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Expert Group on Linking macro and micro data for the household sector

Understanding household wealth: linking macro and micro data to produce distributional financial accounts

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Contents

Abstract

The Expert Group on Linking Macro and Micro Data for the household sector (EG-LMM) was established in December 2015 within the European System of Central Banks (ESCB) with the aim of comparing and bridging macro data (i.e. National Accounts/Financial Accounts) and micro data (i.e. the Household Finance and Consumption Survey) on wealth. Furthermore, the Expert Group also focused on developing distributional results for household macro balance sheets, starting with national data from the euro area Member States.

The Expert Group assessed the extent to which these two sets of statistics could be compared and was able to link most balance sheet items. Since, following adjustments, the estimates yielded from the micro data were still lower than the macro data, an estimation method was developed to gross up the micro data to be in line with the macro data results. The methodology delivers estimates of the distribution of household wealth that are closely aligned with Financial Accounts aggregates, thereby offering valuable new information for the purposes of macroeconomic analyses based on such Financial Accounts.

Further research is needed to examine the robustness of these results and to improve the estimation method taking into account country-specific features and information. The Expert Group has therefore recommended further work be undertaken with a view to compiling experimental distributional results by end-2022.

Keywords: Household Debt and Wealth; and their distribution.

JEL Codes: D31, G51.

Executive summary

The ESCB Expert Group on Linking Macro and Micro Data for the household sector (EG-LMM) was established in December 2015 with the aim of comparing and bridging macro data (i.e. National Accounts/Financial Accounts[1]) and micro data (i.e. the Household Finance and Consumption Survey[2]) on wealth. Over the course of its existence, the EG-LMM has produced a detailed assessment of the comparability of definitions between the Household Finance and Consumption Survey (HFCS) and National Accounts (NA) items and has improved the matching of the two data sources. In the comparison of the two data sources carried out in this report, a distinction is made between two main sets of explanatory factors.

- The first set of factors concerns generic differences that potentially affect all or various components of wealth. These include differences that can be relatively easily identified (definition of population and household sector, reference periods), along with some issues that are more substantial and difficult to quantify and adjust for, such as different valuation concepts (self-assessment versus European System of Accounts (ESA) valuation), the effect of non-response or wrong responses in the survey, and the accuracy of some Financial Accounts (FA) asset categories for which statistical sources are weak. It has also proved difficult to determine the extent to which the surveys provide effective coverage of the households among which wealth appears to be substantially concentrated. In addition, the survey leaves scope for aligning its implementation to national circumstances, which results in some heterogeneity across countries. Finally, macroeconomic Financial Accounts, while more standardised across countries, are only available at a fairly high level of aggregation, which limits the scope for improving the quality of the linking by matching the sub-categories that can best be compared.

- The second set of factors concerns detailed instrument-specific definitions. The EG-LMM has developed alternative concepts of adjusted wealth which cover items that have medium or high comparability in the two sources. Items which are covered in only one of the two sources (notably currency holdings and non-life insurance reserves, which are covered only by the Financial Accounts) or which have low comparability (occupational pensions, financial derivatives, other accounts receivable/payable) are excluded from adjusted wealth. Overall, for more than 90% of the value of households' financial and non-financial assets included in euro area National Accounts statistics, a matching item in, or derived from, the HFCS has been defined with high or medium comparability. In particular, in the recent work of the EG-LMM, the HFCS concepts of housing wealth and (albeit with less accuracy) business wealth were bridged to National Accounts instruments, following analytical work on their components and thanks to the improved availability of National Accounts data on non-financial assets. In

1 See van de Ven, Fano (2017), and ECB's quarterly Household Sector Report.

2 See Household Finance and Consumption Network, 2016a.

a majority of euro area countries, and for the most extended concept of adjusted wealth, the ratio of grossed-up HFCS to National Accounts totals is around 70% to 80%. However, the coverage is lower when focusing purely on financial assets. It also varies considerably across instruments and countries.

Therefore, a significant gap remains between household sector wealth totals derived from the two sources. The second focus of the EG-LMM's recent work was on developing a procedure for closing the gap, i.e. the portions of the National Accounts totals that are not captured by the HFCS. The procedure developed makes best use of the data sources that were available to the EG-LMM. Following this approach, two main sources of differences have been identified, namely incomplete reporting of the holdings of the wealthiest households and under-reporting of wealth by certain survey respondents. These two components are modelled on the basis of: (i) a hurdle method, identifying implausible survey values (mainly zero values) and replacing them with replies from similar households; and (ii) an iterative process involving (a) a calibration procedure and (b) a Pareto model and drawing on a wide stream of economic literature attributing a Pareto distribution to the top part of the wealth distribution. The parameters of the Pareto model are determined on the basis of the HFCS as well as data from lists of the wealthiest households, where available. This model is used to reassess the number of very wealthy households assumed not to be (fully) captured in the HFCS weights.

The estimation method developed by the EG-LMM allows for the compilation of baseline estimates for distributional wealth accounts for the euro area countries. These estimates can – and should as far as possible – be refined using additional information available at national level, such as administrative data sources.

While initial comparisons have shown that the results are plausible, it is important to be aware that these results inevitably carry a degree of uncertainty. The EG-LMM therefore considers the estimation methods as a work in progress, and the methods will be refined in the light of experience.

The EG-LMM has identified a number of areas where further improvements should be achievable and recommends the following four future workstreams.

- Finalising the fine-tuned conceptual linking of the HFCS and National Accounts, e.g. by using more detailed breakdowns taken from monetary financial institutions' (MFI) balance sheet statistics and by including data on non-financial assets to achieve greater comparability.

- Fully implementing and further refining estimation methods, including the use of administrative sources, wherever possible. The European Central Bank (ECB) could run the estimation methods centrally and would submit the estimates to the national counterparts, which could validate and, wherever possible, improve the estimates on the basis of additional data available from national sources. Developing the use of administrative sources is a task mainly performed at the national level, although a concerted effort by the ESCB to strengthen the status of statistics on Distributional National Accounts allowing national central banks to get access to administrative data sources could help drive the process.

- Compiling annual results, based on interpolation for back data, and developing an estimation method for the latest years.
- Conducting research on consistency with estimates on distributional results on income and consumption.

Further steps in areas that are the responsibility of other groups would also be beneficial. Such areas include the coverage and valuation of unlisted shares and other equity, which is the responsibility of the ESCB Working Group on Financial Accounts (WG FA); efforts by the ESCB Household Finance and Consumption Network (HFCN) to enhance data collection regarding business wealth or to distinguish incorporated from unincorporated sole proprietors; and the work done by Eurostat and the European Statistical System to close gaps in the ESA transmission programme and improve the availability of data relating to land.

The work performed by the EG-LMM has also highlighted the increasing relevance of distributional financial information for the household sector, as confirmed by a small survey of selected users and as reflected by the emergence of websites providing estimates compiled by academic researchers. In this context, the EG-LMM highlights the importance of making available to the public at large some results on the distribution of wealth among European households. This will require adequate communication to make clear the current caveats. The results shall be clearly distinguished from distributional indicators driven from survey data, the underlying uncertainty of indicators resulting from various estimation methodologies must be emphasised and the data will need to be labelled ‘‘experimental”.

Finally, the EG-LMM recommends continuing and stepping up cooperation within the scope of the G20 Data Gaps Initiative led by the Organisation for Economic Co-operation and Development (OECD) and the related OECD/Eurostat expert group (Recommendation 9 of the Data Gaps Initiative). While full – and fully aligned – Distributional Financial and Non-Financial Accounts remain a long-term objective, it is important that efforts towards achieving this objective are aligned and that experts collaborate via continuous interaction between international groups working on developing Distributional National Accounts indicators.

1 Introduction

The financial crisis of 2008 and changes in the economic environment have increased demand for more timely, coherent and consistent distributional information for the household sector. In particular, from the perspective of central banks, changes in interest rates carried out to implement monetary policy may well have different effects on different groups of households (as is the case for savers and borrowers, or renters and home owners), and these groups may respond to such changes in different ways. To that extent, it is important for central banks to have an insight into the distribution of wealth and its components in order to assess how their monetary policy is transmitted.

These new data requirements are reflected in the G20 Data Gaps Initiative, which encourages the production and dissemination of distributional information on income, consumption, savings and wealth for the household sector. The Organisation for Economic Co-operation and Development (OECD) is mandated to coordinate this work and cooperate closely with the European Central Bank (ECB) and Eurostat. As part of this mandate, the OECD, together with Eurostat, established an expert group to investigate how to add distributional information to the National Accounts (NA). In addition, Eurostat and the European Statistical System Committee agreed in the Vienna Memorandum of 2016 to work towards this objective, in close cooperation with the ECB, the European System of Central Banks (ESCB) and the OECD. Both of these initiatives currently focus on consumption, income and savings.

The ESCB Expert Group on Linking Macro and Micro Data for the household sector (EG-LMM) was established in December 2015 with the purpose of comparing and bridging the Financial Accounts and the Household Finance and Consumption Survey (HFCS). The HFCS was launched in 2007, and three waves of the survey have been finalised to date[3]. In March 2017, the EG-LMM submitted a conclusive report on the work conducted during its first mandate. The EG-LMM was subsequently mandated to continue its work.

The EG-LMM's second mandate was divided into two workstreams. The tasks in the first workstream included further assessing the generic and instrument-specific differences and linkages, and finding the reasons for the unexplained differences between the two sets of statistics. On the basis of this analysis, the EG-LMM was mandated to develop recommendations to improve the linking of the HFCS and the Financial Accounts and to achieve better coverage ratios. The tasks in the second workstream included defining – on the basis of user priorities – distributional indicators for the household sector balance sheet and the methodology underpinning annual or multi-annual results. As housing wealth and related mortgages are major components of household wealth, it was considered essential to extend the analysis from the financial to the complete household balance sheet, including non-financial assets.

[3] In this report results from the two first survey waves are used. The latest HFCS results have been published shortly before the publication of this report.

The EG-LMM was jointly chaired by the ECB and Banca d'Italia. The members were from 15 countries (Denmark, Germany, Greece, Spain, France, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, Slovakia, Finland and the UK; see the composition of the EG-LMM in Annex 2) and contributed expertise both on Financial Accounts and on the HFCS. Eurostat and the OECD also participated. During the second mandate, the EG-LMM held four meetings.

This report is organised as follows. Chapters 2 and 3 describe the generic and instrument-specific differences between the HFCS and the Financial Accounts, as identified in the "linking" exercise in the first workstream of the EG-LMM's second mandate. Chapter 4 proposes a method for estimating the distribution of the remaining (and still significant) gap between adjusted HFCS data and National Accounts data. Chapter 5 analyses the availability of administrative data sources which could be used for improving the results of distributional balance sheets. Chapter 6 reports on the results of a user survey carried out to identify users' priorities in terms of output. Chapter 7 presents the main conclusions of the work performed and describes avenues envisaged for the way forward.

The present report summarises the results of the work of the EG-LMM carried out between 2017 and early 2019, and summarises possible avenues for further improvement. Where useful, additional information is provided on earlier results of group.

2 Linking Financial Accounts and HFCS: generic differences

The EG-LMM has identified two sets of factors causing differences between these two data sources. The first concerns “generic differences”, i.e. differences affecting all or most components of wealth and the macro-micro comparison. The second set of factors causing differences relates to instrument-specific issues affecting the various asset and debt categories covered by the HFCS and the National Accounts. These instrument-specific differences are described in detail in the next chapter.

