stratification criteria included personal or regional average income, labour status, personal taxable wealth and size or value of dwellings.

Table 8

Sampling frames and stratification criteria

Country	Sampling frame(s)	Stratification criteria
Belgium	National population register	Region, average taxable income by statistical sector and median dwelling price by municipality
Czech Republic	Census enumeration units	Based on the rules of the EU-SILC survey: NUTS-3 regions divided into census enumeration units
Germany	List of municipalities and number of inhabitants; list of street sections for large cities; register of local residents from municipalities	Municipality size, anticipated wealth, region (Bundesland)
Estonia	Statistical population register	Five NUTS3 regions and two income groups, the highest decile and the rest
Ireland	Census 2016	Eight NUTS3 regions and five quintiles of deprivation/affluence
Greece	List of municipalities, cities, villages and building blocks taken from the census in 2011; dwellings	NUTS2 and degree of urbanisation (urban, semi-urban, rural)
Spain	Population register supplemented with tax record information	Taxable wealth, municipality size
France	Tax register on main residences (master sample); fiscal sources within master sample	Geographical area and common property
Croatia	Census 2011	NUTS-3, type of municipality, floor space of dwellings
Italy	List of municipalities	Municipalities by region, demographic size. Households by income groups and outstanding debt.
Cyprus	Customer register of the electricity authority	Counties divided into urban and rural areas
Latvia	Population register; tax register; list of addresses	Degree of urbanisation (three groups), and income (three groups)
Lithuania	List of municipalities; population register	Estimated wealth
Luxembourg	Social security register (IGSS) & National register of natural persons (RNPP)	Nationality, employment status, individual gross income (mean across months)
Hungary	Register of addresses	Regions, income tax base per capita, municipality size, estimated value of dwelling
Malta	Population register	Household size and district
Netherlands	Population register (LISS panel)	No stratification
Austria	List of enumeration districts; register of post box addresses	Region (NUTS 3) and community size classes
Portugal	National dwellings register	Nine regions (subdivisions or divisions of NUTS 2) and classes of useful area of dwellings
Slovenia	Central Population Registry	Municipality size
Slovakia	Household units database based on 2011 Census; database of occupied housing units	Regions (NUTS 3)
Finland	Population information system of Statistics Finland	Income level, type of income (personal taxable income of the main income earner of the household-dwelling unit).

Table 9 shows the numbers of strata used in the sampling designs of various countries. It also indicates the number of units, such as geographical areas or clusters, selected in the first stage in multi-stage designs (primary sampling units, PSUs).

Table 9

Numbers of strata and primary sampling units selected

Country	Number of strata	Primary sampling units selected, for multi-stage designs
Belgium	24	-
Czech Republic	52	946
Germany	48	137
Estonia	10	-
Ireland	162	900
Greece	13	670
Spain	35*	4782
France	8+7**	567+22**
Croatia	13	789
Italy	54	398
Cyprus	16	-
Latvia	12	568
Lithuania	34	17
Luxembourg	26	-
Hungary	820	345
Malta	30	-
Netherlands	-	-
Austria	188	598
Portugal	18	677
Slovenia	6	397
Slovakia	8	477
Finland	48	-

* All regions, except Basque Country and Navarre: five strata by municipality size and seven strata by taxable wealth. Basque Country and Navarre: six strata by municipality size.
** 7 strata and 22 PSUs for overseas territories (DOM).
Notes: Number of strata refers to the first sampling stage only. The number of strata and primary sampling units are now shown when non-applicable. The number of PSUs selected are shown for countries with multi-stage sampling designs.

4.2.2 Panel component

Altogether, 13 countries had a panel component in the fourth wave of the HFCS (Table 10). Ireland, Lithuania and the Netherlands were the new panel component countries, while Latvia had a panel component in the third wave but not in the fourth wave. The Netherlands had a panel component in the second and fourth waves, but not in the third.

In the second HFCS wave only seven countries had a panel component. Out of these, Spain, Italy, and the Netherlands adapted the HFCS to existing wealth surveys in which a panel was already in place. The number of countries with a panel component increased to 12 in the third wave, in which Finland also made use of a pre-existing panel. Table 10 shows the HFCS wave in which countries started having a panel component.

Table 10
Countries with a panel component

Country	Households re-contacted at wave 4, percentage of all contacted households	Panel design	First HFCS wave with panel component
Belgium	22.6	Pure panel with refresher sample	Second
Germany	37.9	Pure panel with refresher sample	Second
Estonia	64.7	Pure panel with refresher sample	Third
Ireland	47.1	Rotating design	Fourth
Spain	40.2	Rotating design	Second*
France	60.6	Rotating design	Third
Italy	31.3	Pure panel with refresher sample	Second*
Cyprus	69.0	Pure panel with refresher sample	Second
Lithuania	35.8	Pure panel with refresher sample	Fourth
Malta	30.7	Pure panel with refresher sample	Second
Netherlands	52.5	Pure panel	Second**
Slovakia	34.3	Pure panel	Third
Finland	18.1	Rotating design	Third*

Source: ECB – HFCS metadata
* Spain, Italy and Finland made use of the panel component of a pre-existing wealth survey. Owing to the panel design of the Finnish survey, no households from the first wave were re-contacted in the second wave, which is why the panel is considered to begin only in the third wave.
** In the Netherlands, the first two waves of the HFCS were adapted to existing wealth surveys, which already had a panel component. This changed in the third wave, meaning that no households were re-contacted. As such, there was a break in the panel between the second and third waves.

In countries with a panel component with refreshment, new households are added to the sample to account for panel attrition and more broadly improve the representativeness of the total sample in the cross-section.

Refreshment samples help mitigate possible problems related to changes in the population structure, which may arise when the same sample is used over time for cross-sectional purposes. For instance, the population ages between waves and if a panel is reused multiple times, it may no longer be representative of the actual population. Section 9.3.1 includes a comparison between the age structure in the HFCS and the one structure to population statistics. They are identical, suggesting that this is not an issue for the HFCS.

4.2.3 Non-coverage of specific sub-populations in the sampling frame

The sampling frames of the HFCS include only households living in the countries where the survey was conducted. In addition, in most national surveys, the whole of the institutionalised population was left out of the sampling frame, because the target population of the HFCS is private households. In addition to homeless, some groups of the population may be excluded from the sampling frames of individual countries, as shown in table 11. The gross sample for Cyprus did not include the population in Northern Cyprus.

However, individuals belonging to some of the excluded groups can be included in the sample, if they are considered as part of a household that is part of the sampling

frame. For example, an institutionalised person with an economic connection to a sampled household might, depending on the circumstances, be treated as a part of the household.

Table 11
Excluded groups

Country	Excluded groups
Belgium, Czech, Republic, Germany, Ireland, Greece, Croatia, Cyprus, Latvia, Lithuania, Malta, Netherlands, Austria, Portugal, Slovakia, Finland	Population in institutions, homeless
Estonia, Spain	Population in institutions
France	Population in institutions, homeless, other people who do not live in a main residence (i.e., those living in mobile homes)
Italy	Population in institutions, homeless, individuals not on the population register
Luxembourg	Homeless
Hungary	Population in institutions, homeless, population of municipalities with less than 30 inhabitants

Source: HFCS metadata.
Note: Population in institutions refers to persons living in, for example, homes for elderly people, military compounds, prisons and boarding schools.

4.2.4 Use of replacements

In some cases, non-responding units may be replaced by reserve units during the fieldwork. The use of replacements can be particularly useful in collecting information from hard-to-reach groups of households. However, replacements may have different characteristics from those of the non-respondents and the ready availability of replacements units may cause the interviewer to make less of an effort to get an interview from the originally selected unit. In the HFCS, the use of replacements should be subject to strict control. Replacements should be selected to closely match the replaced units in terms of key characteristics, and replacements should be allowed only after special efforts have been made to convert refusals.

Replacements were used in three countries in the fourth wave: Spain, Italy and Cyprus.

In Spain, tightly controlled replacements were chosen. In large cities and provincial capitals, up to five replacements were provided for each original household in the sample that would serve as replacements for that household only. These replacements were the two households immediately before and the two immediately after the sample household in a list ranked by income quartile (for non-filers of wealth tax returns), wealth stratum, and per capita household income. Replacements had to belong to the same income quartile (for non-filers of wealth tax returns) or the same wealth stratum as the sample household. This was done within municipalities to keep replacements not too geographically distant from the original sample household. In the case of smaller municipalities, five replacement households were drawn for each refreshment sample household from the same PSU. No replacements were provided for panel households.

In Italy, replacements were allowed within the same municipality after four unsuccessful contact attempts, on different days and at different times, determining either not-at-home, refusal to take part or ineligibility.

In Cyprus, replacements were selected from the same stratum as the original sample unit.

4.3 Oversampling of the wealthy

Wealth surveys pose several additional challenges for the sample design in comparison to other household surveys. Wealth surveys usually aim to conduct several kinds of analyses on all parts of the distribution. However, the distribution of wealth is known to be skewed, and some types of assets are possessed only by a small fraction of households. Consequently, for the sample to adequately represent the full distribution of wealth in the population, it is essential to have a relatively high proportion of wealthy households in the sample (Kennickell, 2007). Data on the wealthiest households should be collected as efficiently as possible to obtain unbiased estimates of total wealth.

Furthermore, the general picture of wealth inequality will be negatively affected by the inability to collect data from the upper fractions of the distribution. This will have an impact on indicators such as the Gini index, the share of wealth owned by the top 1%, and quantile ratios (for example, the ratio of net wealth between the households in the top 20% and bottom 20% of the wealth distribution), all of which are sensitive to the values of the richest households (see, for example, Kennickell, 2019). Attempts have been made to measure the bias caused by the inability of survey data to sample the wealthiest households in the population with the help of external sources, such as data from Forbes' The World's Billionaires list (Vermeulen, 2018).

Capturing the values of assets from the wealthiest households is even more relevant in the case of certain individual items, particularly financial assets that are owned only by a small share of households.

In addition, there is evidence from previous wealth surveys showing that unit non-response rates are higher for wealthier households. This is first caused by the particular difficulty in making contact with wealthy respondents, since they are more likely to be absent from their principal residence during prolonged periods of time, to possess more than one residence and to be surrounded by additional security measures. In addition, both available time and self-perceived value/time ratios usually predispose wealthy households to refuse to take part in surveys.[15] If it is not compensated by post-survey adjustments, the different non-response rate would cause measurement bias. Furthermore, if the sample is selected using information correlated with wealth,[16] this same supporting information may also be useful in

[15] For further information, see references in Sanchez-Muñoz (2011).

[16] For instance, register-based (such as on wealth or income taxes, property taxes, socio-economic information at municipality or small area level, census of dwellings, etc.) or survey-b.ased information (either from previous waves of the survey or from other surveys).

guiding post-survey adjustments, compensating for non-response and reducing sampling error.

In conclusion, achieving a given level of precision would require either a rather large (and costly) sample or, if efficiently designed, a sample that should include a disproportionally high number of wealthy households. Indeed, using data from a purely random selection of units would yield a statistically very inefficient estimate of the distribution of wealth. These challenges should be anticipated during the sampling-design phase.

Of the 22 participating countries, 17 were able to oversample wealthy households through various strategies (Table 12). Italy used oversampling for the first time in the fourth wave, while the remaining 16 countries had already oversampled the wealthy in the previous wave.

The strategies varied significantly between countries and were heavily dependent on the available data, as shown in Table 12. Spain and France were able to use personal wealth data and Lithuania individual data on real assets. Estonia, Finland, Latvia, Luxembourg and Slovakia used personal income data in oversampling. Proxies for wealth were also household-level electricity consumption (Cyprus), the size of the dwelling (Portugal, Croatia), and the estimated value of the dwelling (Hungary). Other countries did not have access to personal-level income or wealth data or other proxies, and consequently oversampling had to be based on regional-level information, mainly on income and/or property prices. For instance, Germany oversampled wealthy street sections.

Table 12

Oversampling strategies

Country	Criteria for oversampling	Details
Belgium	Regional indicators	Neyman allocation based on income dispersion. Households belonging to statistical sectors with a greater average taxable income and living in municipalities where housing is more expensive were oversampled.
Czech Republic	No oversampling	
Germany	Regional indicators	In cities with 100,000 or more adult inhabitants, wealthy street sections were oversampled. Among the smaller municipalities, those with a high share of taxpayers with a total taxable income above a threshold were oversampled.
Estonia	Personal income	Income was divided into two groups, based on the total net income for 2020 taken from the records of the Estonian Tax and Customs Board for the total population (includes income from employment, benefits, gain or loss from transfer of securities and certain other types of income).
Ireland	Regional indicators	The primary sampling units were chosen from geographical areas that scored highly on a wealth index based on homeownership rates and "local property tax" bands. The oversample consisted of an additional 100 geographical areas chosen using probability proportional to size based on a wealth index.
Greece	Regional indicators and income	Oversampling based on equivalized disposable income and median per capita taxable value of property (using various definitions of income and property by municipality and tax code obtained from the Ministry of Finance).
Spain	Personal taxable wealth	Seven wealth strata based on taxable wealth, sample progressively larger in strata with higher taxable wealth, based on wealth and income tax returns.
France	Personal wealth	Within each selected primary unit, two samples were selected. The first targeted wealthy households and the second the other households. For the wealthy sample, four strata have been defined and oversampled: wealthy city dwellers, equity-based wealth, real estate-based wealth, lower wealth.
Croatia	Dwelling size	Oversampling based on occupied dwellings with floor space of over 120 square metres.
Italy	Household income and debt	Secondary sampling units are stratified based on household income (50 strata) and indebtedness (10 strata: 5 debt size groups for non-performing loans and 5 debt size groups for performing loans) from tax and credit registers
Cyprus	Electricity consumption	A fixed oversampling rate was applied, by taking the top 10% of the distribution of annual domestic electricity consumption.
Latvia	Personal income	Different sampling fraction for the highest income decile according to tax registers.
Lithuania	Wealth, real assets	25% of the gross sample was drawn from the top decile according to wealth based on administrative data on real assets.
Luxembourg	Personal income	20% of the gross sample was drawn from the top decile of the gross (employment) income distribution according to the social security register.
Hungary	Dwelling values	Allocation scheme with 50% Neyman allocation and 50% proportional allocation based on dwelling values. Strata of households with higher dwelling values have higher dispersion, and the Neyman-allocation results in oversampling of the wealthy.
Malta	No oversampling	
Netherlands	No oversampling	
Austria	No oversampling	
Portugal	Dwelling size, income, geographical area	44% of the total gross sample correspond to dwellings selected among the ones with a useful floor area above a predefined threshold by region. This proportion was higher in the areas (Primary Sampling Units) with higher income, than in the ones with lower income.
Slovenia	No oversampling	
Slovakia	Personal income	Oversampling based on Labour Force Survey. High-income earners with income over the 90th percentile of the whole population's income oversampled.
Finland	Personal income	Level of income and type of income. High-income earners and self-employed oversampled, based on personal taxable income of the main income earner of the household-dwelling unit. Data from tax registers and register of household-dwelling units.

Source: ECB – HFCS metadata.

The oversampling strategies have enriched the sample with a higher proportion of households with high asset values, or less common financial assets, leading to more precise estimates of wealth. However, the final representation of the wealthy in the

sample is influenced by other factors, such as non-response. An indicator of the representation of the wealthy in the final sample is the “effective oversampling rate of the wealthy” (see Table 13). It indicates the extent to which the share of wealthy households in the sample exceeds their share in the population. These rates are given separately for households belonging to the richest 5% and 10% of the population.

To compute this indicator, the net wealth values of the 90th and 95th percentiles were first calculated from the weighted data. Subsequently, the (unweighted) shares of interviewed households exceeding these values were computed. When the net sample includes a relatively large number of wealthy households with small final estimation weights on average, it is an indication of high effective oversampling of the wealthy households. This measure is only indicative, as the oversampling rate may be biased to some degree. The values associated with the percentiles are determined from the survey, which might not reflect the true level of wealth.

Table 13

Effective oversampling rates of the wealthy

Country	Effective oversampling rate of the top 10%	Effective oversampling rate of the top 5%
Belgium	44	53
Czech Republic	-20	-28
Germany	136	149
Estonia	36	29
Ireland	127	155
Greece	-13	-7
Spain	193	345
France	157	256
Croatia	21	46
Italy	89	120
Cyprus	75	91
Latvia	57	60
Lithuania	23	13
Luxembourg	15	23
Hungary	15	21
Malta	22	24
Netherlands	33	33
Austria	-22	-25
Portugal	117	119
Slovenia	-2	3
Slovakia	-18	-17
Finland	97	103

Notes: “Effective oversampling rate” of the top 10%: (S90 – 0.1)/0.1, where S90 is the share of sample households in the wealthiest 10%. “Effective oversampling rate” of the top 5%: (S95 – 0.05)/0.05, where S95 is the share of sample households in the wealthiest 5%. Wealthiest households are defined as having higher net wealth than 90% (95%) of all households, calculated from weighted data.

The interpretation of the figures in Table 13 is as follows: if the share of rich households in the net sample is exactly 10%, the effective oversampling rate of the top 10% is 0. If the share of households in the wealthiest decile is 20%, the effective oversampling rate is 100, meaning that there are 100% more wealthy households in

the sample than there would be if all households had equal weights. A negative oversampling rate indicates that there are fewer wealthy households in the net sample than there would be if all households had equal weights.

A high effective oversampling rate means that the analyses of wealthy households – and accordingly of aggregate wealth and wealth inequality indicators – are more efficient. The range of oversampling rates is considerable in the HFCS. In the data for some countries, the share of wealthy households in the sample is smaller than their share in the population. In other cases, effective oversampling rates of the top 10% are up to over 200%, and the corresponding rates for the top 5% even higher. Judging by the previous table, oversampling strategies and data availability play a major role in the ability to get interviews from wealthy households. The availability of household-level information for use in the sample design seems to be an especially big advantage.

5 Unit non-response and weighting

High unit non-response rates increase the variability of estimates drawn from the sample, and, to the extent that non-response is non-randomly distributed, it may lead to biased estimates of the variables of interest. Weight adjustments may to some extent be used to alleviate non-response bias.

This chapter compares indicators on response behaviour observed in the fourth wave of the HFCS and describes the common weighting procedure applied in the survey, along with the most significant country features on weighting and calibration.

5.1 Unit non-response in wealth surveys

Unit non-response is the failure to obtain information from an eligible sample unit. It is a result of either being able to contact a selected sample unit, the unwillingness of the sample unit to respond to the survey or various other reasons, such as language barriers or inability to take part in the interview. Owing to the relative sensitivity of wealth data, observed unit non-response rates have been generally higher in wealth surveys than in income surveys.[17]

To improve the quality of the analysis to be conducted with survey data, there is a broad consensus that the basic survey weights determined by the sample design must be adjusted to address non-response and other imperfections in the final sample, such as coverage problems. Furthermore, to maximise comparability in such a multi-national survey, it is usually seen as important that the procedures used are as standard as possible in each country and are compatible with the structure of the sample and the data available for making adjustments.

Although a survey with a 20% response rate has a greater possibility for bias than a comparable survey with a 100% response rate, there is evidence that response rates and non-response bias are not always inversely related (Groves and Peytcheva, 2008). It is common practice to evaluate the degree to which there is identifiable response bias in a survey and the degree to which non-response adjustments may ameliorate such problems. In the case of the HFCS, it is also important to investigate variations in national surveys that may lead to systematic differences in non-response bias.

5.2 Unit non-response in the HFCS

The HFCS takes special care to minimise non-response rates to reduce non-response bias by emphasising the use of best practices. For example, it focuses on the importance of interviewer selection and training, as well as on the incentives that the

[17] For further information, see references in Pérez-Duarte et al. (2010).

survey organiser offers to interviewers and the workload imposed on them. To minimise variability in potential bias across the countries participating in the HFCS, emphasis is placed on the use of common practices, to the extent that this is feasible. Despite these efforts and the fact that information flows well and best practices are exchanged across countries, potentially significant differences in procedures still persist, such as the protocols used to contact survey respondents.

Table 14 presents indicators on response behaviour in the second wave of the HFCS. These indicators are based on standard definitions (see AAPOR, 2011). The following indicators are included:

- Response rate = Interviews achieved / Eligible sample units[18]
- Refusal rate = Sample units refusing to participate / Eligible sample units
- Cooperation rate = Interviews achieved / Sample units contacted
- Contact rate = Sample units contacted / Eligible sample units
- Eligibility rate = Eligible units / Gross sample size

The response rate is probably the most commonly used survey quality indicator. Because non-response reduces the number of observations available for analysis, it has direct implications on the sampling variability of survey estimates. Refusal, cooperation and contact rates provide useful information on the structural characteristics of non-response and may help to better direct survey resources towards respondents with a higher tendency to refuse to take part in the survey, with a view to minimising the risk of non-response bias. Eligibility rates indicate the quality of the sampling frame.

There is a significant variation in the response rates achieved in the HFCS, as shown in Table 14. For the countries with a panel component, response rates both for households interviewed for the first time and for the entire sample are given if information is available. In the comparison of response rates, it is worth noting that the Finnish figures refer to an income survey (EU-SILC), and in France and Portugal, the survey is compulsory for households, though participation is never enforced. In the 2021 wave, the response rates were also impaired by the COVID-19 pandemic, which affected several other aspects of the fieldwork. In some countries, response rates suffered a substantial drop, particularly in the first time selected (non-panel) household samples. This is discussed in more detail in Box 1.

In a majority of the countries, the main reason reported for unit non-response is refusal to participate. Eligibility rates indicate quality of the sampling frames and are above 90% in most countries and above 95% in more than half of the countries. Contact rates also have significant variation across countries but are around 90% or above in most cases.

[18] For sample units for which eligibility could not be defined during fieldwork, the share of eligible units is estimated from the corresponding share of those sample units for which eligibility was identified.

Table 14
Response behaviour indicators in the HFCS

Country	Gross sample size	Net sample size	Response rate*	Response rate** (including panel)	Refusal rate	Cooperation rate	Contact rate	Eligibility rate
Belgium	8,694	2,130	17.3	25.4	50.5	27.4	92.8	96.5
Czech Republic	3,938	3,122	79.3		19.5	79.5	100	99.8
Germany	15,936	4,119	10	33	48.6	38.2	86.4	78.2***
Estonia	3,608	2,247	55.4	64.5	19.1	69.8	92.4	96.6
Ireland	14,548	6,020	33.4	42	5.4	83.6	50.3	98.5
Greece	8,523	3,386	40.9		53.5	42.2	97	97.1
Spain	15,335	6,313	29.7	45.4	44.3	47.8	94.9	90.7
France#	16,338	10,253	58.4	66.3	10.8	75	88.4	94.7
Croatia	4,072	1,357	37		54.9	39.2	94.2	90.2
Italy	23,291	6,239	21.4	31.1	20.9	48	64.9	86
Cyprus	2,267	1,332	46.7	59.1	26.3	61.7	95.8	99.4
Latvia	2,726	1,219	46.4		23.9	65.7	70.6	96.3
Lithuania	3,792	1,676	52.5	45.2	22.1	59.5	75.9	97.8
Luxembourg	20,000	2,010	10.1		89.9	NA	NA	NA
Hungary	15,138	6,032	45.5		29.8	56.7	80.2	87.6
Malta	1,924	1,018	49.1	54.4	12.6	77.2	70.5	97.2
Netherlands	3,754	2,690	58.1	71.7	25.6	71.7	100	100
Austria	5,938	2,293	39		56.9	39.5	98.9	98.9
Portugal#	14,814	6,107	42		4.9	81.4	51.5	98.2
Slovenia	5,924	1,951	34		40.1	43.9	77.6	96.8
Slovakia	3,887	2,174	55.4	58.7	28.7	66.9	87.9	95.2
Finland	13,121	9,474	53.1	72.9	15	81.2	89.7	99.1

Source: ECB – HFCS metadata.
Note: Gross sample includes panel households that have responded to previous waves of the same survey.
In France and Portugal, survey participation is compulsory for households.
* For comparability, response rates are shown for households interviewed for the first time.
** Response rates for the whole sample in countries that have a panel component. In Finland, the panel component consists of households interviewed in the three previous waves of the income and living conditions survey.
*** The share of cases with unknown eligibility was exceptionally high in 2021 (19.9%), as several households could not be contacted at all, and all these cases are treated as "ineligible".
NA: Not applicable.

Lastly, it is worth mentioning that oversampling of wealthy households may decrease the response rate. In spite of this possible drawback, oversampling of specific population groups is beneficial for survey quality, and should be noted when comparing the response rates of individual surveys.

5.3 Weighting

Weighting procedures are an essential tool for adjusting, to the extent that this is possible, both for the bias caused by unit non-response and for other irregularities in the sample. In the HFCS, all participating surveys follow common high-level weighting procedures to ensure the comparability of survey data. However, there are minor differences in some of the details of implementation across countries participating in

the HFCS. There are also differences in more granular elements, such as the structure of the samples and the frame-based and external sources used to adjust the weights.

5.3.1 Weighting procedures in the HFCS

The standard HFCS procedure for computing and adjusting survey weights takes into account: (i) the unit's probability of selection; (ii) coverage issues; (iii) unit non-response; and (iv) an adjustment of weights to external data (calibration). The methodology is coherent with existing international standards (Eurostat, 2011a and United Nations, 2005). These steps are implemented sequentially as follows:

Design weights are computed as the inverse of the selection probability of each unit in the gross sample, that is, both responding and non-responding units.

The first-stage weights are adjusted for coverage, including adjustments both for non-eligible units in the gross sample (frame over-coverage) and for multiple selection probabilities. This stage of adjustment is particularly relevant for sampling frames designed from registers of dwellings rather than of households or individuals.

The coverage-adjusted weights are further adjusted in an attempt to minimise bias potentially induced by discrepancies between characteristics of survey respondents and non-respondents. This adjustment involves estimating response probabilities as functions of characteristics available for both responding and non-responding households, and dividing the coverage-adjusted weights of each responding unit in the achieved sample by the response probability. In the HFCS, such adjustments are conducted either by regression-based modelling or by response homogeneity groups.

To obtain final weights, the non-response-adjusted weights are modified using auxiliary information to align the estimates of a set of variables with corresponding population estimate totals and category frequencies (Särndal, 2007). This adjustment of weights is motivated by a desire to reduce bias induced by discrepancies between the initial sample and the total population that are not captured in the coverage adjustments or that are induced through the other stages of weight adjustment. The HFCS uses a methodology that adjusts weights so that their totals by groups match their representation in the full population of households. To be effective, the calibration variables must be strictly comparable in both the survey and the source of the population data, correlated with the principal study variables, but not too closely correlated with each other. While the selection of calibration variables varies by country, partly dependent on available data sources, calibrating for at least age, gender and household size is common across most countries in the HFCS (see Table 15).

In surveys that have a panel component, the cross-sectional weighting procedure includes additional features. First of all, personal – and ultimately household – weights need to be adjusted for persons leaving and entering the households between waves. Secondly, household weights need to be adjusted for attrition and for households leaving and entering the target population. Different survey waves are treated as independent samples in the first stage of the weighting procedure, and subsequently

the samples are merged and their weights adjusted to the target population of the current wave before the final calibration step[19].

In sample surveys where different units have unequal probabilities of being sampled, using the inverse selection probabilities in weight construction will produce unbiased estimates of means and totals (Horvitz and Thompson, 1952). However, the variability of weights often increases the sampling variances of important survey estimates relative to those of a sample of the same size without weight variation, and there is a trade-off between unbiasedness and the efficiency (low variance) of estimates (Little, 1991). In the case of highly variable weights, the efficiency of estimates can be increased by setting limits for weight adjustment factors in calibration or by trimming extreme weights. However, oversampling of wealthy households introduces variability in design weights, and trimming should be applied with care.

5.3.2 Variables used for calibration

Table 15 shows the external variables and sources used in calibration. Note that in some cases, combinations of individual variables (for example, age by region or by municipality size) were used.

[19] The Finnish sample consists of four rotational groups of the EU-SILC, which are weighted separately, and lastly panel-specific cross-sectional weights rescaled in proportion to the sample share of each group.