The first generic difference relates to the aims and set-up of the Financial Accounts and the HFCS. The aim of the HFCS is to gain more insight into the economic behaviour of households and into the distribution of wealth and liabilities among households and household groups. The main data source is surveys conducted for a sample of households via personal interviews. Data collection in the HFCS is based on a set of common definitions and descriptive features and follows an output-oriented approach. The aim of the Financial Accounts is to provide timely macroeconomic information on the balance sheets and on the financing and investment of the entire household sector. The Financial Accounts do not exclusively focus on the household sector but rather describe relationships between all institutional sectors. For the household sector, Financial Accounts data are usually based on counterpart data, i.e. data reported by financial corporations, most of them produced under ECB statistical regulations. The definitions of instruments, sectors and concepts such as valuation are given by the European System of Accounts (ESA) 2010 and are mandatory in all EU countries.

Second, the two data sources have slightly different definitions of a household. In the HFCS, 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”. Persons living in institutions, e.g. in prisons or retirement homes, as well as homeless people, are excluded from the definition of a household in most countries. Non-resident persons can be members of a resident household if they are temporarily absent but otherwise fulfil the criteria of a household member. In the National Accounts, households have a similar definition, but are regarded as an institutional sector, which covers the whole resident population and does not exclude any groups per se. Under ESA 2010, the unit is resident in the economic territory with which it has the strongest connection, expressed as its centre of predominant interest (ESA 2010, 18.08). The distinction between producer households (to be classified within the household sector) and quasi-corporations and corporations (to be classified within the non-financial corporations sector) in the National Accounts is another potential source of discrepancy that will be discussed later in this document. Because of the population groups excluded from the HFCS target population, the population in the HFCS should be lower than the corresponding Financial Accounts figure. Consequently, the data need to be adjusted for differences

in the size of the target population before comparing wealth figures between macro and micro sources.

The periodicity and timeliness of the statistics are also dissimilar. The HFCS is conducted every three years in most countries, with a relatively long time lag between data collection and data availability. In the HFCS, most data refer to the time of the interview. The Financial Accounts are published quarterly and are available no later than four months after the end of the quarter. The balance sheet is a quarter-end balance sheet. Aligning the reference periods is another potential source of concern in macro-micro comparisons, particularly for several types of financial assets (e.g. listed shares) whose values vary significantly even within individual months.

The final generic difference refers to the valuation of households' assets, debt and income. In the HFCS, these are based on the households' self-evaluation. This was a conscious choice made when developing the survey, since the self-evaluated value of personal wealth is what drives the economic decisions of households. However, households' perception of asset values may not always be aligned with market values, particularly during times when asset prices are changing rapidly. In the National Accounts, all the financial and non-financial instruments are valued at market prices. When a market price is not available, then flows and stocks may be valued at the discounted present value of expected future returns. For items with quoted market prices (e.g. listed shares and debt securities), the valuation is straightforward. However, the valuation for unlisted shares and in particular holdings of other equity is less accurate as the valuation of these assets requires assumptions and modelling. As regards National Accounts data on non-financial assets, the produced capital stock is based on the perpetual inventory method in almost all countries. The estimation of National Accounts data on land is more complicated and varies from country to country.

In addition to the generic differences mentioned above, there are some features both in the HFCS and in the Financial Accounts that can explain the differences between values on household wealth derived from the two sets of statistics. In household surveys, the estimates are affected by reporting and sampling bias. Reporting bias occurs when a value that is recorded or a household in a sample departs from the actual value. Response bias occurs when the structure of households that participate in a survey is different from the structure of the target population. In general, the bias in the HFCS caused by unit non-response is reduced by weight adjustments. However, sampling bias can have a particularly large impact on wealth data given that the distribution of wealth is right-skewed, and consequently it is crucial also to get a representative sample from the very top of the distribution. To minimise sampling bias, the majority of countries oversample wealthy households in the HFCS. In addition to unit non-response, a frequently observed problem in household surveys is item non-response, i.e. the inability of participating households to provide answers to individual questions. The HFCS provides a full dataset for all balance sheet and income variables. Whenever the value of a variable is missing, its value is imputed.

The Financial Accounts are typically based on other statistical sources and the validation of primary statistics. The errors in estimation can be due to one of two reasons: either the source statistics do not have the same coverage as the National

Accounts concept (and this is not possible to fully correct when they are incorporated into the Financial Accounts) or there is a measurement error in the source statistics. In practice, the household sector is mostly based on the counterpart reporting data, i.e. the Financial Accounts data reported by banks, investment funds, insurance corporations and pension funds. It is therefore necessary to review the quality of the different statistical sources in order to assess measurement issues. While the counterpart data can be considered to be of relatively good overall, there can be potential problems in allocating units to the right sectors. Normally, the classification of units is done by the reporting institution, i.e. the bank or insurance corporation. Finally, the data balancing process affects the Financial Accounts results. The Financial Accounts may need to allow some bias in the household sector to satisfy the balancing constraints, i.e. the ultimate aim is not to minimise the bias in the household sector, but instead there is a dual objective of minimising bias in the estimates for the economy as a whole and of minimising statistical discrepancies within the system.

3 Linking Financial Accounts and HFCS: instrument-specific differences

3.1 Assessment of instrument-specific comparability

Given the long-term aim of including distributional information within the Financial Accounts framework, it is essential to assess the conceptual comparability of items included in the comparison. The EG-LMM assessed the similarity of concepts and definitions used for asset and liability categories in the Financial Accounts and the HFCS. A detailed correspondence table is provided as Annex 2a for financial instruments and Annex 2b for non-financial instruments.

As a result of this work, the following Financial Accounts instruments were identified as having high conceptual comparability.

Deposits are defined in a similar way in the Financial Accounts and the HFCS. Furthermore, the split of deposits into "F.22 Transferable deposits" and "F.29 Other deposits" in the Financial Accounts mirrors the survey definitions of sight accounts and savings deposits. "F.22 Transferable deposits" refers to deposits that can be used directly for making payments. The same definition is used for sight accounts in the HFCS. Similarly, "F.29 Other deposits" corresponds to the survey definition of savings deposits, which covers savings accounts, time deposits, certificates of deposit and other such deposits including non-transferable overnight deposits.

Debt securities as defined in the Financial Accounts include "bonds" as defined in the survey. In ESA 2010, debt securities are split into "F.31 Short-term" and "F.32 Long-term". This original maturity breakdown is not available in the HFCS. Both the Financial Accounts and the HFCS require market valuation for debt securities. Overall, the definitions for debt securities are highly comparable.

The survey asks about any "amount of money owed" to the household, an item which is comparable to the Financial Accounts instrument "F.4 Loans" (assets). However, the ESA definition may be somewhat narrower, as it refers to features (non-negotiable, interest-bearing) that are not explicitly mentioned in the HFCS. In the HFCS, loans are defined as any amounts that are expected to be repaid at some point in the future.

The Financial Accounts instrument "F.511 Listed shares" refers to equity securities listed on an exchange. This has conceptually high comparability with the HFCS item "publicly traded shares".

For "Investment fund shares or units", the definition used in the survey is the same as that used in the Financial Accounts. Investment fund shares are subdivided into "Money market fund (MMF) shares or units" (F.521) and "Non-MMF investment fund shares/units" (F.522) in the Financial Accounts. This classification is an exact match for the one in the survey, where there is an even more detailed breakdown into "a –

Funds predominantly investing in equity", "b – Funds predominantly investing in bonds", "c – Funds predominantly investing in money market instruments", "d – Funds predominantly investing in real estate", "e – Hedge funds" and "f – Other fund types (specify)". However, this split (which is similar to the breakdown in the ECB investment fund statistics) is not available in every country, and only the total market value is among the standard imputed variables. Market valuation is used both in the HFCS and the Financial Accounts.

On the liabilities side, "F.4 Loans" (liabilities) are split into short-term and long-term loans in the Financial Accounts. The concept of maturity is the same as used in the survey (original maturity). In the survey, the main categories for loans are mortgage debt (which is split into mortgages on the household main residence (HMR) and mortgages on other properties), non-mortgage debt, credit line/overdraft balance, credit cards balance, private loans and balance of non-collateralised loans. The ECB can calculate a breakdown into mortgage and non-mortgage loans based on monetary financial institutions' (MFI) statistics (see Section 3.4).

The following Financial Accounts instruments have been identified as having medium conceptual comparability with the HFCS: "insurance, pension and standardised guaranteed schemes", "unlisted shares", "other equity" and "non-financial assets". The comparability of "unlisted shares" and "other equity", as well as that of "non-financial assets", is analysed in detail in Sections 3.2 and 3.3. Regarding pension wealth, life insurance and voluntary pension plans have medium comparability. The Financial Accounts instrument "life insurance and annuity entitlements" (F.62) matches the HFCS category "voluntary pension schemes and whole life insurance contracts", despite different terminology (the Financial Accounts do not refer explicitly to voluntary pension schemes). An important difference is, however, caused by the valuation of the data. Data on life insurance, annuities and pension funds in the Financial Accounts are typically based on actuary information about technical reserves reported by insurance corporations or pension funds and reflect the net present value of the contract. In the HFCS the value of accounts is measured as the current value, i.e. "how much they are worth at the moment", which could be either an amount similar to the present value or a current (and lower) early liquidation value of the insurance contract (deducting a surrender charge). A rigorous assessment of this would, however, require further information on the national questionnaires and the value that is typically reported by households.

Of the remaining Financial Accounts instruments, data on currency and other accounts payable are not collected in the HFCS, while occupational pension wealth, financial derivatives and employee stock options and other accounts receivable have low conceptual coverage. The HFCS collects data on the item "managed accounts", for which there is no corresponding instrument in the Financial Accounts. The assets and liabilities of managed accounts are recorded in the corresponding Financial Accounts asset types.

Box 1

How to improve the coverage and comparability of pension wealth

The lack of comparability and coverage of data on household wealth in pensions has been identified as a significant shortcoming in the way that the macro-micro comparison is currently carried out. This box discusses how coverage and comparability can be improved.

Data collection in a household survey is restricted by the feasibility of collecting data on items whose values can be reported by respondents. In the case of pension plans without an account balance, respondents might know how many years they have contributed for, and what they might expect to receive under the current rules of the plans after terminating work, but the present value of this entitlement may be determined only through additional estimation methods that are not carried out during the production of HFCS statistics.

Pension plans can be divided into defined contribution schemes, defined benefit schemes (DBSs), and hybrid schemes (i.e. those that have characteristics of the two). For DBS's in particular, it may be difficult for households to provide a present value of future pension payments in a survey, since they usually do not have an account balance. In the Financial Accounts the value of DBS's is the actuarial value which is based on the insurance companies' and pension funds' balance sheet data. These data are, in turn, typically based on the undertaking's data compiled for supervisory reporting purposes. Here, the ESA requires the inclusion not only of the net present value of future benefits less premiums, but also of the reserve for bonuses and the so-called equalisation reserve to cover unexpected losses (see also ESA 16.44). While the internal consistency of the Financial Accounts requires that the liabilities/reserves of one sector have to be the assets/claims of another sector, these amounts exceed the amounts that the individual household may consider as its personal "account".

Four countries (Austria, Belgium, France and Slovakia) indicated that they include some DBSs in the HFCS data on occupational pension wealth. Other countries either reported that DBSs do not exist or that they did not know whether there were DBSs which had an account balance. As regards the Financial Accounts, 12 countries indicated that they also include DBSs in National Accounts pension entitlements (F.63). Ten of these 12 countries are able to distinguish DBSs from other pension entitlements. Moreover, as of the end of 2017, a new ESA transmission table has provided comparable data on social insurance pensions (and will continue to do so every three years).

In addition to the value of pension plans that have an account balance, the HFCS collects information that allows the current value of pension funds without an account balance to be estimated. This information includes the number of years for which contributions have been made to the pension schemes, the expected age at which pensions will be collected and the amount of the pension payment flows. For public pension plans, these are part of the core questionnaire data collected in all or most countries. For occupational and private pension plans, these details belong to the non-core part of the questionnaire and are collected in a few individual countries. In the third wave of the HFCS, more information on all types of pension plans (e.g. number of years for which contributions have been made) has been collected in all countries as core variables.