Table 15

Calibration variables and sources

Country	Age	Gender	House hold size	Region	Other	Source
Belgium	X	X		X	Household type	Population statistics (NSI)
Czech Republic				X	Household composition, labour status, type of dwelling/house, municipality size, capital/other region, household income per capita (quintiles)	EU-SILC
Germany	X	X	X	X	Education level, labour status and nationality (German/non-German) of main income earner, size of main residence (for homeowners), municipality size	Micro census
Estonia	X	X		X	-	Statistical Population Register
Ireland	X	X	X	X	Employment status, deprivation quintile, home ownership, household composition, agricultural hectares	LFS, Agricultural Census of Ireland
Greece			X	X	Home ownership	EU-SILC, LFS
Spain	X	X	X		Municipality size	Population registers (census and others)
France	X	X	X	X	Degree of urbanisation, education and socio-professional category of reference person, household type, labour and wealth income	Census, LFS
Croatia	X	X		X	-	Population Statistics
Italy	X	X	X		Municipality size, education, fiscal income, debt size (for non-performing loans and performing loans)	Population register, tax register, credit register
Cyprus	X	X	X	X		Census
Latvia	X	X		X	Income	Population statistics, tax register
Lithuania	X	X	X		Values of real assets, loans for HMR purchase, income, degree or urbanization (urban/rural)	The population register, the real property register, loan risk database in the NCB and social security database
Luxembourg	X	X	X		Nationality	Census, Social security register
Hungary	X	X	X	X	Education, labour status, type of locality	Census, LFS
Malta	X	X	X	X	-	NSI
Netherlands	X	X	X		Home ownership, education	NSI
Austria*	X		X	X	Home ownership	Micro census
Portugal	X	X	X	X	Education, home ownership, degree of urbanization, value of loans for house purchase	Census, Credit register
Slovenia	X	X	X	X	-	Population statistics
Slovakia	X	X	X	X	Labour status, income group	Census, Demographic statistics, LFS, Social insurance agency
Finland	X	X	X	X	1. EU-SILC variables: level of education and 16 income related variables 2. HFCS-specific calibration variables: 5 wealth related variables	NSI Population information system, tax and other income registers, register files on the values of listed shares and mutual funds

Note: LFS: Labour force survey. NSI: national statistical institute. EU-SILC: EU Statistics on Income and Living Conditions. CBS: Central Bureau of Statistics, Netherlands.
* Cell-based post-stratification.

5.3.3 Weights

The outcomes of the weighting procedures are shown in Table 16, including the sums, means and coefficients of variation of final estimation weights by country. The sum of final estimation weights corresponds to the size of the target population, i.e. the number of households. Mean weights indicate the average number of households that one net sample unit represents.

Table 16

Final estimation weights by country

Country	Sum	Mean	Coefficient of variation, percentage
Belgium	5,024,851	2,359	93
Czech Republic	4,496,126	1,440	45
Germany	40,863,999	9,921	134
Estonia	615,180	274	73
Ireland	1,895,575	315	124
Greece	4,108,885	1,213	69
Spain	18,821,645	2,981	120
France	30,270,996	2,952	114
Croatia	1,493,264	1,100	96
Italy	25,321,209	4,059	124
Cyprus	303,242	228	110
Latvia	843,395	692	162
Lithuania	1,234,303	736	127
Luxembourg	268,916	134	104
Hungary	3,982,576	660	90
Malta	206,868	203	87
Netherlands	8,043,443	2,990	37
Austria	4,066,627	1,773	57
Portugal	4,156,017	681	158
Slovenia	859,782	441	62
Slovakia	1,852,059	852	98
Finland	2,787,200	294	91

Notes: The sum refers to the sum of the estimation weights over the households and corresponds to the size of the target population, i.e. the number of households. Mean weights indicate the average number of households that one net sample unit represents. Coefficient of variation is the relative standard deviation of final estimation weights (as a percentage of the mean of weights). This indicates the variability of the final weights in the net sample.

6 Editing, item non-response and multiple imputation

Data editing is an essential part of processing survey data in order to minimise errors and inconsistencies from collected observations. Kennickell (2006) shows the effect of editing the data in the Survey of Consumer Finances by comparing the distributions of net worth of imputed but unedited data with imputed and edited data. The unedited data show, for example, underestimation at the bottom of the distribution, but strong overestimation at the top.

A certain degree of item non-response is to be expected in any household survey. In a wealth survey like the HFCS, which contains sometimes difficult and sensitive questions on personal finances, one can expect a higher level of missing answers, particularly for some of the most important variables used to produce statistical indicators and as components of research models. Imputation is the most frequently used process of correcting for item non-response by assigning plausible values to a variable when it was not collected at all or not correctly collected based on the information collected from other households.

The need to provide users with information about the quality of the data is recognised. For this purpose, a set of shadow, or “flag”, variables is produced and provided to users to indicate the origin of the information given for all variables and observations. Flag variables indicate, for example, whether an individual observation was recorded as collected, edited, estimated, imputed from a range value provided by the respondent or imputed because the respondent could not, or did not want to, provide a valid response.

6.1 Data editing

The procedure for detecting errors in and between data records, both during and after data collection and capture, and for adjusting individual items is known as editing (UN, 2001). The use of carefully programmed computer assisted interviews can significantly reduce the number of consistency checks needed after the fieldwork phase. Furthermore, comments made by interviewers during data collection can help to identify possibly unreliable values (Bledsoe and Fries, 2002).

In all countries conducting the HFCS, consistency and range checks were included in the questionnaires. In most cases, interviewer comments were used systematically in the review of data values. Countries applied several distinct editing rules, including logical, range and consistency checks as well as checks for outliers. Eight countries used register data in editing to complement interview information with administrative data. In addition to correcting unreliable observations, values were changed for other purposes, such as converting net amounts of income variables to gross amounts and amounts in legacy currencies to euro.

Audio records of the interviews can also be used in the editing process. For instance, in Spain this has been done since the 2017 wave and has been used to correct values and to decide whether to re-contact households when wrong or unclear answers are detected.[20]

6.2 Imputation of the HFCS data

In the HFCS, observations for which no valid response was received from the households should be imputed. In addition to a common methodology on imputations, software tools have been developed for imputation in order to maximise the degree of methodological commonality.

6.2.1 Imputation requirements

A complete-case analysis that discards non-observed units and analyses only units with complete data would disregard too much information and is thus not considered appropriate for the HFCS. Inferences should be made from the survey data on the entire population rather than on only those units that have provided answers to certain questions (Little and Rubin, 2002). Since imputing all missing values for all variables might not be feasible, a minimum set of variables that need to be imputed has been determined for the HFCS. The set of variables that were fully imputed in the 2021 wave included all components of household income, consumption and wealth, so that the indicators on household balance sheets could be based on the observations of all households that participated in the survey. In addition, selected variables that are most frequently used in the reporting of HFCS results, in monetary policy and financial stability analysis, and as good predictors of balance sheet variables in the imputation models, were fully imputed.

Each NCB/NSI that produces data has the responsibility to impute missing observations. Rubin (1996) makes the case explicitly, claiming that modelling the missing data must be, in general, the data constructor's responsibility, since "In general, ultimate users have neither the knowledge nor the tools to address missing data problems satisfactorily." Database constructors using individual HFCS country data have better information on the reasons for non-response and on the relationship between different variables. Besides, country-specific questions or different interviewing strategies are better evaluated at the country level. Lastly, part of the information used to construct the imputation models is available only at the country level due to confidentiality reasons (wealth strata, regional data, interviewer comments and so on). With this in mind, the HFCS imputation process is fully decentralised and therefore operates at the country level, even though the process strictly follows a common methodology (see following sections).[21]

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[20] In Spain audio records are used to discipline interviewers in the compliance of the survey protocols regarding the administration of the interview. In addition, audio records are extremely useful to improve the knowledge about the interaction between interviewers and respondents and the difficulties that respondents encounter when answering specific questions.

[21] See Biancotti et al. (2009) for further references.

6.2.2 Multiple imputation

Imputation seeks to preserve the characteristics of the distribution of, and the relationships between, different variables (Rubin, 1987). In addition to a complete-case analysis, several other simple procedures could be performed to get around the problem of missing values.

Probably the simplest approach is to fill in missing values with the means of observed values. This would naturally lead to a large and inappropriate decrease in variance and would not reproduce the distributions obtained from the survey data. In stochastic regression imputation, missing values are replaced with a value predicted by a regression plus a residual, to reflect the uncertainty in the predicted value. For normal linear regression models, the residual is treated as normal, with zero mean and variance equal to the residual variance in the regression. For binary or multinomial regressions, the predicted value is a probability distribution, and the imputed value is drawn from that distribution. While this method preserves the distribution of the imputed values, the uncertainty of the imputation process is not fully reflected in a single imputation.[22]

With multiple imputation (MI), M imputed values based on different random draws are provided to the user for each missing value, resulting in M copies of the complete dataset. MI shares the advantages of single imputation in that it allows complete-data methods of analysis and use of all information available to the data collector. However, uncertainty can also be taken into account (i.e. in order to avoid underestimating the resulting estimation variance) when using MI, which is particularly important in cases of significant item non-response.

The construction of multiple imputation models in the HFCS is based on the methodologies used in similar surveys by the Federal Reserve Board and Banco de España (see Kennickell, 1991 and 1998, and Barceló, 2006). HFCS datasets include five implicates (imputed sets of values) for each missing observation. The variability across the five implicates accounts for the underlying level of uncertainty. The imputation technique has an iterative and sequential structure. The models follow a path in which all variables are filled in with a predefined sequence. The models are run iteratively several times, and imputed values from each of the previous rounds are treated as observed values in the subsequent iterations.

Furthermore, a broad-conditioning approach is used, meaning that a high number of covariates, based on several criteria, are included in the models for all variables to be imputed. The model should include, first of all, variables that have predictive power, empirically shown by regressions, for the variable to be imputed. Covariates should also include variables that have explanatory power suggested by economic theory, although potentially not empirically exhibited for the dataset in question. Because of the sequential structure of the model, predictors of the most frequently used covariates for other variables are also important. Finally, any variables that could potentially explain the non-response pattern of households should appear as covariates in the imputation model. MI in the HFCS is based on the assumption of

[22] For further information, see references in Household Finance and Consumption Network (2008b).

"missing at random", meaning that the distribution of the complete data depends only on the observed data, conditional on the determinants of item non-response and other covariates. Consequently, this complete set of variables must be incorporated into the imputation models (Barceló, 2006).

6.3 Imputation methodologies in the HFCS

Table 17 shows the methodological choices of the participating countries for the imputation models. The first column shows whether multiple imputation is applied. The second item shows whether survey weights are used in the imputation models – either by performing weighted regressions or by using survey weights as covariates. There is evidence that ignoring information on sampling design in the imputation models will lead to biased results (Reiter et al., 2006; Zhang et al., 2009). However, weighted regression potentially leads to less efficient estimates (Faiella, 2010). The last item describes the selection process of covariates for the imputation model.

Table 17

Imputation methodology

Country		Use of weights			Selection of predictors in the imputation model		
	Use of MI	Weighted regression	Weight as covariate	No weights used	Automatic with limited editing	Automatic pre-selection with case-by-case evaluation	Case-by-case evaluation
Belgium	X	X				X	
Czech Republic				X			X
Germany	X	X	X			X	
Estonia	X			X	X		
Ireland	X		X				X
Greece	X		X				X
Spain	X			X			X
France		X		X*			X
Croatia	X	X					X
Italy				X			X
Cyprus	X			X	X		
Latvia	X	X	X			X	
Lithuania	X		X		X		
Luxembourg	X	X				X	
Hungary	X	X					X
Malta			X			X	X
Netherlands	X			X			
Austria	X		X				X
Portugal	X		X				X
Slovenia	X			X		X	
Slovakia	X		X			X	
Finland		X				X	

Source: ECB – HFCS metadata.
* Depending on the variable.

6.4 Comparative information on item non-response and imputation

Tables 18 to 20 show information on the imputed observations for three of the most significant balance sheet variables: the current value of the household main residence, the outstanding balance of the biggest loan collateralised by the household main residence and the value of savings accounts. The first two columns indicate the share of households that have either reported having the item or for which the item was imputed as existing. The next three columns show the share of non-missing observations that were collected, imputed from a range value provided by the respondent or imputed from a missing value respectively. The last two columns show the difference between the conditional means of all and collected observations. These indicators reflect the impact of imputations in different countries.

With very few exceptions, variables indicating the existence of the above-mentioned items were collected during the interviews. The difference between the mean of collected values and all observations does not necessarily imply a biased imputation. It may just be a reflection of the differences between households that are able to provide asset values in the interview and those that are not.

In frequent cases a high share of balance sheet values has been imputed from a range value provided by the respondent. This procedure should be distinguished from an imputation for a missing value, since the range value provides a fair estimation of the point value directly received from the respondent.

When comparing item non-response rates, a few issues should be noted. In some countries, the HFCS blueprint questionnaire was not implemented as such and some of the HFCS variables were converted from variables collected in more detail for national-level purposes. Interviewing in more detail, as well as differences in the routing of the questionnaire, might overstate item non-response in the HFCS data compared with national data. When one HFCS variable is constructed from several national variables, non-response to any of the national questions is reflected in the HFCS variable.

Table 18

Item non-response rates: current value of household main residence

Country	Percentage having HMR	Of those having HMR*			Conditional mean (EUR)	
		Collected	Imputed from ranges	Imputed from missing	All	Collected#
Belgium	72.2	86.9	9.5	2.3	322,754	324,907
Czech Republic	78.9	100.0	0.0	0.0	131,720	131,720
Germany	59.0	95.2	2.5	2.3	352,747	359,891
Estonia	82.1	60.0	35.0	4.9	95,222	96,055
Ireland	83.5	91.3	0.0	6.4	316,388	319,320
Greece	53.3	65.6	29.1	5.3	101,088	101,632
Spain	80.3	82.1	14.5	3.4	179,260	180,218
France	72.3	22.9	64.1	13.0	264,925	274,784
Croatia	84.5	85.3	3.1	9.8	104,140	99,949
Italy	80.8	98.6	0.0	0.0	219,584	219,584
Cyprus	76.2	79.4	0.0	19.9	272,475	285,129
Latvia	84.9	84.3	9.0	6.3	46,484	47,832
Lithuania	93.4	63.7	0.3	35.2	78,600	75,015
Luxembourg	73.8	76.0	12.8	10.8	997,432	982,621
Hungary	84.3	100.0	0.0	0.0	69,027	69,027
Malta	81.8	68.7	27.5	3.8	349,139	349,648
Netherlands	65.1	85.4	6.9	4.1	372,052	370,738
Austria	42.9	83.8	11.6	4.4	384,116	387,180
Portugal	88.2	60.9	17.7	21.4	150,449	155,273
Slovenia	81.4	78.9	9.3	11.9	160,835	162,839
Slovakia	88.3	94.9	0.0	5.0	108,733	108,227
Finland	78.3	All values estimated			196,746	196,746

* Collected observations include those collected from administrative sources. In addition to collected and imputed values, observations can be edited or estimated, which is why the columns do not always add up to 100%.
# Includes observations collected from registers, edited, estimated or collected as range values and then imputed.
Note: Response rates are not weighted, though conditional means are.

Table 19

Item non-response rates: largest mortgage on household main residence: value still owed

Country	Percentage having mortgage	Of those having mortgage*			Conditional mean (EUR)	
		Collected	Imputed from ranges	Imputed from missing	All	Collected#
Belgium	27.5	72.6	13.5	9.0	107,350	112,413
Czech Republic	10.3	100.0	0.0	0.0	40.319	40,319
Germany	19.2	93.0	3.2	3.4	100,487	102,002
Estonia	26.1	98.3	0.0	0.0	51,935	51,935
Ireland	32.4	95.5	0.0	1.4	142,991	143,739
Greece	5.9	58.8	11.1	5.0	54,798	51,338
Spain	23.8	90.6	5.3	4.1	73,838	74,798
France	27.4	52.0	0.0	48.0	108,539	127,486
Croatia	5.4	91.8	4.1	4.1	33,371	33,258
Italy	12.3	94.8	0.0	0.0	111,652	111,652
Cyprus	29.8	89.2	0.0	10.1	107,140	109,989
Latvia	16.1	93.4	1.0	3.1	32,552	34,131
Lithuania	7.8	100.0	0.0	0.0	46,837	46,837
Luxembourg	37.2	73.9	9.5	15.6	320,369	295,127
Hungary	13.3	100.0	0.0	0.0	16,116	16,116
Malta	12.7	82.2	7.8	10.1	79,733	81,720
Netherlands	50.3	77.1	10.9	9.3	141,493	150,130
Austria	11.2	84.0	5.4	10.6	87,912	86,487
Portugal	31.1	67.5	14.8	17.0	59,010	60,705
Slovenia	8.8	88.9	4.7	6.4	54,136	52,701
Slovakia	14.9	77.8	0.0	18.5	43,400	44,747
Finland	38.5	100.0	0.0	0.0	85,920	85,920

* Collected observations include those collected from administrative sources. In addition to collected and imputed values, observations can be edited or estimated, which is why the columns do not always add up to 100%.
# Includes observations collected from registers, edited, estimated or collected as range values and then imputed.
Note: Response rates are not weighted, though conditional means are.

Table 20

Item non-response rates: value of savings accounts

Country	Percentage having savings account	Of those having savings account*			Conditional mean (EUR)	
		Collected	Imputed from ranges	Imputed from missing	All	Collected#
Belgium	77.8	76.6	13.7	7.3	51,231	53,256
Czech Republic	31.6	100.0	0.0	0.0	6,898	6,898
Germany	75.3	95.2	2.1	2.7	30,909	30,703
Estonia	48.3	99.8	0.1	0.1	6,225	6,189
Ireland	79.7	74.4	4.5	21.0	22,587	25,059
Greece	92.1	76.4	0.0	23.6	11,390	8,322
Spain	15.2	86.7	5.9	7.4	33,759	32,962
France	89.4	76.0	14.9	9.1	24,308	24,402
Croatia	9.9	98.5	0.0	0.0	9,044	9,044
Italy	17.2	73.8	26.1	0.0	16,196	16,196
Cyprus	18.6	81.5	0.0	18.5	38,772	44,046
Latvia	50.0	95.6	0.8	3.6	3,622	3,652
Lithuania	10.6	56.7	0.0	43.3	4,824	5,049
Luxembourg	64.5	73.5	18.4	8.2	101,952	105,401
Hungary	21.4	75.2	0.0	24.8	9,251	9,344
Malta	42.7	39.8	56.3	3.9	29,831	30,394
Netherlands	79.8	73.8	11.5	14.8	41,209	39,603
Austria	82.5	76.5	7.8	15.6	31,511	28,540
Portugal	54.4	60.9	15.0	24.1	32,520	34,146
Slovenia	17.0	72.6	6.3	21.0	17,898	17,046
Slovakia	28.6	89.9	0.0	10.1	10,159	9,241
Finland	45.7	37.2	3.0	4.3	29,446	29,533

* Collected observations include those collected from administrative sources. In addition to collected and imputed values, observations can be edited or estimated, which is why the columns do not always add up to 100%.
# Includes observations collected from registers, edited, estimated or collected as range values and then imputed.
Note: Response rates are not weighted, though conditional means are.

7 Variance estimation

Variance estimation allows researchers to distinguish between a statistically significant phenomenon and a spurious result caused by the random nature of the sample. Underestimating the variance of an estimate may lead to incorrect conclusions (too many false positives), while overestimating the variance seemingly renders the data less useful, as fewer outcomes are estimated as being statistically significant.

The variance of an estimator can have several components, though not all components can be estimated. One central component is sampling error, which is caused by the random selection of the units participating in the survey. A second key component is item non-response, which is addressed in the chapter on imputation and which will be connected to total variance estimation in this chapter.[23]

Users of the HFCS need to be able to estimate the variance of several kinds of indicators. This chapter motivates the use of replication-based methods and describes the one chosen for the HFCS.

7.1 Variance estimation using replication-based methods

Since sampling error is linked to sample design, its estimation relies on the provision of sample design information. In most surveys, information on the number of stages of sampling, the strata at each stage, the identification of sampling units (primary, secondary, etc.) and the selection method (e.g. with or without replacement, equal or unequal probabilities) is sufficient to allow end-users to estimate sampling variance, using linearisation techniques for estimators other than means or totals. Even so, calculating these variance estimates is far from simple when the sample design is complex.

Moreover, sample design information is often withheld for confidentiality reasons: in many countries, the first level of stratification is often geographic (regions), and primary sample units are often linked to geographical units (municipalities, blocks, etc.). This increases the re-identification risk, and survey producers are understandably concerned about providing sample design information in that case.

Replication techniques are a robust and flexible way to estimate variance, even in the case of complex survey designs. Although in theory it applies only to linear statistics, and asymptotically in the case of the bootstrap, in practice these techniques have been found to be very useful because their flexibility allows them to cope with different kinds of sampling designs and various kinds of statistics, without requiring an explicit formula for the variance of each statistic (as with linearisation techniques).

[23] Other potentially relevant sources of variability, which the survey is not currently able to estimate, include variations in the understanding of questions by respondents, in interviewers' adherence to survey protocol, in formal sample coverage and in decisions made in data editing or other aspects of processing.

In replication techniques, the full sample is used to draw (in different ways) sub-samples or replicate samples, which are used to estimate the statistic of interest and its variation across replicate samples and which can be provided to users as a (large) set of replicate weights. Nevertheless, the relative merits of different replication techniques are still under discussion (among them, Jackknife, Balanced Repeated Replication and bootstrap, each with many variants).

The HFCS uses the bootstrap to compute replicate weights, as it offers the flexibility needed to cover the various national sample designs and is powerful enough to cover many types of estimators.

In the bootstrap procedure, a with-replacement[24] sample of primary sampling units (PSUs) from each stratum is selected.[25] The number of PSUs per unit does not need to be constant. The number of replicates (bootstrap samples), as well as the number of PSUs sampled in each replicate, can be chosen, although there are practical recommendations for both these quantities (for example, in the rescaling bootstrap proposed by Rao and Wu, 1988, and generalised by Rao et al., 1992). The precision of the bootstrap is higher if the number of replicates is increased.

7.2 The Rao-Wu rescaled bootstrap and its extensions

The variant of bootstrap for the HFCS is the rescaling bootstrap of Rao and Wu (1988), as further specified by Rao, Wu and Yue (1992). It is applicable for one-stage samples and can also be used in the case of a multi-stage sample drawn with low sampling fraction in the first stage. This is the case in several popular setups of stratified sampling, although other sampling designs can also be approximated using this setup. While – like all bootstrap methods – the rescaling bootstrap is computationally intensive and the resulting variance estimates may be less stable than with other methods (such as Jackknife and linearisation), it provides consistent variance estimates in the case of non-smooth statistics such as distribution quantiles.

The Rao-Wu bootstrap can be described as follows. We consider the case of strata indexed by $h = 1, \dots H$, with N_h units in each of them, out of which n_h are sampled without replacement. The sampling fraction is thus $f_h = n_h/N_h$. To each unit (h, i) there is a variable of interest y_{hi} and a weight $w_{hi} = N_h/n_h$. The total of this variable is $Y = \sum_{h=1}^{H} \sum_{i=1}^{N_h} y_{hi}$, which is estimated without bias by $\hat{Y} = \sum_{h=1}^{H} \sum_{i=1}^{n_h} w_{hi} y_{hi}$. The parameter of interest is a function of this total, say $\hat{\theta} = f(\hat{Y})$. For the Rao-Wu bootstrap applied in the HFCS, the following is done B times:

A sample of size m_h is taken with replacement from each stratum.

Writing r_{hi}^* the number of times unit (h, i) is resampled, the weights are adjusted as follows: $w_{hi}^* = \left(1 - \lambda_h + \lambda_h \frac{n_h}{m_h} r_{hi}^*\right) w_{hi}$ with $\lambda_h = \sqrt{\frac{m_h(1-f_h)}{n_h - 1}}$.

[24] Meaning each selection is independent, such that an element may be selected more than once and thus may appear multiple times in the same sample.

[25] In case of multi-stage sample designs, the methods below only consider the first sampling stage, as in practice this stage represents the largest part of the variance.

The bootstrap total is computed $\hat{Y}_b^* = \sum_{h=1}^{H} \sum_{i=1}^{n_h} w_{hi}^* y_{hi}$ and $\hat{\theta}_{*b} = f(\hat{Y}_b^*)$.

The bootstrap variance is then calculated as $V_{*(\theta)} = \frac{1}{B-1} \sum_{b=1}^{B} \left(\hat{\theta}_{*b} - \bar{\hat{\theta}}_*\right)^2$, where $\bar{\hat{\theta}}_*$ is the mean of the bootstrap total over all B iterations.

7.2.1 Replicate sample size

In the HFCS, the replicate samples are drawn independently and with replacement in each stratum. The number of units m_h drawn in each stratum of size n_h is set to $m_h = n_h - 1$. The final estimation weight for each observation is then rescaled by a specific factor $\frac{n_h}{n_h - 1}$ and multiplied by the frequency of the observation in the replicate sample (number of hits).

7.2.2 Number of replicates

The number of replicates is at least 1,000, as a commonly used compromise between computational efficiency and stability of the variance estimates. Given the way bootstrap works, in practice it is not necessary to use all the weights. It is possible to use only, say, the first 200 or 500 replicates for faster (but somewhat more unstable) variance estimation. This may depend on the type of estimator and size of the domain (e.g. mean of total population vs. medians for specific population subgroups).

7.2.3 Variance estimation model

Given that the standard Rao-Wu rescaled bootstrap is applicable to one-stage stratified simple random samples, but that two- and three-stage designs are used in some countries, a variance estimation model is used in those countries. Most notably, the second sampling stage is dropped (as in practice most of the variance originated from the first stage), except when the PSU is sampled with certainty, in which case the second sampling stage is used in the bootstrap. Strata may be merged, especially if the number of units is small. In countries with dual-list samples, some adaptation of the methods was required when conducting this survey.

7.2.4 Calibration of replicate weights

Since the final weights are adjusted for non-response (see Chapter 5.3 of this report), post-stratified or calibrated (the specific technique not being important), the replicate weights have been adjusted according to the same procedure, such as by running the calibration procedure with the same margins on each of the replicate weights. This can be considered an additional rescaling factor. For instance, after drawing the sample and rescaling the weights as in point 3, the weights are further rescaled to satisfy post-stratification or calibration constraints for each replicate. This is to ensure that the replicate estimates are close to unbiased in each replicate sample.

In most countries, each set of replicate weights sums up to the same number of households, consistent with the sum of final estimation weights, and to the same number of persons. When they do not, the variation in the number of households/persons is limited.

7.2.5 Extension to multi-stage sampling

In each stage, the sampling of units (primary, secondary, and so on, up to ultimate) induces an additional component of variability. In multi-stage designs, the usual assumption is that the sampling variance comes mostly from the first stage of sampling (i.e. the selection of PSUs and not the selection of secondary sampling units (SSUs) in each PSU). This helps to simplify the variance formulae and reduce the computation burden (although this does not apply to the bootstrap), with a negligible loss of information in the presence of small sampling fractions in the subsequent stages.

The approach proposed by Preston (2009) is an alternative. This is an extension of the without-replacement bootstrap to include multistage sample designs. Osiewicz and Pérez-Duarte (2012) apply the same methodology in the case of a with-replacement bootstrap, making it a direct extension to the Rao-Wu bootstrap. It is applicable to multi-stage stratified sample designs where the sampling fraction at the first stage is not negligible. Its use is transparent to final users of the data, since all the information is included through the replicate weights. The multi-stage rescaled bootstrap shows an improved estimation of the variance when two stages are used in the calculation of the replicate weights, but when the gain of a third stage is minor.

7.3 Combining replicate weights and multiple imputation

In the description below, we consider the general features of a multiply-imputed sample survey, as described in Chapter 6 of this report. Each observation has a final estimation weight w_i. There are M implicates (multiple imputation) indexed by m, and B replicate weights w_{ib} indexed by b. In the HFCS, $M = 5$ and $B = 1000$.