Three countries (France, Italy and the Netherlands) in the first HFCS wave and four countries (the same three plus Finland) in the second HFCS wave indicated that they collect data – either as part of the HFCS or as part of some other survey – on pension plans for persons that are already receiving benefits. Furthermore, because of its high significance at national level, the Netherlands and Finland

provide estimates of the value of occupational pension plans without an account balance for the second wave of the HFCS.

In the Financial Accounts, the main delineation criteria between social security pension plans (which are not covered) and other employment related pension schemes (which are covered) is whether the government is controlling the pension plan beyond its role as a supervisory body or employer, i.e. whether the government can change the conditions of the pension plan such as the retirement age or the level of the pension.

In a survey, the respondent may not be aware of whether the government controls the pension plans he/she is participating in. In the national HFCS, the names of pension plans are often collected. In the EG-LMM questionnaire, it was asked whether government-controlled pension schemes were included in the data collection of the HFCS on occupational pensions. For the second wave, seven HFCS countries answered “yes”, 11 countries “no”. Others indicated that the government decisions can affect all pension systems, i.e. all the pension systems are subject to pension laws, but this does not necessarily mean that these pension schemes are “controlled by the government”.

To conclude, there are large cross-country differences in the structures of occupational pensions, which also complicates the comparable measurement of pensions in surveys and the Financial Accounts. The main coverage criteria differ (accounting balance versus non-social security); in addition the survey leaves some flexibility as regards the coverage of different pension forms. Different terminology complicates the bridging further. Additional work could be carried out in the following three areas to establish better bridging and better coverage of pension wealth.

1. To correctly understand the collection of occupational pension wealth data in the HFCS, more detailed country-level information on different pension schemes is needed, e.g. whether DBSs can have an account balance, in other words whether the terms “defined contribution scheme” and “with an account balance” are synonyms.

2. In addition, various methods using survey data and/or external data sources could be used to estimate the values of occupational pension wealth for plans that do not have an account and for individuals that are already receiving pension benefits. Experiences from the Netherlands and Finland may be useful in developing such methodologies;

3. New and completed data on pension entitlements in the Financial Accounts (ESA Table 29) were released at the end of 2017 and may be used to improve the completeness of the bridging for pensions.

Conversely, for the HFCS concepts of business wealth and housing wealth, it was not possible to link the two sets of statistics directly, and additional steps were required, as described in Sections 3.2 and 3.3.

3.2 Matching the HFCS concept of business wealth with National Accounts

As mentioned above, the EG-LMM has taken steps to link the HFCS concept of business wealth with National Accounts instruments. In addition, this section also covers some of the work carried out on non-financial assets, to the extent that the work involved the identification, and in some cases collection and/or estimation, of National Accounts data on non-financial assets comparable with the HFCS concept of business wealth, i.e. non-financial assets excluding housing wealth.

Splitting the HFCS business wealth concept into National Accounts instruments

In the HFCS, wealth from private businesses is split into self-employment and non-self-employment business wealth. Self-employment businesses are defined as businesses in which a household member is either self-employed or has an active role in running the business. These businesses can be either sole proprietorships, independent professionals, partnerships or limited liability companies in which self-employed household members are actively participating. Non-self-employment business wealth refers to passive investment only.

In the Financial Accounts, there is no "business wealth" concept. If a household runs a business, either the business is recognised (according to certain criteria) as a corporation or so-called quasi-corporation, or it is not, and the household is simply regarded as a "producer household".

- In the first case, the assets identified as business wealth in the HFCS would be recorded under "F.512 Unlisted shares" or "F.519 Other equity", which represent the market value of unlisted shares and other equity held by households in corporations and quasi-corporations.
- In the second case, the assets identified as business wealth in the HFCS would be shown in the Financial Accounts as financial and non-financial assets of households, not distinguishable from "non-business" assets and liabilities. A further difference is that the Financial Accounts record these in gross terms on both sides of the balance sheet, while the underlying concept of the HFCS is to record the expected value of the business if it is sold (i.e. a net value).

To maximise the conceptual comparability of business-related assets and liabilities, the first step is therefore to separate assets included in self-employed business wealth in the HFCS which correspond to the Financial Accounts aggregated item "unlisted shares and other equity". This is conducted in two steps. First, based on information available in the HFCS, all legal forms other than sole proprietors and partnerships are assumed to issue F.512 and/or F.519. These enterprises are incorporated businesses and recognised as such in the Financial Accounts, so that, as explained above, their assets are recorded on the Financial Accounts balance sheets of the corporation sector, and their equity is recorded as unlisted shares or other equity (as a liability of

the corporation sector and an asset of the household sector). Second, for unincorporated businesses (i.e. referring to the HFCS legal forms other than "sole proprietor" and "partnership"), country-specific criteria are applied to make a distinction between those regarded in the Financial Accounts as "producer households" and those treated as "quasi-corporations", as explained above.

In National Accounts practice, and depending on the legal setting and available data sources, countries apply different practical borderlines between producer households and quasi-corporations. In November 2014, Eurostat's National Accounts Working Group approved several "decision trees" which are meant to assist non-financial accounts compilers in approximating this sector delineation. In addition, information on the recording of business assets was collected in an EG-LMM questionnaire in June 2016.

These steps allow for a comprehensive reclassification of HFCS self-employment business wealth into unlisted shares and other equity and into other Financial Accounts instruments. A bridging table assessing the correspondence between HFCS business wealth and National Accounts instruments for most EU countries is shown below.

Table 1

Bridging table for National Accounts instruments and HFCS business wealth

NA item	HFCS item	HFCS details	Countries
F.512 Unlisted shares + F.519 Other equity	DA2104 Non-self-employment private businesses		All
	DA1140 Self-employment business wealth	If legal form not sole proprietor or partnership	All
		Additionally, if legal form partnership	BE, EE, ES, LT, LV, HU, PT, SI
		Additionally, if legal form partnership, or legal form sole proprietor and number of employees above threshold (in brackets)	AT (50), IT (5), FI (2), IE (10), PL (10)
Other financial instruments and non-financial assets	DA1140 Self-employment business wealth	If legal form sole proprietor or partnership	CY, DE, FR, LU, NL, GR, SK
		If legal form sole proprietor	BE, EE, ES, LT, LV, HU, PT, SI
		If legal form sole proprietor and number of employees below threshold (in brackets)	AT (50), IT (5), FI (2), IE (10), PL (10)
		Classification criteria for sole proprietors and partnerships not available	HR, MT

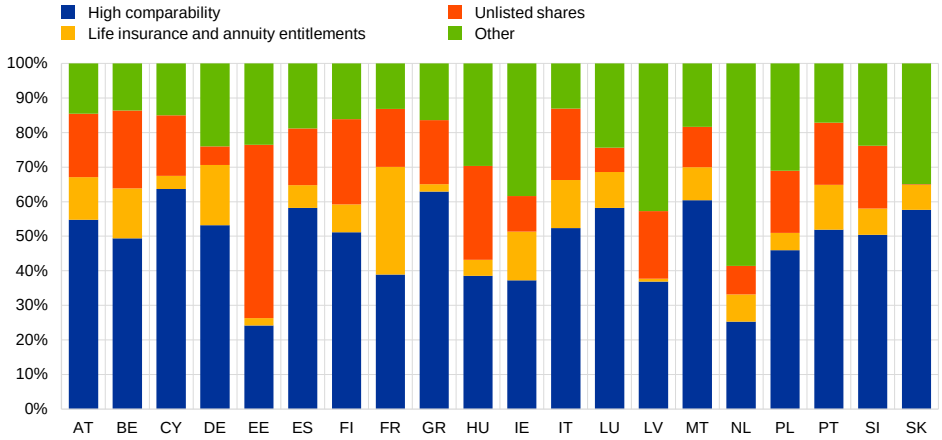
The following National Accounts instruments had previously been assessed as having high comparability: deposits, debt securities, loans, listed shares and mutual fund shares. Allowing a coherent macro-micro comparison between Financial Accounts unlisted shares and other equity on the one hand, and HFCS business assets on the other, increases the scope of the distributional analysis significantly.

Chart 1 distributes the instruments included in Financial Accounts (gross) financial wealth by their conceptual comparability with HFCS assets. The blue bar indicates the share of Financial Accounts instruments with high comparability to related HFCS components. The red and green bars show 2 items with medium comparability, i.e. the

Financial Accounts instrument “F.62 Life insurance and annuity entitlements” corresponding to the HFCS item “voluntary pensions” (red bar) and the Financial Accounts item “F.512+F.519 Unlisted shares and other equity” related to the HFCS item “business wealth” (green bar). After adding up these items with high and medium conceptual comparability, the macro-micro comparison covers more than three-quarters of the Financial Accounts balance sheets in most euro area countries.

Chart 1

Proportion of Financial Accounts financial wealth which can be compared with HFCS results



Having achieved a relatively coherent comparison between HFCS assets corresponding to the Financial Accounts items unlisted shares and other equity, the next step should be to match the HFCS self-employment business wealth with the financial assets and non-financial assets in the balance sheets of sole proprietors and partnerships in the Financial Accounts. However, the breakdown into non-financial and financial assets is not available from the HFCS.

The EG-LMM also concluded that the comparability between the HFCS and the National Accounts could be further improved in the future with respect to the following two aspects.

First, as described above, the HFCS data do not include information on how to classify the remaining part of self-employment business wealth into various Financial Accounts instruments and non-financial assets. The EG-LMM has therefore included all self-employment business assets of producer households recorded in the HFCS in the non-financial wealth of households until better information becomes available. This assumption may be justified by the fact that small businesses typically do not have high levels of financial assets, but mostly own machines, transport vehicles or buildings used for their business.

Second, the EG-LMM has proposed splitting the HFCS category “sole proprietor” into “incorporated” and “unincorporated” sole proprietors. This change will be implemented in the 2020 wave of the HFCS and will improve the sector delineation. In the

macro-micro comparison, the net assets of incorporated sole proprietors would be recorded as unlisted shares and other equity held by households.

In addition to these two areas of potential improvement, the EG-LMM concluded that a remaining general limitation on comparability is the fact that the HFCS collects the net value of self-employment businesses, while the Financial Accounts record assets and liabilities separately on a gross basis. There is, however, a certain heterogeneity as to how exactly the net recording is implemented in the national versions of the HFCS, and the actual impact of this factor at country level could not be fully clarified.

Identification in National Accounts of non-financial assets comparable with HFCS business wealth

As explained above, the household sector in the National Accounts includes households running businesses not recognised as corporations or quasi-corporations. In order to improve the link with the HFCS, a distinction needs to be made between housing wealth (collected as a separate asset in the HFCS) and other non-financial assets. The relevant instrument in the National Accounts is "produced non-financial assets", which is made up of three components, namely: (i) dwellings; (ii) inventories; and (iii) land. To be able to link HFCS with these National Accounts data, efforts are needed to solve two practical difficulties, namely incomplete National Accounts data on non-financial assets (covered by the ESA transmission programme) in many countries and limited availability of data on "land underlying dwellings" (not covered by the ESA transmission programme). It is useful to be able to distinguish between land that is part of housing wealth and land that is mostly used for business purposes (e.g. agricultural land).

The EG-LMM identified available data sources on the various components of non-financial assets and produced estimates of the split between "housing wealth" and "other non-financial assets", the latter being part of the HFCS concept of non-financial business wealth. The main challenge with these tasks has been estimating housing wealth; this is explained in detail in Section 3.3.

Table 2 summarises the current data availability of the National Accounts components of "non-financial assets". Three approaches can be used to distinguish non-financial business wealth (while countries may have more detailed data available to improve the linking).