For each implicate m, the estimator of interest θ_m is calculated using the estimation weight w_i (for example the population total of a variable y, as $\sum_i w_i y_{im}$). The variance of this estimator is estimated using the bootstrap weights as follows: for each of the B replicates, using the replicate weight w_{ib}, calculate θ^*_{mb}, with mean across replicates $\bar{\theta}^*_m = \frac{1}{B}\sum_{b=1}^{B}\theta^*_{mb}$. The partial variance for implicate m is $U_m = \frac{1}{B-1}\sum_{b=1}^{B}(\theta^*_{mb} - \bar{\theta}^*_m)^2$. This is the standard bootstrap variance used in complete case analysis.

The total variance is then calculated according to the MI formula

$$T = W + \left(1 + \frac{1}{M}\right) Q,$$

where W is the within variance $W = \frac{1}{M}\sum_{m=1}^{M} U_m$ and Q is the between-imputation variance, $Q = \frac{1}{M-1}\sum_{m=1}^{M}(\theta_m - \bar{\theta})^2$ and the final estimator of interest is $\bar{\theta} = \frac{1}{M}\sum_{m=1}^{M}\theta_m$.

7.3.1 Test statistics

According to multiple imputation theory, the quantity $(\theta - \bar{\theta})T^{-\frac{1}{2}}$ is approximately distributed as a t-distribution with ν_M degrees of freedom, with $\nu_M = (M - 1)\left(1 + \frac{W}{(1+\frac{1}{M})Q}\right)^2$. Barnard and Rubin (1999) recommend an alternative measure in the case of small samples, as in that case, the ν_M can be much larger than the complete data degrees of freedom. This recommended measure is $\nu_M^* = \left(\frac{1}{\nu_M} + \frac{1}{\nu_{obs}}\right)^{-1}$, where $\nu_{obs} = \frac{\nu_0+1}{\nu_0+3}\nu_0(1-\gamma)$, ν_0 is the complete-data degrees of freedom, and $\gamma = \frac{(1+\frac{1}{M})Q}{T}$.

In the context of sample surveys, the degrees of freedom are customarily calculated as $n - L$, where n is the number of PSUs and L is the number of strata. For the HFCS, at the euro area level as a whole, it is likely that the large sample assumption holds, and that the measure ν_M is more appropriate. However, when looking at country-level data, where the number of PSUs is not large, it may be more appropriate to use the small sample formulas. It is proposed to leave this decision to final users.

7.4 Variance estimation of changes between waves

In addition to estimating variances of indicators at a given time t, the four waves of the HFCS add the time series dimension to the data analysis. It is therefore necessary to understand the principles of estimating the variance of changes between time t and $t+1$ for different estimators. The estimator for a parameter Y at a given time t for a probability sample s_t is denoted as $\hat{Y}_t$. $\hat{Y}_t$ appropriately reflects the sampling design used to select s_t. Correspondingly, $\hat{Y}_{t+1}$ denotes the estimator for the same parameter at time $t+1$, which again appropriately reflects the sampling design used to select s_{t+1}.

The change in the estimator of parameter $\hat{Y}$ between t and $t+1$ can be denoted as $\hat{D} = \hat{Y}_{t+1} - \hat{Y}_t$. The variance of $\hat{D}$ is given by:

$$\mathrm{Var}(\hat{D}) = \mathrm{Var}(\hat{Y}_t) + \mathrm{Var}(\hat{Y}_{t+1}) - 2\mathrm{Cov}(\hat{Y}_t, \hat{Y}_{t+1}),$$

where $\mathrm{Var}(\hat{Y}_t)$ and $\mathrm{Var}(\hat{Y}_{t+1})$ denote the unconditional variances of $\hat{Y}_t$ and $\hat{Y}_{t+1}$ respectively and $\mathrm{Cov}(\hat{Y}_t, \hat{Y}_{t+1})$ denotes the unconditional covariance between $\hat{Y}_t$ and $\hat{Y}_{t+1}$.[26] When the sampling designs at time t and $t+1$ are statistically independent, the estimators of parameter Y are also independent. Consequently, the covariance between the two estimators of parameter Y is 0 and the variance of the change in the parameter is equal to the sum of variances of $\hat{Y}_t$ and $\hat{Y}_{t+1}$. If the two samples are not

[26] See Eurostat (2013).

statistically independent, usually $\mathrm{Cov}(\hat{Y}_t, \hat{Y}_{t+1}) > 0$ and the estimates of change are more efficient.

The HFCS includes samples with a panel component, which means that the cross-sectional samples of t and $t+1$ are not statistically independent. On the other hand, there are no instances where the net samples at t and $t+1$ would consist of exactly the same population, due to refresher samples, attrition and other types of entries to and exits from the sample population.

While it is important to acknowledge the impact of sample coordination on the variance of changes in parameter values, calculating exact measures of such variance is not easy. There is no universally recognised methodology for estimating the covariance between $\hat{Y}_t$ and $\hat{Y}_{t+1}$[27]. Furthermore, taking the covariance between these estimators as zero in two household surveys conducted with identical sampling designs at different times will lead to conservative estimates of the precision of changes and overstate variance.

[27] Several papers, for example Berger (2004) and Berger and Priam (2010), propose methodologies to estimate covariance matrices for estimators measured at different points of time for overlapping samples using various kinds of information on sampling designs.

8 Statistical disclosure control

Statistical disclosure control for the HFCS has two facets: safe data and safe users. The latter refers to the procedure for granting access to the HFCS dataset, as explained in subsection 8.1. The former is the process whereby the data collected during the survey are anonymised, i.e. treated in such a way that the effort needed to re-identify a particular respondent – either a household or a person – is disproportionately high. The remaining sections of this chapter deal with this anonymisation process.

8.1 Access to the HFCS microdata

Access to the HFCS microdata may be requested for research projects. Researchers need to submit a microdata access request form, which includes a confidentiality commitment that must be signed. Further information on accessing the microdata can be found on the HFCS main page, including the access request form.

The following sections explain the anonymisation procedure of this dataset.

8.2 General principles of Statistical Disclosure Control in the HFCS

The anonymisation procedure is applied either by the NCB (or NSI, i.e. before submitting the data to the ECB) or by the ECB, and is designed to ensure, insofar as possible, data comparability. Country-specific anonymisation techniques may also be applied centrally by the ECB in close coordination with the NCB (or NSI) concerned, to ensure the confidentiality of responses where necessary.

The anonymisation procedure has two main components: a “general procedure” and “country-specific procedures”. The general procedure is applied to the data of all countries, while country-specific procedures may be applied to the extent necessary and on a case-by-case basis, depending on local data protection regulations, assessments of disclosure risk or customs.

8.3 General anonymisation procedures

For all countries, the following steps are taken:

- Most information on the sample, such as date of interview or characteristics of the dwelling or sampling units, is not included in the research dataset for anonymisation purposes.

- Only those households that participated in the survey are included in the research dataset, i.e. non-respondents are not included.
- Some variables are top- or bottom- coded. These include age (top-coded at 85), length of stay in the country (top-coded at 85), time lived in the household main residence (top-coded at 85), year of property acquisition (bottom-coded at 1935), total time in employment (top-coded at 73), number of years contributing to a pension plan (top-coded at 73) and year in which a gift/inheritance was received (bottom-coded at 1935).
- For a number of variables, bracketed versions of them are included in the research dataset. The original variables are included only for those countries where further anonymisation is not required. These include age (eighteen brackets), size of the household main residence (ten brackets) and number of employees in self-employment businesses (four brackets).
- For several variables, categories are grouped together. These include country of birth (recoded in four categories, showing only the country where the survey took place, other euro area countries, other EU countries, and other countries), education (recoded in four categories, according to the International Standard Classification of Education (ISCED), version 1997, namely ISCED1, ISCED 2, ISCED 3+4 and ISCED 5+6+7+8) and ISCO description of employment (limited to first digit of ISCO classification).

8.4 Country-specific anonymisation procedures

In addition to the general procedures that the ECB applies to certain variables for the whole dataset, similar procedures (deletion, top- or bottom- coding, bracketing, grouping of categories) may also be applied to other variables for individual countries if this is considered necessary at national level for anonymisation purposes.

Furthermore, random rounding is applied to certain numeric variables in a number of countries. The approach used is based on Kennickell and Lane (2007). The idea is to prevent identification disclosure through matching with the exact amounts provided by the household. The solution is to round the numbers to a specified precision, randomly, in a way that does not bias the results (either up or down, based on how far the amount is from the rounded values above and below).

This procedure is equivalent to adding random noise of mean 0 to each amount, with heteroscedastic variance. For example, 12,345 would be rounded to 12,000 approximately two-thirds of the time, and to 13,000 one-third (if rounded to two digits). This is done independently across implicates.

Altogether, this is a minor measure of statistical disclosure control whose effect is limited, as the respondents themselves often spontaneously round many amounts. It only needs to be applied when there is a clear case of re-identification risk (e.g. matching with administrative data). Internal tests have shown that rounding to two

digits has a minimal effect on sample means and that rounding to three digits has a similar minimal effect on medians.

9 Comparability issues

9.1 Data comparability between survey waves

Ongoing efforts are made in all countries to improve coverage, reduce non-response, minimise response bias, and improve sampling, imputation and other methodologies of the survey. This implies that the surveys in all countries undergo changes in terms of coverage and methodology over time. Therefore, changes in results between survey waves should be viewed with some caution as they may to some extent reflect improvements made to the survey.

Changes between previous waves and the 2021 wave may also be down to the impact of COVID-19 on the survey and as such should be interpreted with caution. Aside from the impact of COVID-19 on the data collection, as discussed in Box 1, the pandemic also affected the economic and financial situation of households, and this is reflected in the results of the survey.

Detailed metadata covering various aspects of data collection are collected from all NCBs and NSIs participating in the HFCS. To conclude our description of methodologies, this chapter describes the most important methodological changes between the most recent and the previous survey wave in various countries.[28]

In **Estonia,** information on non-collateralised loans and leasing has been based on register data since the 2017 wave, whereas in the first two waves the information was collected via interviews. Information on private loans has been collected separately since the 2017 wave, while previously it was included in other non-collateralised loans. From the 2021 wave onwards, information on mortgage loans is also taken from registers.

In **Ireland**, administrative data from the Central Bank of Ireland's Central Credit Register (CCR) was used in wave 4 to supplement responses to debt questions in the survey. This makes an important change on the previous waves, where data collection for debt variables was based solely on information self-reported by households. The inclusion of the CCR has improved both accuracy and coverage of debt. A revised version of wave 3 data incorporating the CCR is available, making the two waves comparable. However, this does lead to comparability issues between wave 2 and wave 3 data, since CCR data are not available for wave 2.

In the imputation of real estate wealth in **Latvia,** data from the cadastral value base provided by the State Land Service are used. While the same source of administrative data was used in 2014 and 2017, real asset values increased significantly, due to the improved coverage of real estate values in the source data. Consequently, the development of real estate wealth in Latvia between the two most recent HFCS waves should be interpreted with caution.

[28] The methodologies used for the third HFCS wave are described in Household Finance and Consumption Network (2020).

In **the Netherlands**, the first two waves were based on smaller samples (around 1,200 households) than in 2017 and 2021 and information on assets and liabilities was derived from existing Dutch surveys. The most recent waves used a sample of approximately 2,500 households and followed the exact wording of the HFCN questionnaire. Therefore, the previous two waves may show more sampling uncertainty, and differences in the wording may also have influenced the outcomes. Overall, the data from the 2017 and 2021 waves are better aligned with the data on household wealth published by Statistics Netherlands.

In **Luxembourg**, the COVID-19 pandemic forced a change in the survey methodology, which may limit comparability across time. Computer-assisted personal interviewing (CAPI) was replaced with computer-assisted web interviewing (CAWI), resulting in a drop in the response rate from 24% to 10%. This change in methodology also affected the composition of the sample, with more highly-educated, younger people completing the survey. It is unlikely that the weighting procedure was able to correct all dimensions of the selection process.

In the 2021 wave, the survey included, for the first time, residents employed at extraterritorial institutions (EU institutions, NATO, etc.), which represent around 10% of the total population and were not sampled in previous waves. This change is expected to provide better coverage of the target population.

There was also a change in the pension section, as the questionnaire from the 2017 wave did not work well in Luxembourg. A new pension section was introduced, resulting in a substantial increase in participation rates from wave 3 to wave 4.

In **Italy**, the sample design of the survey has been modified to improve the statistical coverage of indebted households and high-income households. In particular, the second stage of the sampling design now includes an optimal stratification of households within the sampled municipalities, according to their income and debt, by exploiting newly available information from register data.[29]

The redesign has led to a reduction in the bias of estimators of household income and wealth and has brought the estimates obtained through the survey considerably closer to the corresponding figures in the national accounts (Banca d'Italia, 2022). However, it has made it difficult to compare the results with those obtained in previous waves. To account for this drawback, an additional weighting system has been constructed to enable comparisons of results across waves. Such weights are adjusted to make the distribution of income and debt in the sample of wave 4 as similar as possible to the distribution one would have obtained had the design not been adjusted.[30]

In **Cyprus**, the weights have been revised for all HFCS waves, following a methodological update to improve accuracy and coverage across regions. Consequently, any comparison of Cyprus HFCS data with previous publications using the outdated version of the weights should be made with caution.

[29] For more details on the selection of the income see Barcaroli et al. 2021.

[30] Details on the construction of the weight for time series comparisons can be found in Gambacorta and Porreca, 2022.

In **Portugal**, the COVID-19 pandemic forced a change in the survey methodology, which may limit comparability across time and make in some respects the data less accurate than in the previous waves. This is the case of the data on the homeownership rates among the different age groups. The impossibility of conducting personal interviews and the fact that many households had outdated phone contact numbers contributed to a significant decline in the response rate and to bias in the net sample towards households living in the same address for many years. This problem was only partially solved by a change in the variables used to calibrate the weights.