- Method N1: According to this method, "non-financial business wealth" is equal to the sum of fixed assets excluding dwellings, plus land not underlying dwellings, plus inventories. This is the most correct estimation, although it includes assets of non-profit institutions serving households (NPISHs).
- Method N2: If the country provides all the required ESA transmission programme data but no separate data for land underlying dwellings, "non-financial business wealth" is estimated as the sum of fixed assets minus dwellings and inventories. This estimate does not include land used for production purposes (e.g. that of sole proprietor farmers). NPISHs are included as in method N1.

- Method N3: If the country provides only fixed assets and dwellings, “non-financial business wealth” is the difference between these two items. In contrast to method N2, inventories are not included, though this is generally a very small item in the National Accounts (less than 2% of produced non-financial assets in many countries).

Table 2

Methods of estimating “non-financial business wealth” from National Accounts sources

	Method	Land not underlying dwellings	Inventories	Fixed assets – dwellings
Belgium	N1	X	X	X
Germany	N1	X		X
Estonia	N2		X	X
Ireland	None			
Greece	N2		X	X
Spain	None			
France	N1	X	X	X
Italy	N1	X	x	X
Cyprus	N3			X
Latvia	N2		X	X
Luxembourg	N3			X
Hungary	N2		X	X
Malta	None			
Netherlands	N1	X	x	X
Austria	N3			X
Poland	N2		X	X
Portugal	N1	X	X	X
Slovenia	N2		X	X
Slovakia	N2		X	X
Finland	N1	X	X	X

Note: “Land not underlying dwellings” in the table refers to the difference between total land and land underlying dwellings. The “X” indicates that these data are available.

3.3 Matching the HFCS concept of housing wealth with National Accounts

The ESA transmission programme does not contain a variable on housing wealth. However, such data can be derived by adding up dwellings and land underlying dwellings. There are three issues that make the comparison difficult: (i) in the ESA transmission programme, NPISHs are included; (ii) data underlying dwellings are often not separated from other land; and (iii) National Accounts data on non-financial assets do not include housing wealth abroad, i.e. mainly holiday homes which are abroad, but instead these are recorded under “other equity” held by households. Conversely, in the HFCS, NPISHs are excluded, land underlying dwellings and other land are separated, and holiday homes abroad are included in the concept of housing wealth.

In addition, even though the National Accounts data became obligatory as a part of the transmission programme at the end of 2017, there are still some country-specific derogations in place (ending at the latest in 2020).

To derive best estimates of housing wealth, land data reported in the ESA transmission programme had to be complemented either by national data sources on housing wealth or by available national data on land underlying dwellings. Once housing wealth is estimated, the rest of the non-financial assets are assumed to be self-employed non-financial assets, as described in the second part of Section 3.2.

Table 3 shows the components that are available for deriving National Accounts-based estimates of housing wealth. For seven countries, information on dwellings and land underlying dwellings can be combined to derive a good estimate of housing wealth (although it covers NPISHs): these are the countries for which "method N1" was used to assess non-financial business wealth. In Table 3 this approach is described as "method H1". For a further six countries, described as using "method H2" in Table 3, all land (along with dwellings) needs to be included to derive housing wealth. Finally, for the last seven countries, no estimate for National Accounts housing wealth can be derived, as data on either dwellings or land, or both, are missing: this is described as "method H3" (where dwellings are available) or "none" (where dwellings are not available). As mentioned above, by 2020 the situation is expected to improve, as data on "total land" and on "dwellings" are to be transmitted to Eurostat.

Table 3

Estimates of housing wealth from National Accounts sources

	Method	Land underlying dwellings	Total land	Dwellings
Belgium	H1	X		X
Germany	H1	X		X
Estonia	H2		X	X
Ireland	None		X	
Greece	H3			X
Spain	None			
France	H1	X		X
Italy	H1	X		X
Cyprus	H3			X
Latvia	H3			X
Luxembourg	H2		X	X
Hungary	H3			X
Malta	H3			X
Netherlands	H1	X		X
Austria	H2		X	X
Poland	H2		X	X
Portugal	H1	X		X
Slovenia	H2		X	X
Slovakia	H2		X	X
Finland	H1	X		X

Note: all the data for Ireland are confidential except for those relating to land. Therefore, no housing estimate is calculated for Ireland. The "X" indicates that these data are available.

3.4 Breakdowns of liabilities from monetary financial institutions' balance sheet statistics

Although conceptually comparable, households' liabilities in the Financial Accounts and the HFCS can only be compared at a very aggregated level, i.e. for total liabilities. However, statistics on monetary financial institutions' (MFI) balance sheet items (MFI BSI statistics) provide more detailed breakdowns of loans granted to households at the macro level.[4] In these statistics, households' liabilities are reported separately for housing loans, consumption loans and other loans. In addition, other loans granted to sole proprietors and partnerships without legal status can be identified separately for most euro area countries. The separation of housing loans from non-housing loans in particular is very useful for the macro-micro comparison, since housing loans are generally more accurately reported in survey data than non-housing loans, and the distribution of housing loans across different household groups is very different from the distribution of non-housing loans. The aggregate levels of liabilities in MFI BSI statistics are coherent with the Financial Accounts data, making it a useful data source to further improve the macro-micro linkage.

In practice, the Financial Accounts figure on total liabilities can be multiplied by the share of housing loans of all households' liabilities in a country, as reported in the MFI BSI statistics. This aggregate can be considered conceptually comparable to the HFCS concept of housing loans. Similarly, Financial Accounts total liabilities multiplied by the share of non-housing loans, as reported in the MFI BSI statistics, is comparable with the HFCS concept non-housing loans. The HFCS variables on mortgages and non-mortgage loans cannot be applied as such, since mortgages are defined as loans collateralised by real estate, while housing loans are defined as loans taken out to purchase real estate. However, the HFCS collects information on the purpose of loans that can be used to identify housing and non-housing loans. This new split was agreed by the EG-LMM and should be applied to the results in future work on Distributional Financial Accounts.

The EG-LMM also discussed the possibility of using information on sole proprietor loans to further improve the macro-micro linkage. However, since the assets of sole proprietors are only collected as net of liabilities in the HFCS, improving the linkage is not straightforward. Consequently, using information on sole proprietor loans has been left for future consideration (see Chapter 7).

3.5 New wealth concept

The EG-LMM initially concentrated on items that are conceptually comparable between macro and micro data sources. However, the wealth concepts have been gradually expanded to cover as much of the total household balance sheets as feasible. For this report, three different wealth concepts have been developed, which are summarised in Table 4 below.

[4] Regulation (EU) No 1071/2013 of the ECB of 24 September 2013 concerning the balance sheet of the monetary financial institutions sector (recast) (ECB/2013/33), OJ L 297, 7.11.2013, p. 1.

The narrow adjusted financial wealth concept A includes only items that have high conceptual comparability. These include deposits, debt securities, loans, listed shares and investment fund shares on the assets side, and all liabilities of households. The adjusted financial wealth concept B includes, in addition to the items included in the narrow concept, financial wealth items that have medium conceptual comparability. Additional items in this concept include life insurance and annuity entitlements, as well as unlisted shares and other equity. Concept B includes most of total financial wealth as defined by the Financial Accounts, excluding currency, financial derivatives, other accounts receivable and all instruments in the "insurance, pension and standardised guarantee schemes" category except life insurance and annuity entitlements. These instruments are not collected comprehensively or do not have comparable definitions in the HFCS.

The most comprehensive wealth concept is the adjusted broad wealth concept C that also includes non-financial assets, as defined in Section 3.3. While there are some conceptual differences between macro and micro statistics as regards the collection of data on non-financial wealth, the inclusion of non-financial wealth significantly increases the scope of this exercise. In survey data, real assets account for more than 80% of household wealth.

Table 4

Wealth concepts

ESA 2010 code	NA instrument	HFCS variable(s)	HFCS Wave 2 variable and details	Conceptual comparability
Narrow financial wealth concept A				
Assets				
F.22	Transferable deposits	DA21011	Sight accounts	HIGH
F.29	Other deposits	DA21012	Savings accounts	HIGH
F.3	Debt securities	DA2103	Bonds	HIGH
F.4	Loans	DA2107	Amount owed to household	HIGH
F.511	Listed shares	DA2105	Publicly traded shares	HIGH
F.52	Investment fund shares	DA2102	Mutual fund shares	HIGH
Liabilities				
F.4	Loans Housing loans: F.4 multiplied by the share of housing loans in MFI BSI statistics	Part of DL1000	HFCS loans taken out for the purpose of purchasing the household main residence or to refurbish and renovate the residence.	HIGH
F.4	Loans Non-housing loans: F.4 multiplied by the share of non-housing loans in MFI BSI statistics	Part of DL1000	HFCS loans taken out for any purpose other than to purchase the household main residence or to refurbish and renovate the residence.	HIGH
Adjusted financial wealth concept B (in addition to concept A)				
Assets				
F.512 + F.519	Unlisted shares + Other equity	DA2104 + Part of DA1200	Non-self-employment not publicly traded businesses + value of self-employment businesses, depending on legal form of business and number of employees. Delineation rules vary across countries; see Section 3.2.1.	MEDIUM
F.62	Life insurance and annuity entitlements	DA2109	Voluntary pension/whole life insurance schemes	MEDIUM
Adjusted broad wealth concept C (in addition to concept B)				
Assets				
AN.111 + AN.2111	Dwellings + Land underlying buildings and structures	DA1110 + DA1120	Household main residence + Other real estate properties	MEDIUM
(AN.11 – AN.111) + AN.12 + (AN.2 – AN.2111)	(Fixed assets – Dwellings) + Inventories + (Non-produced non-financial assets – Land underlying buildings and structures)	Part of DA1200	Value of self-employment businesses, depending on legal form of business and number of employees. Delineation rules vary across countries; see Section 3.2.1.	MEDIUM

The HFCS/NA coverage ratios of each adjusted wealth concept are shown in Chart 2. In the calculation of all concepts, both the denominator and the numerator include the items shown in Table 4 for the HFCS and National Accounts respectively.

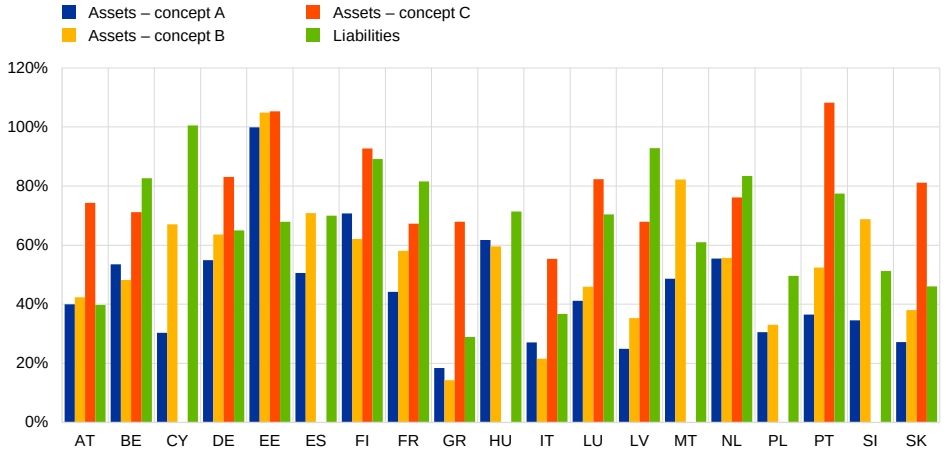
The resulting HFCS/NA coverage ratios may be summarised as follows: by expanding the instrument coverage, the coverage ratios increase for most countries. The biggest effect is observed when including housing wealth. This reflects the fact that the HFCS/NA coverage ratio for housing is typically higher than for financial instruments. In some cases, the concept including housing wealth shows coverage higher than 100% (albeit based on broad estimates on the National Accounts side for certain countries).

The coverage of concepts A and B, which cover only financial instruments, is below 75% for the largest countries (and below 30% for Italy), and lower than 50% for a number of smaller-sized countries. In most cases, the HFCS/NA ratios are smaller for the narrow concept A than for the broader concept B, though this does not necessarily indicate better data quality. In the case of business wealth particularly, a larger coverage ratio may reflect uncertainties in the instrument allocation when matching HFCS to National Accounts. For some countries, the HFCS/NA coverage ratio of business wealth versus unlisted shares and other equity is larger than 100%, possibly implying that the HFCS value includes assets not recorded under unlisted shares and other equity in National Accounts. However, the impact of this outcome on the results is generally small (1% to 4% of financial assets for the large countries).

Chart 2

Coverage of National Accounts by HFCS

(HFCS as % of NA)[5]



[5] Concept C could not be computed for Cyprus, Spain, Hungary, Malta and Slovenia, as data on land were not published. For technical reasons concept C could not be computed for Poland.

4 Methodology for bridging the gap

4.1 Methods for integrating macro and micro sources: a review of the relevant literature

This section provides an overview of the methods that could be used to adjust survey data for differential non-response at the top of wealth distribution and for under-reporting behaviour. The final adjusted dataset produces estimates that are in line with the National Accounts totals. In all cases it is assumed that the methods are employed after all possible statistical adjustments have been applied – i.e. after the best possible alignment of definitions and categories in the HFCS and Financial Accounts has been achieved.

Let t_y be the population total for variable of interest $y = (y_1, \ldots, y_N)$ to be estimated using survey data of N participants. A classical estimator is the Horvitz-Thompson one:

$$t_y^{HT} = \sum_{i=1}^{N} w_i y_i$$

where w_i is the sampling weight for the i–th household.

If both micro and macro data were perfect, t_y^{HT} should be equal to t_y, the corresponding macro aggregate. In practice, however, this is seldom the case. In fact, because of non-response and under-reporting, the value of the aggregated micro data is generally below the macro aggregates. The methods that can be used to adjust survey data to fill such a gap can be grouped into two broad categories.

The first one is the design-based approach, which is aimed at correcting survey data by modifying the sampling weights w_i through reweighting methods while keeping the individual responses y_i unchanged (Deville and Särndal, 1992; Särndal, 2007). In the literature, this approach is mainly used: (i) to force consistency of certain survey estimates to known population quantities, (ii) to reduce non-sampling errors such as non-response errors and coverage errors; and (iii) to improve the precision of estimates (Haziza and Beaumont, 2017). To address the problem of non-response, the sample selection is implemented as a two-phase process. In the first phase, a "theoretical" sample is selected. In the subsequent phase, the sample of respondents actually interviewed is treated as the result of a second stage of sampling. Each unit in the population has a certain probability of participating in this second phase, which can be estimated in various ways and then used to adjust the sampling weights and construct estimators with better asymptotic properties.

The second, model-based approach is aimed at adjusting the individual responses collected through the survey y_i while sampling weights w_i are left unchanged. It requires a model for the distribution of the measurement error and auxiliary information to estimate the parameters of the model. Among the several models available in the literature, those most suitable for our purposes are imputation

methods. For a general description, see the seminal work of Rubin (1978, 1987). These methods can be used both for the problem of under-reporting and for the problem of non-response (a relevant example is the use of the Pareto distribution; see Vermeulen, 2018).

The two approaches have some shared traits, so that the distinction is not always clear-cut. For example, the weighting adjustment can also be seen as a method of imputation consisting in compensating for the missing responses by using the respondents with the most similar characteristics; in the same way, the imputation of plausible estimates in lieu of respondents' claimed values can be thought of as a reweighting method.

However, it should be borne in mind that the choice of the method of adjustment is basically driven by three factors. First, it depends on the estimator of interest. For example, if the interest is to estimate the share of total wealth held by rich households, the use of the Pareto method could be sufficient. Second, the choice depends on the magnitude of the gap to fill. If the gap is considerable, it may be desirable to combine different methods. Finally, the choice depends on the information that is available. If, for example, the only available auxiliary information is in the form of population totals, the design-based approach might be the only one feasible; but if auxiliary data are available at the individual level, then the model-based methods may represent the most effective solution.

4.2 Reweighting methods

In the design-based approach, the calibration method for estimating the population total t_y^{REW} is computed as follows:

$$t_y^{REW} = \sum_{i=1}^{N} w_i^* y_i \qquad w_i^* = w_i a_i$$

The adjustment factor a_i is a function of the variables used in calibration of the constraints $\boldsymbol{z_i} = (z_{i1}, \ldots, z_{ik})$ and it is computed so that final weights meet benchmark constraints,

$$\sum_{i=1}^{N} w_i^* z_i = \boldsymbol{t}_z$$

while, at the same time, being kept as close as possible to the initial ones. Benchmark constraints are defined with respect to $\boldsymbol{t}_z = (t_{z1}, \ldots, t_{zk})$, that is the known vector of population totals or counts of the calibration variables. The final output is a single new set of weights to be used for all variables. The magnitude of the adjustment factors and, therefore, the variability of the final set of weights is a function of the number of constraints (dimension of the vector $\boldsymbol{z_i}$) and the imbalance (difference between the Horvitz-Thompson estimate and the population total). A high variability of weights hinder the quality of final estimates for sub-populations and for variables not involved in the calibration procedure. For these reasons, weights are usually required to meet range restrictions such as to be positive and/or within a chosen range.

The method was originally developed to improve the efficiency of the estimators and to ensure coherence with population information, but then it was also largely applied to adjust for non-response (Särndal and Lundström, 2005). For example, Little and Vartivarian (2005) show that if the variables used to construct the weights are associated both with non-participation and with the variable of interest, the bias and the variance of the estimator are reduced.

Calibration is a model-assisted procedure, and the model implicitly assumed by the procedure is essentially a linear regression between z and y. The procedure does not require an explicit modelling of non-response or measurement error: this is implied by the choice of the calibration variables and the functional form chosen for the adjustment factor a_i. The latter can be interpreted as an estimate of the inverse of the response probability of unit i. The vector of auxiliary variables used in calibration usually refers to socio-demographic characteristics but could also include variables relating to households' income or wealth such as the amount of deposits or housing wealth. When using auxiliary information on household wealth, the implicit adjustment model tends to increase the weight of richer households since this is the most effective way to meet benchmark constraints without modifying the initial weights too much. So, in a sense, the gap, when positive, is allocated more than proportionally to rich households. A negative gap would be allocated more to poor households.

The main problem with the use of household balance sheet data in reweighting methods is that wealth is generally very skewed and concentrated in the hands of a small group of the population that has both low propensity to participate in the survey and different socio-demographic characteristics from the average population. As a consequence, calibration may produce a very variable final set of weights or, in some instances, may fail to find a set of weights that meets all the constraints (benchmarks and range restrictions). One interesting generalisation of the method that addresses this issue is ridge calibration (Rao and Singh, 1997; Beaumont and Bocci, 2008; Montanari and Ranalli, 2009).

In classical calibration, benchmark constraints are met exactly, that is

$$\left(\sum_{i=1}^{N} w_i^* z_i\right) - \boldsymbol{t}_z = 0$$

In ridge calibration, by contrast, constraints are relaxed in order to reduce weight variability and/or meet range restrictions. In particular,

$$\left|\left(\sum_{i=1}^{N} w_i^* z_i\right) - \boldsymbol{t}_z\right| \leq \mathrm{diag}(\boldsymbol{\tau})\boldsymbol{t}_z$$

where $\boldsymbol{\tau} = (\tau_1, \ldots, \tau_k)^T$ is a vector of tolerances[6], one for each benchmark constraint. Tolerances can take positive or negative values. Clearly, the benchmark is met exactly if the corresponding value of the tolerance is equal to 0. This method could be used to

[6] The tolerance is the remaining gap between micro and macro estimates resulting after the adjustment process is carried out. A value of the tolerance equal to 0 means that the adjusted survey-based estimate should be exactly equal to the macro estimate. The higher the tolerance, the higher the discrepancy that one is willing to accept. The use of a positive tolerance could be useful when there are significant conceptual differences between the two sources and/or in case of a low reliability of the benchmark.

accept a discrepancy between micro and macro estimates that is due to conceptual differences and/or to a lower reliability of the benchmark.

In the case of weights adjustments, the internal consistencies between the variables are preserved by definition. This represents a definite advantage, especially for micro analysis. At the same time, a modification of the weights results in a modification of the final estimates for all surveyed variables and should therefore be carefully monitored.

4.3 Imputation methods

Imputation models have been widely used in the literature to adjust for non-response and measurement errors.

These methods, working at the level of the single observation, generally yield estimates with smaller variance than would be obtained by modifying the weights. Consider, for example, financial assets, which are heavily concentrated in the hands of a limited number of households and subject to significant under-reporting. This means that a part of the sample could be subject to very substantial weight adjustment, which could increase overall variability. Furthermore, in these cases it is not uncommon for weight calibration not to converge, as it fails to align the sample with both financial and socio-demographic external information. In addition, imputation models are more flexible than reweighting since they can be tailored on the basis of the variable to correct (and of the information available).

In this section, we describe three possible methods that could be used to deal with under-reporting: (i) the proportional adjustment method, (ii) the difference-type adjustment methods and (iii) the hurdle models.

The proportional adjustment procedure modifies sample values y_i by multiplying them by the inverse of the coverage ratio $CR = \frac{t_y^{HT}}{t_y}$, that is the ratio of the known macro aggregate to the total sample estimate.

$$t_y = \sum_{i=1}^{N} w_i y_i^* \qquad y_i^* = \frac{t_y}{t_y^{HT}} y_i$$

The adjustment procedure can be summarised in the following steps.

First, select the figures from National Accounts to be used as benchmark. One option is to limit the choice to the most comparable items (deposits, bonds, shares, mutual funds, financial debts and housing wealth). Second, compute coverage ratios for each of the chosen items. Third, compute an average coverage ratio (weighted average across instruments using the portfolio composition as weights). Fourth, use the coverage ratios for adjusting the amounts collected in the survey (y_i). Fifth, adjust income flows accordingly, in order to allocate households over the adjusted income classes.

This method is based on the assumption that under-reporting only depends on the type of instrument (y_i) but not on respondents' characteristics. Indeed, for all

households the under-reporting is assumed to be equal to a constant fraction of the true amount. In addition, the method does not allow adjustments to be made for non-reporting, i.e. failure to report the ownership of an asset held by the household, as only the positive amounts are inflated.

This method has two main advantages: (i) it is easy to implement and (ii) it minimises the variance of estimators since it preserves the univariate distribution of the adjusted variables. However, when multiple wealth components are involved in the adjustment, the distribution of total wealth changes in a way that is difficult to predict ex ante.

The difference-type adjustment method modifies the amounts collected in the survey using the following model:

$$y_i^* = y_i + b_i\left(t_y - t_y^{HT}\right)$$

The difference with respect to proportional allocation is that the method allocates the difference between macro and micro estimate instead of the ratio $\frac{t_y}{t_y^{HT}}$. The b_i are households' specific parameters that may, for instance, reflect their propensity to provide reliable answers.

This method has two main advantages over proportional allocation. First, it allows differentiated allocation of under-reporting to households, whereas in the proportional adjustment the under-reporting is assumed to be equal across household groups. Second, this method allows non-reporting to be addressed. Even if the household reports a zero value ($y_i = 0$), as long as the coefficient b_i is different from zero, the household will be assigned part of the "missing wealth".

A third imputation approach that could be used is based on hurdle models. These models are founded on the idea that, for given instruments, some "zeros" are unreliable (non-reporting). The models therefore impute the assumed "true values" using the information provided by other similar respondents. The adjustment is based on the following steps.