9.2 Data comparability between countries

Household net wealth varies substantially across euro area countries, with the median ranging from €31,000 to €718,000 and the mean from €73,000 to €1,270,000. A great deal of work has gone into making figures comparable across the euro area. Nevertheless, cross-country differences should be interpreted with great caution, with both institutional and methodological issues having an impact on the indicators across countries.

In particular, a feature of the HFCS that has a significant impact on data comparability across countries is the fieldwork year. Substantial progress has been made to harmonise this, together with the reference years of income, assets and liabilities. In the third wave of the survey, most countries conducted the majority of interviews in the same year, 2017. However, the outbreak of the COVID-19 pandemic affected this harmonisation effort for the fourth wave. In some countries, the fieldwork planned for 2020 was postponed to 2021. The fact that countries conducted the HFCS fieldwork in different stages of the COVID-19 pandemic should be considered when making cross-country comparisons.

Furthermore, household characteristics and institutional factors vary across countries. For example, in this survey, wealth is measured at the household level, yet the average size of a household differs from country to country. The share of one-person households is more than 40% in Germany, Estonia, Latvia, the Netherlands and Finland, but only 25% or less in Cyprus, Portugal and Slovakia. Since higher levels of household wealth are generally observed for larger households, differences in the demographic structure should be taken into account when comparing indicators on household assets.

The same holds true for rates of home and land ownership and for households' preferences with respect to holding real or financial assets. Most importantly, house price developments and the extent to which households take up loans to acquire property differ markedly across countries. Homeownership rates, in particular, have a strong impact on wealth differences across countries. In Germany and Austria less than 50% of households own their main residence, while this share is higher than 80% in Lithuania, Hungary and Slovakia. The share of non-financial assets in households' portfolios has an impact on the survey results – in particular on mean values of wealth – since financial assets are usually not reported in surveys as comprehensively as real assets. Furthermore, the definition of household wealth excludes certain items

considered relevant in specific countries. Most notably, defined benefit schemes for occupational pensions are significant components of household wealth in the Netherlands[31].

The magnitude of "public" wealth (including pensions, social housing and the provision of public services) varies across countries, and the expected value of public pensions, for example, can have a significant impact on households saving behaviour. It is crucial to understand that the HFCS measures household wealth only and does not provide any insight into the wealth of the public sector.

From a methodological standpoint, in complex surveys like the HFCS, any data production step could influence the statistical inference based on the final dataset. All decisions made with regard to the construction of the questions asked, sampling design, non-response, protocols for survey execution, editing, imputation, weighting design, tools for variance estimation and all other steps of survey production may significantly influence the bias and variance of estimates based on final data.

In the case of survey execution protocols, there are important known differences, which are reflected in this report. As regards statistical processing, the HFCS established high-level frameworks and in some instances made fairly detailed prescriptions. Yet there is inevitably room for interpretation and judgement, and the resulting variation has the potential to affect true bias, true uncertainty of estimates and the degree of true bias or uncertainty that is actually measured. There is often a trade-off between measured bias and uncertainty in choices made in statistical processing. It should therefore be taken into consideration that datasets based on a data production process in which substantial variance was traded against bias will more often deliver "significant" results, even though they may have a larger true bias, which cannot be measured.

9.3 Demographic information in the HFCS compared with other statistics

The HFCS provides a unique source of data on household-level wealth, indebtedness, income, and consumption, for the euro area, Croatia, Hungary and Czech Republic. There are no other data sources that cover all these topics at the personal and household level, although individual components of the survey are measured by other statistics. Even though the definitions of variables and data production approaches in other statistics are sometimes quite different from those used in the HFCS, these sources can still be used as a benchmark. The following three sections show comparisons between the HFCS and other data sources producing personal- or household-level information.

The target population of the survey are private households residing in the national territory at the time data are collected and their current members. For the results of the

[31] A non-core variable on occupational pension schemes without an account balance is included in the HFCS User Database, to enable the adjustment for the otherwise distorted net median and mean wealth position of Dutch households in comparison with other countries.

survey to be reliable, the structure of the survey population, by age, household size, economic activity, and so on, must be coherent with the target population. In a sample survey, the structure of the population is determined by sampling and weighting procedures, as described earlier in this document.

A variety of external sources measure the structure of the household population in euro area countries. The first benchmark source used in this report is population statistics by Eurostat. Population statistics provide accurate measures of population size, along with several breakdowns, such as by age and gender, thus allowing for comparison of basic personal-level data. For comparison of household-level data with identical definitions of households, as well as for some more detailed individual level characteristics, data from other surveys are the only feasible benchmark. In this chapter, HFCS data are compared with EU Statistics on Income and Living Conditions (EU-SILC), which is a harmonised survey conducted annually in every EU country. When comparing the two surveys, it should be noted that EU-SILC faces the same challenges as the HFCS when it comes to household surveys, and differences between the data outcomes of these two surveys can be caused by methodological issues specific to one or other of them. In the following chapters, the demographic structure of the HFCS data is compared with external benchmarks with respect to age, household size and labour status.

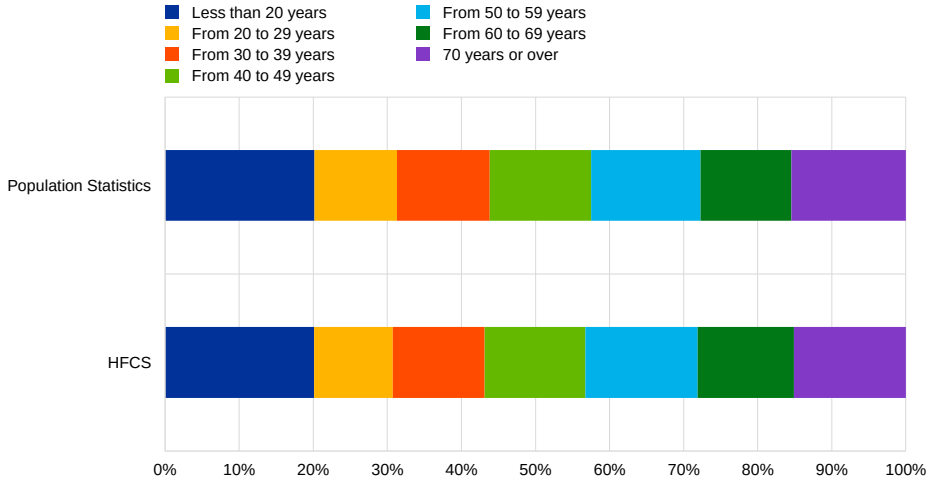
9.3.1 Age structure

The development of net wealth follows a hump-shaped profile over the age of the household reference persons. Net wealth rises approximately to the age of 60 and declines gradually thereafter. Wealth differences between the youngest age groups and the age groups close to retirement age are substantial. It is therefore crucial that the survey population by age provides a good representation of the target population.

Chart 1 below shows the age structure in the HFCS and the structure according to population statistics. Note that this age distribution is different from what is used to report the results, where wealth data are analysed at the household level and the relevant age is that of the household reference person. Chart 1 also shows the age structure of all household members, including children. The age structure of the total adult population is younger on average, because younger household members are less frequently classified as reference persons, such as in households that comprise several generations.

Chart 1

Euro area population structure by age in the HFCS and population statistics



Sources: ECB – HFCS and Eurostat – Population statistics.
Note: Population statistics data refer to 2021.

The age structure of persons in the survey population is a very close match to the corresponding structure of population statistics in the euro area. In the HFCS, there is a slight underrepresentation of young working-age adults, though overall the differences in the euro area age structures between the two statistics are small.

9.3.2 Household size

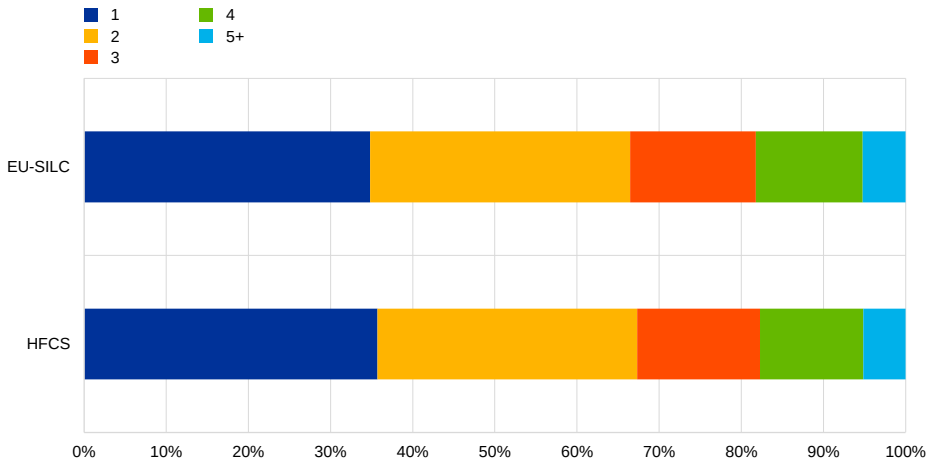
Wealth in the HFCS is reported at the household level and no equivalence scales are used, as in most income distribution statistics, such as EU-SILC. This is consistent with international recommendations on having households as the preferred unit of analysis for household wealth statistics (OECD, 2013). Therefore, the distribution of the survey population by household size is an important aspect, not only in the comparison of wealth levels, but also in assessing the representativeness of the sample. Bigger households hold on average more wealth than smaller households, due to the larger number of adult members with wealth holdings. Additionally, larger households tend to live in larger and more valuable homes. This is crucially important, given the significance of the household main residence in the wealth portfolios of households. Consequently, most countries included household size as one of their calibration variables, using data either from the census or other surveys.

While the definition of age is straightforward in any statistics, the definition of household is different in survey data when compared with statistics based on administrative or census data, in which the household-dwelling concept is applied (Eurostat, 2011b). In the HFCS, persons living in the same dwelling can belong to one or more different households, or one household can consist of individuals registered in different dwellings. The household composition, as defined in the HFCS, can be determined only during the interview. Consequently, it is feasible to compare the household size distribution using another set of survey statistics with identical household definition as a benchmark. The HFCS household definition has been

adapted from the recommendations of the EU-SILC survey. However, in individual countries differences may persist.

Chart 2

Euro area household structure by household size in the HFCS and EU-SILC



Sources: ECB – HFCS and Eurostat – EU-SILC.
Note: EU-SILC data refer to 2021.

Compared with EU-SILC, the HFCS produces a very similar distribution of the household population by household size for the euro area (see Chart 2). As in the case of the age distribution, the small differences should not lead to significant bias in the interpretation of the HFCS results.

9.3.3 Labour status

Another important determinant of household wealth is labour status. The HFCS collects information about the labour status of each household member aged 16 or over. This variable indicates whether the person is working, retired, unemployed and so on. For those working, there is an additional question on whether the person is an employee or self-employed.

According to the HFCS results, households with a self-employed reference person have on average the highest wealth holdings, while working age persons who are not economically active have the lowest wealth holdings. The labour status structure has, thus, significant implications for the results.

As in the case of household size, other surveys are the only comparable benchmark statistics on labour status distribution. From 2021 onwards, information on self-defined current economic status is collected through two questions in the EU-SILC, with classification similar to that of the HFCS. The only difference is the category “on sick/maternity/other leave”, which does not exist as such. Persons belonging to the latter category are in most cases classified as employees in EU-SILC.

Chart 3 shows the distribution of the survey population aged 16 or over in the HFCS and EU-SILC by self-defined labour status. As in the case of age, this classification is

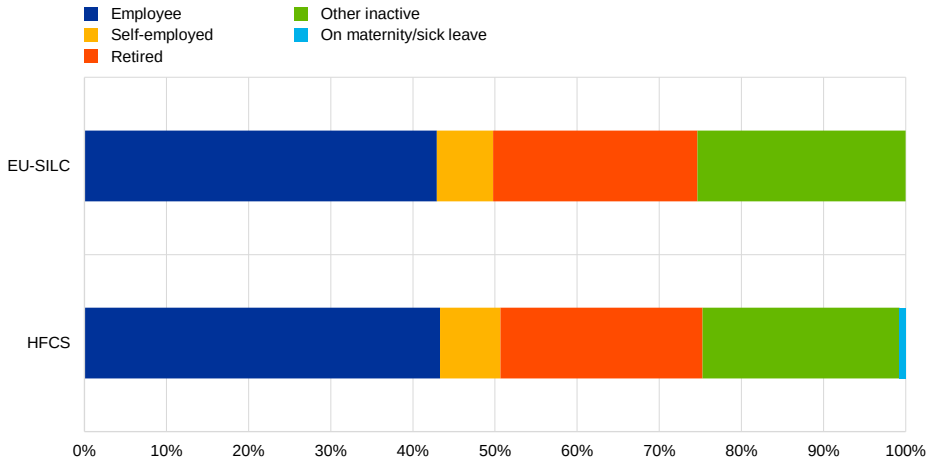
done at the person level, not by the household reference person. The breakdown by labour status in the HFCS results report is based on the labour status of the household reference person and is thus different from the breakdown presented here.

The population structure by labour status in the euro area is extremely coherent with the benchmark statistics. There is a slightly higher share (0.5 percentage points) of self-employed persons in the HFCS and a slightly smaller share of the group “Other inactive” (1.4 percentage points). Some differences in the labour status structures between the HFCS and the EU-SILC are to be expected, given that in some cases labour status can be a difficult concept to self-report.

Differences in the labour status structure are also caused by various methodological choices across both the HFCS and EU-SILC. Oversampling the wealthy in the HFCS is also likely to have an influence on the results. In addition, in the case of the self-employed, the fact that the HFCS collects detailed information on self-employment businesses before asking the question on labour status may have an impact. The role of interviewers is also extremely important for collecting accurate information in questions such as those relating to labour status.

Chart 3

Euro area population structure by labour status in the HFCS and EU-SILC



Sources: ECB – HFCS and Eurostat – EU-SILC.
Note: EU-SILC data refer to 2021.

9.4 Comparing the HFCS and macro data on financial wealth and liabilities

Data on household sector wealth and liabilities are also available from national accounts and other macro sources. While it is useful to compare wealth data from micro and macro statistics, it should be noted that there are significant differences between the definitions and methodologies applied in the two statistics. Consequently, differences in the levels of wealth between the two data sources are expected to be observed, especially if one compares the concepts of aggregate wealth used in each source.