- First, for each instrument, estimate the probability the i–th household owns it on the basis of some observable characteristics. Binomial models can be used to estimate this probability, and the covariate set can vary across countries, depending on the determinants of non-reporting behaviour.
- Second, for some "zeros", impute the ownership by a random experiment, i.e. where the reported zero is detected as unreliable, given the predicted probability of reporting for the individual household. If some external information such as the number of households holding a given financial instrument is available, this can be used in the imputation process.
- Third, once new ownerships are created, impute the value of the amount held.
- Finally, compute the new sample estimate of the total and redistribute the (eventual) remaining gap using, for instance, the proportional adjustment method or calibration.

Imputation methods may be very useful when auxiliary data at the individual level are available. They allow for explicit modelling, for both non-reporting and under-reporting behaviours.

4.4 Top tail adjustments of survey-implied wealth distributions: Pareto models

In this section, we provide an overview of adjustments to compensate for the fact that surveys may under-represent very rich households (those at the top tail of the wealth distribution) and discuss ways these methods can be used to improve survey data from the HFCS.

A relatively small number of missing billionaires can seriously affect distributional aspects of a wealth survey. Wealth distributions have always been characterised by their skewness, with few individuals at the top of the distribution holding most of the fortunes of an economy: most often, the sampling process is unable to capture those individuals whose wealth exceeds a certain threshold.

This could happen for a variety of reasons, including non-reporting, under-reporting or simply the low number of these households. What matters is that, when a survey is unable to record these observations in the tail, the entire distribution is affected. The HFCS, like many other wealth surveys, is not immune to this.

It is well known that these issues emerge when computing the Horvitz-Thompson estimator $\sum_{i=1}^{N} p_i w_i$(the summation of the product of weight p_i and wealth w_i for each individual household i) from the HFCS: indeed, the estimator will only cover a fraction of the total reflected in the Financial Accounts. Any attempt, however, to correct for these mismatches between the Financial Accounts and survey data without accounting for the missing top wealth is bound to generate biased figures.

Many researchers have focused on finding the "missing wealthy"[7], and most have relied on the Pareto distribution to do so. The Pareto distribution is a probability distribution based on power law. It was first created by the Italian economist Vilfredo Pareto in his studies on wealth distributions.

An overview of the literature making use of the Pareto is provided in Box 1. Essentially, these approaches assume that, over a certain wealth threshold (w_0), the empirical cumulative distribution of wealth is approximated by a power law, which can be expressed as:

$$P(W \leq w_i) = 1 - \left(\frac{w_0}{w_i}\right)^{\alpha}, \text{ for } w_i \geq w_0$$

where the parameter $\alpha \in \mathbb{R}_{\geq 0}$ indicates the shape of the tail. The rationale for this approximation by a power law is that wealth accumulation is thought to follow a random multiplicative process, leading to a "fat-tailed" distribution of wealth.

[7] See e.g. Vermeulen (2016), and Chakraborty and Waltl (2018).

With regard to the HFCS survey, the Pareto distribution has notably been used to produce figures for total wealth above the threshold (w_0), replacing the empirical tail. Vermeulen (2016) tested a number of methods for estimating the parameter α empirically, finding his "regression approach" to yield the most consistent results. He also found, along with many others, that the estimation process was more precise if some sort of upper bound was defined: the solution was to integrate information from the Forbes – or similar – "rich list" to anchor the very top of the distribution.

After a reliable approximation of the shape parameter α has been obtained, total wealth in the top tail of the survey can be re-estimated. This adjustment is usually performed by multiplying the sum of survey weights after the threshold w_0 by the mean of the Pareto distribution: the resulting figure gives the total amount of wealth for all households whose wealth exceeds w_0, and the new survey total is obtained by summing this value with the wealth at the bottom of the survey.

While yielding promising increases in the coverage between the HFCS survey and the Financial Accounts, these methods alone are unable to fill the remaining gap. These contributions rely on the implicit assumption that the HFCS adequately samples household wealth for the range of wealth before the distribution starts according to the Pareto power law. It may be recalled that, if observations are ranked in order of wealth, an unbiased estimate of the wealth of the lower part of the distribution will be provided by the Horvitz-Thompson estimator:

$$t_{W_b}^{HT} = \sum_{i=1}^{n} p_i \, w_i \quad \forall \; i = (1, \dots, n, w_0, \dots, N)$$

However, these approaches also assume that the sum of the weights of the top tail adequately estimates the number of households in the top tail. Should this be the case, top tail adjustments should only involve re-estimating the total amount of wealth at the top of the Pareto distribution, as e.g. Vermeulen (2018) and Chakraborty and Waltl (2018) have done. There are, however, reasons to move beyond this assumption, as survey weights are rarely calibrated on the basis of household wealth, and these approaches still leave a sizeable gap in the coverage between the HFCS and the Financial Accounts. For these reasons, top tail adjustments should focus not only at estimating top tail wealth, but also the number of households at the very top.

Furthermore, the integration of rich lists in household surveys has generated a number of concerns regarding the reliability of such a source of information. The methodology behind the compilation of said lists is often obscure, and often only net worth is provided, with no instrument breakdown being given. In contrast, generalised Pareto adjustments (recommended by Blanchet et al., 2017 and implemented in Chakraborty and Waltl, 2018; see explanations in Box 2) provide the advantage of relying on percentile totals obtained from external sources (administrative records such as tax data, as in the case of France), rather than relying on rich lists.

However, this is only possible when such information exists and is accessible for national central banks (NCBs) and national statistical institutes (NSIs), which is often not the case at present (see Chapter 5, Administrative sources).

Box 2

Pareto models and the HFCS: an overview

Measuring wealth distributions from survey data has two major advantages compared with the use of tax and register data. First, wealth surveys are specifically designed to capture all relevant components of wealth, including those not producing income flows or for which current market values are not readily available. In addition, the sampling strategy is designed to generate a weighting scheme that yields results representative of the (target) population.

Despite these advantages, the inability of voluntary wealth surveys to accurately capture the top of the distribution challenges the exclusive use of survey data (Vermeulen, 2016). There are two main reasons for this: first, the large concentration of wealth among just a few households and, second, the decreasing likelihood of rich households to participate in surveys.

The first of these two reasons is statistical: a strong concentration within a small sub-population requires a large number of observations from this part of the distribution to achieve a satisfactory degree of precision. Strategically oversampling rich households in a survey is well suited to addressing this issue. Indeed, most HFCS countries apply oversampling strategies, although these differ strongly in their implementation and effectiveness (HFCN, 2016a). As certain asset classes – in particular risky financial assets and non-owner-occupied properties – are heavily concentrated at the very top, reliable measurement of these components requires strategic sampling approaches. For instance, Kennickell (2008) reports that in the US Survey of Consumer Finances, roughly 90% of the households were captured by means of oversampling.

The second reason is related to differential response rates: even when a rich household is sampled, it is still less likely to be interviewed and hence to be included in the survey results (see Kennickell and Woodburn, 1999). This differential non-response introduces bias in both aggregate and distributional results. Increasing the sample size – the overall sample size or the specific sample size among the rich – does not correct this bias. Reweighting survey responses can adjust for the bias only if detailed information on the characteristics of non-responding households (and particularly some information on their wealth) is available.

Both issues, precision and bias, can be addressed by applying ex post adjustments to the survey, making use of additional auxiliary data describing the wealth or the share of total wealth held by the very rich.

Recently, several authors addressed this topic. All of them use Pareto adjustments to approximate the top tail of the wealth distribution, following Davies and Shorrocks (1999), who describe “two enduring features of the shape of the distribution of wealth. First, it is positively skewed […]. Second, the top tail is well approximated by a Pareto distribution”.

Vermeulen (2018) uses observations from the Forbes World’s Billionaires list, which he combines with top survey observations for nine HFCS countries (first wave), along with the United States and the United Kingdom, to estimate a Pareto model. The top of the empirical distribution implied by the survey is subsequently replaced by the estimated Pareto model. He points out that estimating a Pareto model from survey data alone is not suited to adjusting for the missing wealthy, but when including additional observations from rich lists, such an approach is able to address both issues, namely low precision and non-response bias.

Bach et al. (2018) follow Vermeulen's Pareto approach but use more comprehensive national rich lists for France, Germany and Spain to analyse the importance of the missing rich in the first and second wave of the HFCS. They find large changes in aggregates and the distribution, measured by wealth shares and standard inequality indicators.

While Bach et al. (2018) focus on micro data only, Vermeulen (2016), Chakraborty et al. (2018), Chakraborty and Waltl (2018) and Waltl (2019) benchmark survey results to the National Accounts. For most asset classes, the amounts reported in the National Accounts are (substantially) larger than the amounts reported in the survey. More specifically, Chakraborty et al. (2018) discuss conceptual and generic differences between survey and Financial Accounts data, based on the work of the EG-LMM. Additionally, they empirically compare Pareto-adjusted (making use of the Forbes list) and unadjusted survey-implied totals to macro aggregates. They do not consider a comprehensive measure of wealth but rely on several truncated definitions of financial wealth. They use the first wave of the HFCS and study Austria, Germany, France, Spain and Finland.

Chakraborty and Waltl (2018) use national rich lists together with the Pareto approach to adjust the second wave of the HFCS for Austria and Germany. Taking into account typical portfolio structures for wealthy households (which differ strongly from portfolio structures of households belonging to other parts of the distribution), they quantify the importance of the missing wealthy households for several components of wealth. Their study shows that the largest adjustments are for equity and mutual funds, while changes to deposits, liabilities and bonds are quite low. They demonstrate how such adjustments can be used to compile Distributional National Accounts.

Waltl (2019) uses data from the second wave of the HFCS for Austria, Finland, France, Germany and Spain, together with national rich lists. She analyses the impact of different oversampling techniques on the magnitude of changes in total wealth when applying top tail adjustments. She finds a large negative correlation between the quality of the oversampling strategy applied and the impact of top tail adjustment, and hence confirms concerns regarding cross-country comparability of HFCS data. Furthermore, she demonstrates how to extend the Pareto approach to include a generalised Pareto adjustment. Finally, she compares adjustments based on rich lists with those based on top wealth shares estimated from tax/register data, as well as leaked data from wealth stored in offshore tax havens as reported by Alstadsæter et al. (2018). Not surprisingly, she finds that using tax/register data yields lower adjustments than when additionally taking into account hidden wealth stored in offshore tax havens. Rich list adjustments lead to strikingly similar results as the top share adjustments including hidden wealth for Spain and France, the two countries for which such data are available. Finally, she compiles distributional accounts from top tail-adjusted HFCS data: adjusted wealth at the top is broken down to identify contributions from each wealth component; these contributions are then redistributed to the different "vertical groups", including wealth groups, income groups and different functions of wealth.

There are two important conclusions to be drawn from this stream of literature: first, the amount of missing wealth in surveys attributable to the top is large. Second, the distributional impact of the missing wealthy differs strongly across HFCS countries. The first observation implies that the degree of measured wealth inequality from the HFCS only constitutes a lower bound and that true wealth inequality is very probably higher in all countries. The second conclusion is that cross-country comparisons relying on unadjusted statistics are very likely to be hampered by differences in the survey implementation and, in particular, differences in applied oversampling strategies. A top tail adjustment is hence not only important to approximate the true distribution of wealth, but also for the sake of internationally comparable results.

Notwithstanding technical difficulties (broadly discussed in Bach et al., 2018, and Chakraborty and Waltl, 2018) and issues regarding the reliability of auxiliary data (particularly in the case of rich lists), the importance of the wealthiest of the wealthy for any overall measure of wealth, together with the substantial differences in their coverage across countries, undoubtedly calls for a top tail adjustment of survey-implied wealth distributions. Assessing and collecting auxiliary data that can be used to perform such an adjustment and developing objective decision criteria for the methodological implementation must therefore be prioritised in future work towards compiling distributional accounts.[8]

4.5 Towards a unified approach

Undersampling of the rich is generally the most tangible issue that wealth surveys suffer from. However, all surveys are also affected (albeit to varying degrees) by under-reporting and differential non-response at the tail of the wealth distribution. These considerations suggest that the use of a single adjustment may not be enough, and that, instead, several adjustments should be performed iteratively.

For the Pareto tail estimation, the threshold where the tail starts needs to be chosen, and the share of the population above that threshold needs to be estimated. If there were no under-reporting, this information could be based on the unadjusted survey data. Since this is not always the case, a preliminary adjustment for under-reporting may be necessary before applying the Pareto method. At the same time, in order to correct for the under-reporting behaviour in the rest of the wealth distribution, it is necessary to adjust the estimate of the share of total wealth held by the rich households.

To address these issues, it is also necessary to supply the Pareto model with external information in order to adjust the estimate for the share of total wealth held by the rich households. The estimated shape parameter of a Pareto curve is unaffected by the underlying number of observations constituting its empirical counterpart: if information on the number of households after the threshold is available, then the whole distribution can be corrected accordingly; otherwise, it can be estimated using survey weights and the Pareto shape parameter.

This leads to a methodology which iteratively estimates the Pareto while adjusting for measurement error across the wealth distribution. In its current form, this method relies on Financial Accounts totals and rich list imputation to iteratively reconstruct the missing wealth from the top. To achieve the best conceptual comparability, following on from the previous work of the EG-LMM, we adopt the wealth concept C, although the procedure can account for different instrument compositions.

The envisaged procedure, involving a simultaneous Pareto-calibration allocation, consists of the following steps.

[8] For example, some EG-LMM members have suggested using income as an auxiliary variable.

Step (1): Select instrument benchmarks from the National Accounts. Generally, the wealth concept C has been used, but other approaches may be tested.

Step (2): Taking the size of the gap into account, as well as any other available information on the quality of the HFCS and National Accounts data, perform an adjustment for under-reporting using hurdle methods. Conversely, if no under-reporting is assumed, skip to step (3).

Step (3): Choose the threshold where the tail starts (w_0), i.e. the segment of the distribution of (unknown) population whose wealth distribution is assumed to be Pareto distributed. This choice is discretionary. In their study, Vermeulen (2018) and Waltl (2018) set this threshold at €1 million, but a number of alternative approaches can be considered. Automatic threshold selection can be achieved by finding the lowest threshold w_0^* above which the Mean Excess Function $E[w_i - w_0 \,|w_i > w_0]$ increases linearly with w_0.

Step (4): Estimate the shape parameter of Pareto distribution for the richest households. To obtain a more precise estimate of the shape of the tail, extreme wealth observations from an external source (such as the Forbes World's Billionaires list), where available, are pooled with the survey data.

Step (5): Estimate the density of households with wealth above the threshold and rescale survey weights based on this information. This information could be available from an external source or could be estimated from the survey and rich lists. In the latter case, for any given value of w_i, compute the ratio between the Pareto density functions estimated with and without the rich list, and multiply survey weights by the resulting parameter; this process will achieve reweighting and ensure the conformity of the survey wealth distribution with the true wealth distribution.

Step (6): To obtain the true total number of rich households, divide the sum of survey weights at the top by the value of the Pareto cumulative distribution relative to the maximum recorded value of wealth in the survey w_{max}. The resulting parameter gives the implied number of households at the top (which we will call HHT), given the Financial Accounts total, to which top survey weights can again be rescaled. The weights of the bottom part of the distribution should be adjusted accordingly.

Step (7): To ensure consistency with demographic parameters, use calibration to readjust survey weights. Repeat steps 5 to 7 until the sum of the survey weights at the top equals the implied number of households estimated through the Pareto CDF (HHST) or until the differences between Pareto density functions estimated with and without the rich are minimised. Convergence is usually achieved in few iterations.

Step (8): Estimate for each financial asset and for liabilities the total amount held by rich households. This can be done using the ratio of real assets to gross wealth, the ratio of financial asset to wealth, and the ratio of liabilities to gross wealth computed in the adjusted survey data.

Step (9): For each asset and for liabilities, subtract the total amount held by rich households from the benchmark. This total is obtained by multiplying the Pareto mean by HHT and by the resulting Pareto-adjusted coverage ratio. This new benchmark

should then be used to allocate reported values relating to households below and above the threshold separately. This adjustment, which essentially aims to reflect (further) under-reporting by households while maintaining the distributional information from the Pareto, should be performed via one (or more) of the imputation or reweighting methods described in the previous sections (according to the information available); the standard approach involves the calibration method. If the calibration approach is selected, instruments with similar comparability should be calibrated together.

As a result of this process, the estimated total assets and liabilities will closely approximate the totals from the National Accounts. A measure of the adequacy of the adjustment will then be given by other indicators, such as the share of wealth of households in the top percentiles, or by instrument-specific coverage ratios (which can be estimated through bootstrapping). At the same time, the sum of weights is not increased, and all amendments are made on the original micro data observations, so that micro-level analysis can still be accomplished.

4.6 Preliminary results

Initial results have been produced for the first three methods, reflecting three scenarios:

- pure HFCS data;
- proportional allocation, which assumes under-reporting by all surveyed households to the HFCS and does not make any correction for very rich households;
- simultaneous Pareto-calibration allocation.

The last two methods lead to full allocation of National Accounts wealth to the households surveyed. In other words, they allow the gap between HFCS and National Accounts to be fully bridged, so that the resulting distributional data cover exactly the National Accounts (adjusted) wealth concepts chosen.

The estimates have been implemented on an experimental basis for four countries, namely France, Italy, Germany and Finland, as summarised in Table 5. Given that, owing to both reweighting and imputation, both methods affect the number of wealthy households, Table 5 also presents the number of households whose wealth exceeds the threshold of €1 million. In addition, estimates have been produced for the wealth of the top decile, which can be compared with World Wealth and Income Database (WID) estimates or administrative sources for some countries. To further assess the differences between the results produced by these methods, a comparison has been performed on: (i) key indicators such as the debt-to-asset ratio for the highest quintile and the Gini coefficient; and (ii) the overall wealth distribution (the latter is shown in Charts 3 and 4).

The table shows that, while the magnitude of the adjustment varies between countries, the proportional allocation method and the simultaneous Pareto-calibration allocation tend, as expected, to increase the number of wealthy households by comparable margins. The proportional allocation, however, tends to underestimate the top tail distributional implications of wealth owing to its lack of information on the top tail of the distribution. This implies that the more information on the top tail of the distribution is missing from the base survey, the more Gini coefficients and top 10% shares will increase after performing the simultaneous Pareto-calibration allocation.

In the case of France, findings from the World Inequality Database show results similar to our preliminary estimates: indeed, Garbinti, Goupille-Lebret and Piketty (2016) estimated that, in 2014, the top 10% of French households held 54.9% of the country's wealth, a figure not too distant from the estimates that we obtain after our process has reached convergence (58.0%). Finland's case is also particularly interesting: since, here, most information on wealth is sourced from tax and other income registers (which are also used for stratification during survey sampling), the base HFCS distribution should not suffer from under-reporting and non-reporting in the same way as other surveys: indeed, after reweighting the distribution with information on the missing wealth from the Pareto, the coverage ratio for Finland's assets comes close to 100%, so that no further calibration needs to be implemented on the asset side.

The results for Germany are strongly influenced by the fact that the housing wealth data collected in the HFCS covers 95% of the corresponding aggregates in the National Accounts, thus leading to a much higher coverage ratio for concept C than for A and B, as shown in Section 3.5. In this context, the Gini coefficient and – to a lesser extent – the number of rich households in Germany are only marginally affected by the adjustment, though the share of the top 10% of households increases from 57.5% to 61.4%.

In other cases, where under-reporting is assessed to play a significant role – as might be argued to be the case for Italy – proportional methods are bound to overestimate the number of wealthy households in the economy, overcompensating for the lower wealth indicated by respondents, indicating that adjustments such as simultaneous Pareto-calibration allocation are more appropriate. In these cases, marked increases in Gini coefficients (rising to 0.74 in Italy) and top 10% shares (now 62.6%) can be expected. The Italian survey is also characterised by its lack of oversampling for rich households. In such a situation, it could be advisable to use a fixed parameter for the share of rich households for more consistency in the results.

In any case, it is worth highlighting that the proposed methodology can be amended at each step: better precision can be obtained e.g. by refining the reweighting from Step 5 in cases where further information is available on that parameter, or by imposing more restrictive assumptions on the under-reporting behaviour of households. Automated selection of the threshold can also improve the estimates, even though our results are relatively robust to different threshold choices (within the €1 million to €2 million interval). Most importantly, access to administrative data can help bring about significant improvements: such data may assist in improving

estimates by providing a benchmark for specific parts of the distribution, or by providing a fixed parameter for the share of top households.

Table 5

Comparison of the results of alternative estimation methods

		France	Italy	Germany	Finland
HFCS	Households above w_0 (1)	1,001,778	681,305	1,350,286	60,794
	Top 10% (2)	49.4%	42.3%	57.5%	41.6%
	Debt to fin. assets (top quintile)	0.99	0.29	0.62	0.80
	Gini index	0.66	0.60	0.74	0.60
Proportional method	Households above w_0 (1)	2,179,070	1,961,780	1,888,289	86,400
	Top 10% (2)	50.9%	49.6%	55.9%	52.2%
	Debt to fin. assets (top quintile)	0.49	0.19	0.44	0.58
	Gini index	0.67	0.64	0.73	0.67
Simultaneous Pareto-calibration allocation	Households above w_0 (1)	2,186,614	1,437,417	1,995,667	59,024
	Top 10% (2)	58.0%	62.6%	61.4%	46.0%
	Debt to fin. assets (top quintile)	0.50	0.21	0.42	0.54
	Gini index	0.71	0.74	0.78	0.63

Notes: (1) Estimated number of households above the wealth threshold, based on gross wealth. Pareto wealth threshold w_0 set at EUR 1 million.
(2) Wealth share of the top 10% of households. Top % shares are computed with the HFCS total as the reference (which, in the Pareto-adjusted survey, is very close to the Financial Accounts total). Calculated only for the assets comparable with Financial Accounts.