There are several reasons for the discrepancy between total wealth levels derived from micro and macro sources. Coming from different traditions and addressing different purposes, the micro and macro approaches have developed quite independently. Thus, there is significant variability in practices when assessing the boundaries of the household sector, when valuing assets and reference periods and when defining wealth and individual wealth items.

These kinds of discrepancies between micro and macro data have been analysed in several research papers, including Andreasch and Lindner (2014) and Honkkila and Kavonius (2013). An expert group coordinated by the ECB has been working to understand and quantify the differences between survey and national accounts data on household wealth (Expert Group on Linking Macro and Micro Data for the Household Sector, 2020). This chapter acknowledges the group's conclusions on the differences between the methodologies. Instead of analysing total (financial) wealth with the concepts applied in micro and macro statistics, this chapter concentrates on comparing wealth items that are conceptually comparable across the two sources.

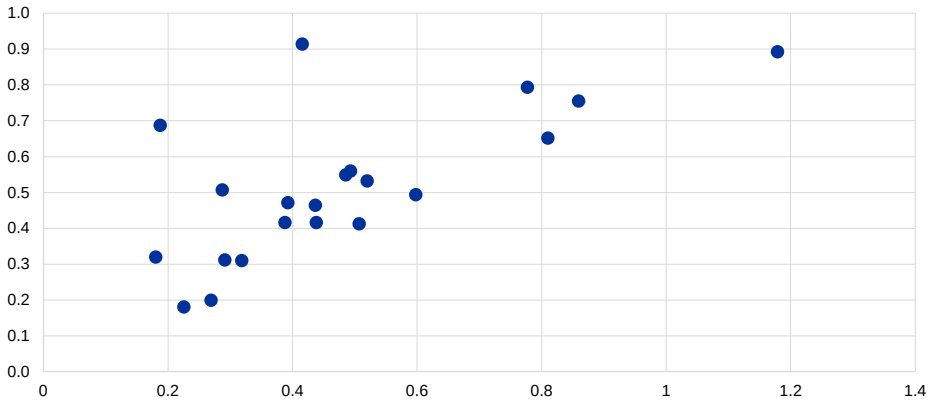
9.4.1 Financial assets

The levels of financial wealth in survey data are generally lower than the levels produced by national accounts, and to a larger degree than in the case of real assets. Cross-country differences in the ratio between HFCS financial wealth and national accounts financial wealth can be observed. It is fair to assume that a portion of these cross-country differences is caused by divergences in the methodologies applied in the country-level production processes of both statistics.

Chart 4

Ratio of adjusted financial wealth per capita in the HFCS to national accounts

(2017 – horizontal axis; 2021 – vertical axis)



Sources: ECB – HFCS and ECB – Annual Sector Accounts.
Note: All HFCS countries included. Annual Sector Accounts data refers to the reference year of each country.

According to previous literature, deposits, mutual fund shares, listed shares and bonds are financial wealth items that share definitions in surveys and national accounts. This concept will be called adjusted financial wealth in the remainder of this chapter. These items are summed up for both sets of statistics, and the ratio of HFCS

per capita totals to national accounts per capita totals is shown in Chart 4 above for all countries that participated in the two latest HFCS waves.

Chart 4 shows that the HFCS produces lower levels of per capita financial wealth than macro data, even if only comparable items are used in the comparison. There is also significant cross-country variability between the ratios of adjusted financial wealth. In the majority of countries, these ratios were very stable across the two HFCS waves in 2017 and 2021, while for a reduced set of countries the coverage improved remarkably between the two waves.

9.4.2 Liabilities

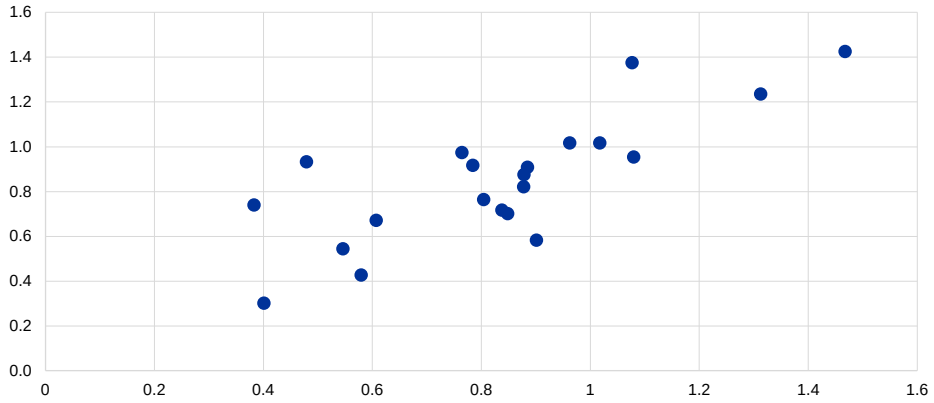
On the liabilities side of the households' balance sheets, there are minimal conceptual differences in the definitions between micro and macro statistics. In the HFCS, debt is collected by collateral. In addition, private loans, i.e. loans from other households, are collected separately. Household' liabilities in macro statistics are classified by the duration of the loan, and there is usually no differentiation between mortgages and other loans. However, the definition of aggregate loans in macro statistics is almost identical to the HFCS definition. The only exception is private loans, which are usually not recorded in macro statistics. This has a limited impact on the evaluation, and the share of private loans in total household debt is approximately 1% in the HFCS.

The benchmark data for liabilities used in this chapter are the ECB statistics on the balance sheets of monetary financial institutions (MFIs), which provide several advantages compared with similar information derived from national accounts. MFI data include information on loans provided by such MFIs, classified by the institutional sector of the lender. The statistics are harmonised at the euro area level. Data are collected directly from the institutions providing loans and, unlike the data from national accounts, are thus not subject to any balancing adjustments. In addition, loans given to sole proprietors can be separated from household loans. Sole proprietors are to a large extent considered as a part of the household sector in national accounts, while in survey data their liabilities are recorded in the balance sheets of self-employment businesses, not as household liabilities. The drawback of MFI data is that they do not differentiate between households and non-profit institutions serving households.

Chart 5

Ratio of household' liabilities per capita in the HFCS to MFI statistics

(2017 – horizontal axis; 2021 – vertical axis)



Sources: ECB – HFCS and ECB – Statistics on balance sheets of Monetary Financial Institution.
Note: All HFCS countries included. MFI statistics refer to the reference year of each country.

The results of the comparison of the levels of household' liabilities between micro and macro statistics are shown in Chart 5. The levels of debt produced by the survey are generally closer to the levels of macro data than the levels of adjusted financial wealth shown in the previous chapter. This is not surprising, since the sampling bias caused by having fewer of the richest households in the sample than in the population is smaller for liabilities than for financial wealth. A significant share of financial assets is held by extremely wealthy individuals, whereas the distribution of debt is much less skewed. However, cross-country differences in the HFCS/MFI ratio of liabilities can be observed. As in the case of adjusted wealth, the difference between levels of debt in micro and macro statistics in individual countries is generally stable across the two HFCS waves.

9.5 Comparison of income data between the HFCS and EU-SILC

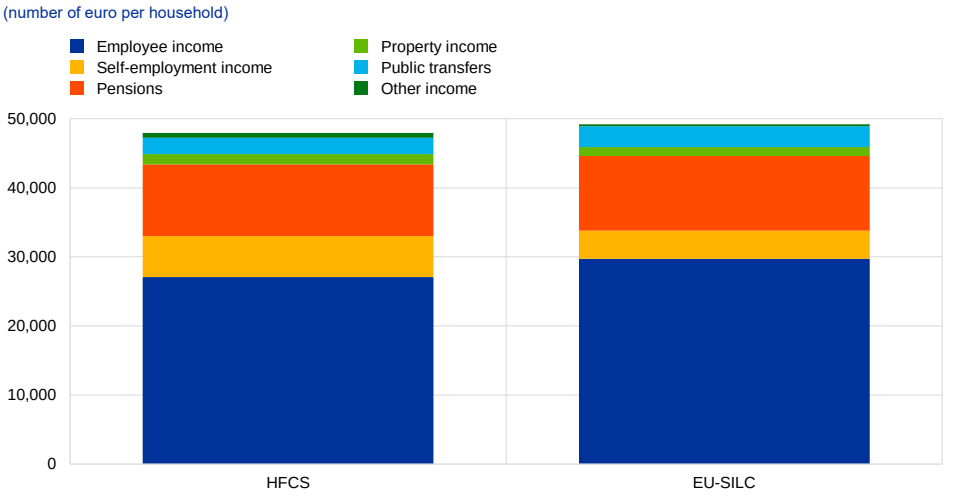
The main purpose of the HFCS is to collect data on households' balance sheets. While data on income is not the priority, it is essential to collect reliable income data for several analytical purposes. For example, it is useful to analyse indicators on wealth and liabilities by household groups classified by their level of income. Furthermore, indicators on financial vulnerability, such as the debt-income ratio or the debt service-income ratio, are frequently used to assess the financial stability of households. The drawback is that it is not possible to comprehensively collect both wealth and income data in a single survey, as doing so it may excessively increase respondent fatigue. Consequently, only gross income is collected in all national datasets of the HFCS.

The concept of gross income in the HFCS is identical to the one used in EU-SILC, which is the most complete harmonised survey on household income in Europe. The structure and distribution of gross income can thus be compared between the two data sources. Chart 6 shows levels of income in the euro area according to the two

sources. Data from EU-SILC are taken from reference year 2020, which corresponds to the most common reference period for income in the fourth wave of the HFCS. In EU-SILC, average gross income per household is only slightly higher than in the HFCS. The relatively small difference indicates good comparability for a survey not specialised in the collection of income and marks an improvement in comparison with the previous wave. The levels of employee income, pensions and other social transfers are to a similar extent higher in EU-SILC. However, the HFCS produces higher (unconditional) averages of property income and substantially higher levels of self-employment income. During a wealth survey, there is probably less recall bias for income items related to wealth.

Chart 6

Structure of gross income in the HFCS and EU-SILC



Sources: ECB – HFCS and Eurostat – EU-SILC.
Note: EU-SILC data refer to the 2021 survey (income reference year 2020).

Given that one of the motivations for collecting income data in the HFCS is to be able to conduct distributional and vulnerability analyses, it is not only the correct levels of income that matter. The HFCS should also produce a reliable picture of income distribution. The main purpose of the following comparison is to assess the comparability of HFCS income data used to report the results with EU-SILC data.

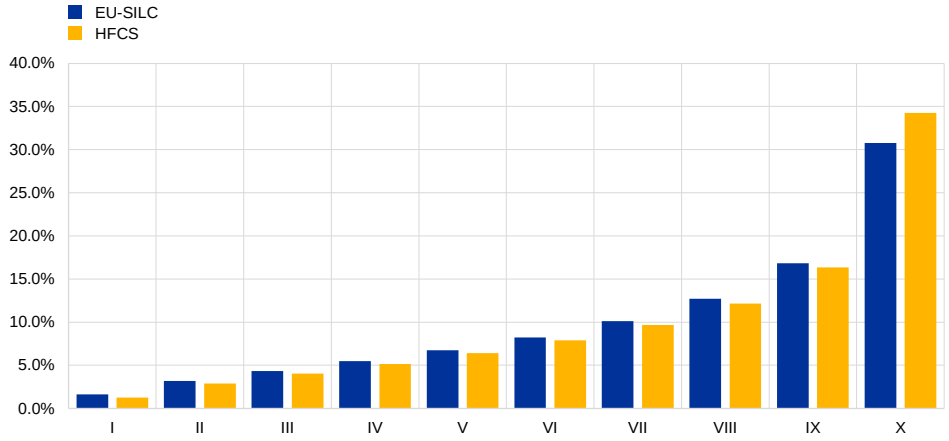
The HFCS uses gross income and measures distributions by households. This is consistent with the approach on collecting and measuring wealth information at the household level. Thus, data on distributions in HFCS publications are very different from such data in EU-SILC publications, where equivalised disposable income[32] is used. However, it is still possible to compare the distributions of household gross income for both surveys.

Chart 7 compares the gross income distributions produced by the HFCS and EU-SILC. The columns indicate the share of total income in each income decile.

[32] This income measure is calculated by first assigning the household-level total net income to all household members, regardless of age, and then dividing it by the number of consumption units in the household. An equivalence scale that assigns weights to the different household members is used for this calculation.

Chart 7

Share of total household gross income by deciles in the HFCS and EU-SILC



Sources: ECB – HFCS and Eurostat – EU-SILC.
Note: EU-SILC data refer to the 2021 survey (income reference year 2020).

The comparison between the two surveys shows how the HFCS data imply a more unequal distribution of income than EU-SILC data, as already observed in previous waves of the survey. The differences are not striking, with the share of gross income in the bottom half of the distribution being very close: 21.4% for the EU-SILC and 19.7% for the HFCS. The largest difference is observed in the top decile. In EU-SILC data, the share of total household gross income in the top decile is 30.8%, while in the HFCS it is 34.3%.

These divergences can be explained by the differences in the structure of income described earlier. HFCS provides higher estimates for property income while EU-SILC provides higher estimates for transfer income, which tends to have an equalising impact on income distribution. Additionally, oversampling of wealthy households most likely has an impact on the share of households with very high income in the HFCS.

To conclude, the level, structure and distribution of household gross income resulting from the HFCS is fairly coherent with the corresponding information produced by EU-SILC. However, the concepts and methodologies used to report the results of the two surveys are very different and are not always comparable.

Appendices

A1 HFCS definitions

Financially knowledgeable person

The “financially knowledgeable person” (FKP) is defined as the person who is most knowledgeable on financial matters regarding both the household as a whole and its individual members. The FKP will be invited to provide a large part of the information requested during the interview.

HFCS household

The target reference population for national surveys consists of all private households and their current members residing in the national territory at the time of data collection. Persons living in collective households and in institutions are generally excluded from the target population.

A household means a person living alone or a group of people who live together in the same private dwelling and share expenditures, including the joint provision of living essentials. Employees or other residents (i.e. live-in domestic servants, au-pairs, etc.) and flatmates without other family or partnership attachments to household members (e.g. resident boarders, lodgers, tenants, visitors, etc.) are considered separate households.

Subject to the further and specific conditions described below, the following persons must, if they share household expenses, be regarded as household members:

1. persons usually resident, related to other members;
2. persons usually resident, not related to other members;
3. persons usually resident, but temporarily absent from dwelling (for reasons of holiday travel, work, education or similar);
4. children of the household being educated away from home;
5. persons absent for long periods, but having household ties: persons working away from home;
6. persons temporarily absent but having household ties: persons in hospital, nursing home, boarding school, or other institution.

Further conditions for inclusion as household members are as follows:

For persons usually resident, but temporarily absent from the dwelling (3):

- the person currently has no private address elsewhere and the actual or intended duration of absence from the households is less than six months.

For children of the household being educated away from home (4) and persons absent for long periods, but having household ties, such as persons working away from home (5):

- irrespective of the actual or intended duration of absence, if the person is the partner or child of a household member, continues to retain close ties with the household, regularly returns to this address (for instance, at the end of the academic term) and considers it to be his/her main residence.

For persons temporarily absent but having household ties: persons in hospital or in a nursing home, boarding school or other institution (6):

- the person has clear financial ties to the household and the actual or expected duration of absence from the household is less than six months.

Sharing in household expenses includes benefiting from expenses (e.g. children, persons with no income) as well as contributing to expenses. If expenses are not shared, then the person constitutes a separate household at the same address.

A person will be considered a usually resident member of the household if they spend most of their daily night-rest there, evaluated over the past six months (this includes children in joint custody and elderly parents if they spend more days living in the household dwelling than anywhere else).

Persons forming new households or joining existing households will normally be considered members at their new location; similarly, those leaving to live elsewhere will no longer be considered members of the original household. The above mentioned “past six months” criteria will be replaced by the intention to stay for a period of six months or more at the new place of residence. Account has to be taken of what may qualify as “permanent” movements in or out of households. Thus, a person who has moved into a household for an indefinite period or with the intention to stay for a period of six months or more will be considered a household member, even though the person has not yet stayed in the household for six months and has in fact spent a majority of that time at some other place of residence. Similarly, a person who has moved out of the household to some other place of residence with the intention to stay away for six months or more will no longer be considered a member of the previous household.

If the person who is temporarily absent is in private accommodation, then whether they are members of this (or their other) household will depend on the length of their absence.

Exceptionally, certain categories of persons with very close ties to the household may be included as members irrespective of the length of absence, provided they are not considered members of another private household. In particular, students that live elsewhere but retain close ties with the household, regularly return to this address and

consider this address to be their main residence are to be considered part of the household irrespective of their length of stay at the other address.

Coverage issues: when applying these criteria, the underlying intention should be to minimise the risk of individuals who have two private addresses at which they might potentially be enumerated being double counted in the sampling frame.

Similarly, the intention should be to minimise the risk of some persons being excluded from membership of any household, even though in reality they belong to the private household sector. Persons living in collective households and the institutionalised population, as defined below, are excluded from the survey population and therefore not covered:

Collective household: refers to a non-institutional collective dwelling such as a boarding house, dormitory in an educational establishment or other living quarters shared by more than five persons without sharing household expenses. This category also includes persons living as lodgers in households with more than five lodgers.

Institution: refers to elderly care homes, health care institutions, religious institutions (convents, monasteries, etc.) and correctional and penal institutions. The key distinction between institutions and collective households is that in the former, the resident persons are not individually responsible for their housekeeping. In some cases, elderly care homes can be considered to be collective households under this rule.

A2 Collection of non-core items

Table A.1

HFCS non-core variables collected in national surveys

Demographics

Variable	Collected in:
RNA0200 Citizenship	France, Italy, Luxembourg, Portugal
PNA0100 Field of study	Italy
PNA0200 Health	Luxembourg
PNA0300 Siblings	France
PNA0400 Are you the eldest?	France
PNA0500 RP's/partner's father alive	France
PNA0501 RP's/partner's mother alive	France
PNA0510x Age of father and mother	France
PNA0600x Education of father/mother	Italy, Portugal
PNA0700 Occupation of father	France, Portugal
PNA0701 Occupation of mother	France, Portugal
PNA0850 Legal arrangements for marriage or recognised partnership	France
PNA0851 Sort of legal arrangement for marriage or recognised partnership	France
HDZ0310 Life satisfaction	Germany, Estonia, Greece, Italy, Luxembourg, Latvia, Malta, Portugal, Slovakia
HND3500 Risk taking attitude	Portugal

Real assets and their financing

Variable	Collected in:
HNB0800 HMR – Any part used for business purposes?	France
HNB0810 HMR – Year of construction	Greece, Italy, Portugal, Finland
HNB0910x HMR – External support for housing acquisition	France, Malta
HNB0920 HMR – Imputed rent	Greece, Italy, Malta, Finland
HNB130$x HMR mortgage: institution you have loan with	France
HNB140$x HMR mortgages: work for institution granting the loan	Portugal
HNB1700 Overpaying/voluntary step-up payments on HMR mortgages	Portugal
HNB1710 Monthly amount of extra voluntary payments on HMR mortgages	Portugal
HNB1800 Rent, net or including other charges	France
HNB1830 Owner of rented HMR	Italy
HNB190$x Other property: how property was acquired	France, Italy
HNB2000 Remaining other properties: renting out of property	France, Italy, Malta
HNB2010 Other properties: how much rent is collected	Italy, Malta
HNB205$x Other property $x: located abroad	Belgium, Italy, Malta
HNB2300 Overpaying/voluntary step-up payments: loans on other properties	Portugal
HNB2310 Monthly amount of voluntary payments: loans on properties other than HMR	Portugal
HNB3000 Reasons for moving	Portugal
HB4510x Number of other vehicles	Belgium, Greece, Portugal

Other liabilities, credit constraints

Variable	Collected in:
HNC004$x Non-collateralised loan: year the loan was taken	France, Italy, Portugal
HNC005$x Non-collateralised loan: nature of the lender	France
HNC0126 Any outstanding overdue payments	Cyprus, Portugal
HNC0150 Any non-bank liabilities	Belgium
HNC0200x Reasons for being refused credit	France

Private businesses, financial assets

Variable	Collected in:
HND010$x Business: year the business was started	France, Portugal
HND020$x Business: last year's total business sales	France, Portugal
HND0400 Any guarantees provided to businesses	Portugal
HND0420 Any guarantees provided to non-HH members	Portugal
HND0800 Are all accounts in euro?	Portugal
HND1000x Market value by type of bond	Italy
HND2200 Assets deposited abroad	Portugal
HND3000x Largest assets in HH balance sheet	Belgium
HND3010 Portfolio shifts last two years?	Belgium
HND3020 Portfolio shifts last two years: money out	Belgium
HND3030 Portfolio shifts last two years: money in	Belgium
HND3040 Would not invest again?	Belgium
HND3050x Assets HH would not invest again	Belgium
HND3100 Net worth, past two years	Belgium, France, Malta, Portugal
HND3200 Net worth next two years	Belgium, Malta, Portugal

Employment

Variable	Collected in:
PNE0100 Seasonal employment	Greece, Italy, Portugal
PNE0110 Number of working weeks per year	Italy, Portugal
PNE0200 Gross monthly income – main job (employees)	Portugal
PNE0300 Gross monthly income from self-employment	Portugal
PNE0500 Private-public organisation	France, Italy, Malta, Portugal, Finland
PNE0600 Number of employees – main employer	Portugal
PNE0700 Hours worked – additional employment contracts (as an employee)	Italy
PNE1000 Looking for job	Greece, Slovakia
PNE1100 Expect find new job in next 12 months	Greece
PNE1300 Hours a week would like to work in new job	Slovakia
PNE1400 For what minimum wage would work	Slovakia
PNE1600 Year they stopped being employed (for retirees)	Portugal
PNE1700 Employment status in last main job	France
PNE1800 Full time/part time – last job	France
PNE1900 What did firm/organisation you worked for make or do	France
PNE2000 Former job title and description / ISCO	France, Portugal
PNE2100 Time in former employment	France
PNE2200 Total time in full-time employment	France
PNE2210 Total time in all part-time employment	France
PNE2400 Number of different employers	Italy
PNE2700x Worsening of job conditions past 2 years	Greece, Portugal
PNE2800x Expected worsening of job conditions next 2 years	Greece

Pensions and life insurance

Variable	Collected in:
HNF0100x Has other insurance policies (accidents, theft, fire etc.)	Italy
PNF0720 Current value of all occupational plans that do not have an account	Netherlands
PNF100$x Occupational pension plan: is employer contributing	France
PNF180$x Occupational pension plan: expected age of collecting pension	France
PNF310$x Voluntary pension plan: whole life insurance policy: cash value	France
PNF3600 Has private health insurance	Italy
PNF3610 Monthly payments for health insurance policy(ies)	Italy

Income

Variable	Collected in:
HGZ027x Non-financial assistance received	Portugal
HNG0110 Net income from regular social transfers	Italy, Portugal
HNG0210 Net income from regular private transfers	Italy, Portugal
HNG0310 Net rental income from real estate property	Italy, Portugal
HNG0410 Net income from financial investments	Italy, Portugal
HNG0510 Net income from private business other than self-employment	Italy, Portugal
HNG0610 Net income from other sources	Italy, Portugal
HNG0710 Income taxes and social contributions	Italy, Finland
PNG0110 Net employee income	Belgium, Italy, Portugal
PNG0210 Net self-employment income	Belgium, Italy, Portugal
PNG0310 Net income from public pensions	Belgium, Italy, Portugal
PNG0410 Net income from private and occupation pension plans	Italy, Portugal
PNG0510 Net income from unemployment benefits	Italy, Portugal

Intergenerational transfers, gifts

Variable	Collected in:
HH0700 Expect to receive inheritance in the future	Portugal, Greece
HNH0500 Substantial gift made to children/other people outside household?	France
HNH0600 Who was the beneficiary of the gift?	France
HNH0700 Year donation was made	France
HNH0800 How much was donation made worth?	France

Consumption and saving

Variable	Collected in:
HI0350 Financial assistance provided to relatives and friends	Portugal
HI0360 Amount given as financial assistance per year	Portugal
HNI0200 Meet any regular payments?	Portugal
HNI0210 Expenditure on regular payments	Portugal
HNI0410 Household has saving?	Slovakia, Malta
HNI0420 Amount of saving	Slovakia, Malta
HNI0610 Ability to make ends meet	Belgium, Italy
HNI0700 More or less savings in the next year	Belgium
HNI0800 General price expectations	Belgium, Slovakia
HNI1000 General personal financial situation expectations	France, Slovakia

Payment habits and financial literacy (Non-core section)

Variable	Collected in:
HNJ1100 Any debit or/and ATM cards?	Italy
HNJ1300 Frequency of cash withdrawals in ATMs	Italy
HNJ2300a Number of credit cards	Italy
HNJ3100 A computer at home?	Finland
HNM0100 Financial literacy Variable/fixed interest rates	Slovakia
HNM0200 Financial literacy: Inflation	Greece, Italy, Slovakia
HNM0300 Financial literacy: Portfolio diversification	Greece, Italy, Slovakia
HNM0400 Financial literacy: Riskiness	Greece, Slovakia

Impact of COVID-19

Variable	Collected in*:
HV0100x Impact of COVID-19 on employment	Germany, Estonia, Greece, Spain, France, Italy, Cyprus, Luxembourg, Latvia, Malta, Netherlands, Austria, Portugal, Slovenia, Slovakia
HV0200 Impact of COVID-19 on income	Belgium, Estonia, Greece, Spain, France, Italy, Cyprus, Luxembourg, Latvia, Malta, Netherlands, Austria, Portugal, Slovenia, Slovakia
HV0210 Estimates of gain/losses in income	Belgium, Greece, Italy, Cyprus, Luxembourg, Netherlands, Austria, Slovenia, Slovakia
HV0300x Impact of COVID-19 on finances	Estonia, Greece, Spain, France, Italy, Cyprus, Latvia, Malta, Netherlands, Austria, Portugal, Slovenia, Slovakia
HV0400 Impact of COVID-19 on financial wealth	Estonia, Greece, France, Italy, Cyprus, Luxembourg, Netherlands
HV0410 Impact of COVID-19 on financial wealth in absolute terms	Greece, Italy, Cyprus, Luxembourg, Netherlands
HV0500 Impact of COVID-19 on saving	Greece, France, Italy, Cyprus, Luxembourg, Netherlands, Austria
HV0600 Impact of COVID-19 on consumption	Belgium, Greece, France, Italy, Cyprus, Luxembourg, Latvia, Netherlands, Austria, Slovakia
HV0610 Estimate of gains/losses on consumption	Belgium, Greece, Italy, Cyprus, Luxembourg, Netherlands, Austria, Slovenia, Slovakia

*There are certain differences across countries in how the non-core questions are formulated in the COVID-19 module, such as in the number of answer categories. Additionally, some countries did not collect all items of the variables with multiple items (i.e., HV0100x and HV0300x).

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Abbreviations

Countries

AT	Austria
BE	Belgium
BG	Bulgaria
CH	Switzerland
CY	Cyprus
CZ	Czech Republic
DK	Denmark
DE	Germany
EE	Estonia
IE	Ireland
ES	Spain
FI	Finland
FR	France
GR	Greece
HR	Croatia
HU	Hungary
IT	Italy
JP	Japan
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom
US	United States

Other

CAPI	Computer-assisted personal interviewing
CATI	Computer-assisted telephone interviewing
CASI	Computer-assisted self-interviewing
CAWI	Computer-assisted web interviewing
ESA	European System of Accounts
EU-SILC	EU Statistics on Income and Living Conditions
FKP	Financially knowledgeable person
HFCN	Household Finance and Consumption Network
HFCS	Household Finance and Consumption Survey
HMR	Household main residence
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
LFS	Labour force survey
MFI	Monetary financial institution
MI	Multiple imputation
NACE	European Classification of Economic Activities
NCB	National central bank
NSI	National statistical institute
NUTS	Nomenclature of territorial units for statistics
PAPI	Paper-and-pencil Interviewing
PSU	Primary sampling unit
RP	Reference person
UDB	User database

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