Chart 3

Assets distribution by quintile and method

(EUR billions)

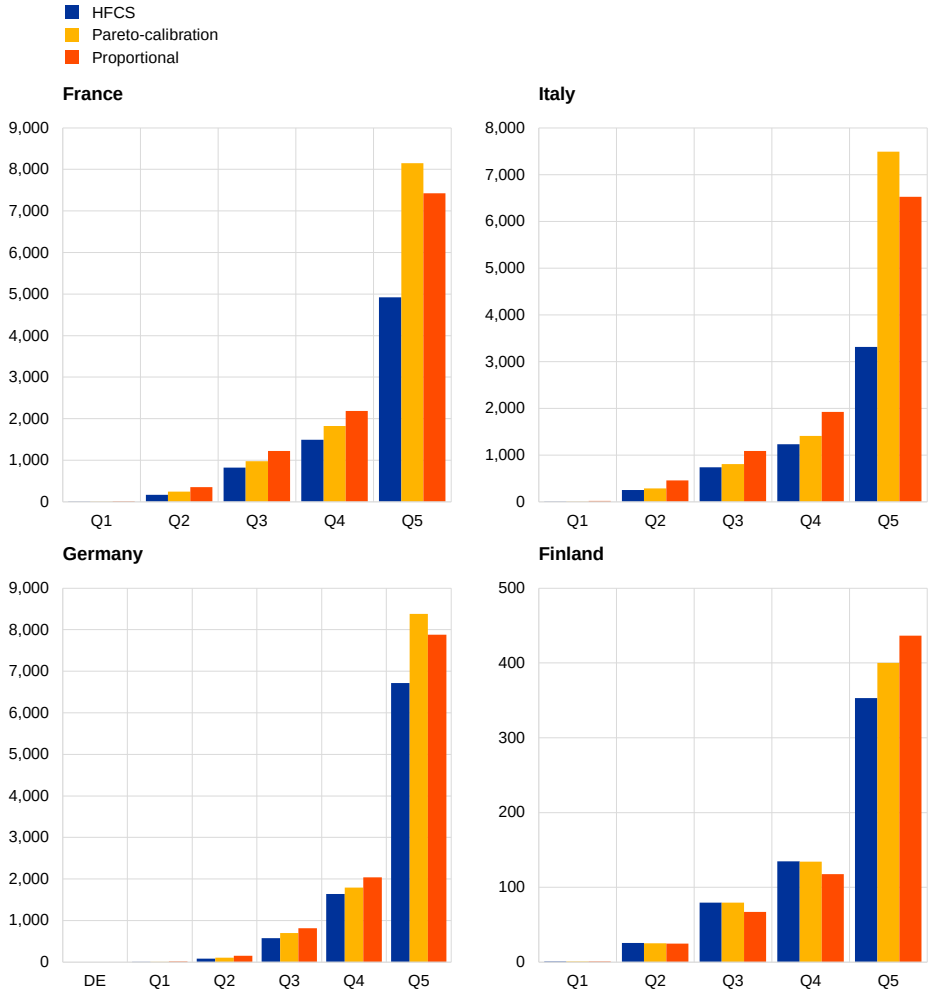
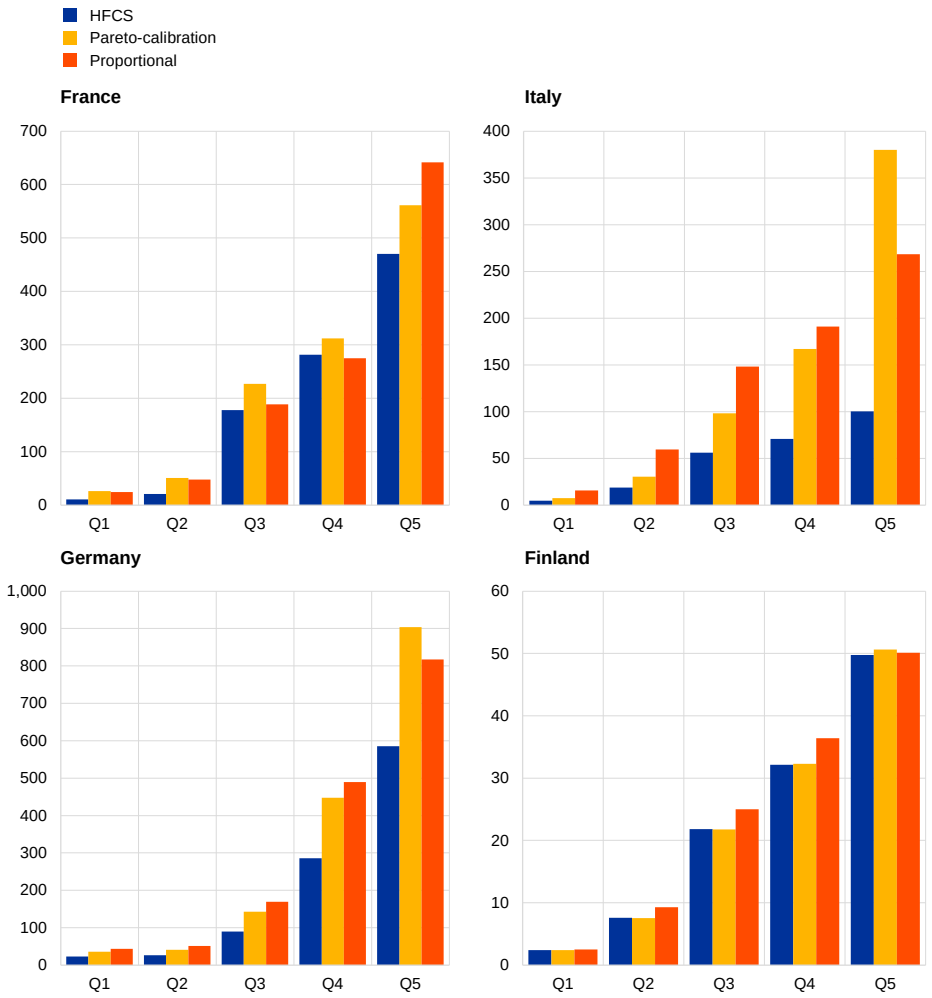


Chart 4

Liabilities distribution by quintile and method

(EUR billions)



4.7 Methods for assessing the estimations

Obviously, as for any macroeconomic aggregates, no full certainty can be reached on the accuracy of the results compiled. However, various methods can be followed to assess the likelihood of the estimates produced. At this stage, four main approaches can be used: (i) robustness; (ii) conformity with economic developments; (iii) comparison with other available data; and (iv) use of National Accounts identities. However, further work needs to be carried out to further expand the scope of the assessment of the estimates.

1. Robustness

It is useful to assess the sensitivity of estimates with regard to changes in relevant parameters. However, where there is a large range of possible values to be estimated,

it is likely that the estimates will vary significantly depending on the assumptions performed.

2. Conformity with economic developments

In some cases, the use of additional information on economic developments can help. For example, in countries where economic policies have aimed to limit inequality in the last few decades and high taxes on the richest households have been imposed, or where the population generally thinks that inequality is low, one might not be easily convinced by estimates showing very high inequality.

3. Comparison with other available data

In a number of cases, administrative data allow at least some parts of the wealth distribution to be assessed, as described in Chapter 5. Even where this does not allow for an assessment of the full distributional data, it may allow some parts of the data to be checked, e.g. the most indebted quintile.

Similarly, new sources have emerged, such as the World Inequality Database, where academics have managed to design useful estimates of income and wealth for many countries. The data produced often reflect extensive efforts using public sources (e.g. in some cases inheritance tax data are used, while in income data are capitalised over a long period). Estimates of Distributional Financial Accounts (DFA) can be compared with such results in some cases.

Furthermore, as with other euro area statistics, the comparison of results, or of the differences between the HFCS and the DFA estimates, across countries can provide meaningful information for assessing the results for individual countries.

4. Use of National Accounts identities

A further proposal is making use of National Accounts identities to assess the estimated data. In particular, the sum of financial transactions (namely purchases and sales of financial instruments, such as quoted shares, or increases/decreases in instruments such as deposits) carried out by a given sub-group of households has to be equal to the balance of their non-financial transactions, i.e. their income, savings and other similar transactions (forming the “net lending/net borrowing” aggregate in the National Accounts). On the financial side, few data are available that enable estimates of financial transactions to be made, but as transactions are equal to differences in outstanding amounts, adjusted for price, foreign exchange and “other” changes (e.g. changes in entities’ activities, resulting in the need to allocate their activities to a different economic sector), it may be feasible to compile reasonable estimates of these transactions based on Distributional National Accounts data and estimates of price changes for each asset type. Taking into account the work performed by the Expert Group on Disparities in a National Accounts framework (EG DNA) on non-financial transactions, it may be possible to put together distributional non-financial accounts data with financial transactions, and thus to assess the consistency of both sources.

5 Administrative sources

Administrative data can be used to improve macro-micro comparisons in various ways, depending on the kind of data available. Even if register data are available only at the aggregate level, the aggregates can be compared with both Financial Accounts and HFCS data to assess the overall quality and coverage of both data sets. In cases where register data can be disaggregated into different household groups with classifications available in the HFCS data, the degree of reporting bias across various household groups can be assessed. Both aggregate and sub-group-level data can also be helpful in the estimation of the wealth shares of the top tail. In the most favourable scenario, granular administrative data can be linked with HFCS individuals. This allows the distributional results of the survey, as well as the sampling bias, to be assessed in great detail.

Section 5.1 gives an overview of the available data sources, Section 5.2 provides two examples of the potential benefits of administrative data for DFA purposes.

5.1 Availability of administrative data

The EG-LMM has collected information with the purpose of assessing the availability of administrative data on household income, wealth and liabilities. A summary of this assessment is presented in Table 6. for 18 EU countries that responded to the questionnaire. The table shows large cross-country differences in the availability of administrative data, particularly concerning data on individuals that can be linked to the HFCS data with personal identifiers. In Estonia, Finland and Denmark administrative data on income, most financial wealth items and debt can be used as such to produce HFCS variables. Administrative data that relate to income and are linkable at the individual level are also available in Ireland, France and Lithuania. Income data are in most cases derived directly from tax registers. Data on financial assets are taken either from tax registers (Finland, Denmark) or are reported by banks (Estonia). In most other countries, relevant administrative data are available only at the aggregated level, if at all.

Table 6

Availability[9] of administrative sources on income, wealth and liabilities

	Income	Deposits	Listed shares	Investment fund shares	Land and dwellings	Loan liabilities
CZ	B	-	-	-	B	-
DE	B	-	C	C	-	-
DK	A	A	A	A	A	A
EE	A	A	A	A	C	A
IE	A	C	-	-	-	C
ES	B	B	C	C	B	A
GR	-	-	-	-	A	-
FR	A	C	B	B	-	C
IT	B	C	A	-	C	A
LV	B	-	-	-	B	B
LT	-	-	C	C	-	-
LU	B	-	C	C	C	-
HU	B	C	C	C	-	B
NL	B	B	C	C	B	B
AT	C	C	-	-	B	C
PT	C	-	C	C	-	B
SK	B	C	C	C	-	C
FI	A	-	A	A	A	A

Source: EG-LMM.
Notes: A = Available at granular level, can be linked to HFCS individuals
B = Available at granular level, cannot be linked to HFCS individuals
C = Available at aggregated level
- = Not available

Several countries reported that granular-level administrative data are in principle available but said that the data cannot be accessed by the NCBs due to legal constraints (limiting the access to such sources, with the aim to protect their confidentiality). For example, several NCBs reported that individual level credit registers existed, but that only a few countries were able to use it in their data production or analysis of macro statistics.

The experiences of NCBs with access to personal level data have revealed several ways to overcome legal constraints. Cooperation among central banks and statistical institutes has proven to be useful, since national statistical institutes (NSIs) more frequently have access to administrative registers. Some NCBs and NSIs mentioned in response to the questionnaire that conferring the status of “official statistics” on the wealth statistics produced by the HFCS has enabled access to register data. The criteria for statistics to be classified as “official” vary from one country to the next. Some countries have indicated that the existence of EU legislation is a prerequisite. NCBs that have access to administrative data emphasised the importance of negotiations with register authorities and legal assistance in the interpretation of national legislation. Sharing best practices among countries could facilitate such negotiations.

[9] Availability means that either the national central bank or the national statistical institute has access to the data source mentioned.

Even if access to micro-level administrative data is not possible, information at the meso level (i.e. at a low level of aggregation) can be useful for the macro-micro comparison. Examples of such information might be the share of assets owned by household groups (e.g. by age, wealth deciles or of the richest 1%) derived from administrative data, or the number of households or individuals above a predefined wealth threshold. The use of such information was described in Chapter 4. Information of this kind is available in most of the responding countries, at least for some instruments. A detailed assessment of its usefulness for DFA purposes will require an in-depth, country-by-country investigation to be carried out in the future.

5.2 Case studies on the use of administrative data: Finland and Ireland

Two countries presented their experiences with the use of administrative data in the EG-LMM.

Finland presented a comparison between HFCS data and register data on listed shares and investment funds. Register data can be linked to the HFCS data via personal identifiers, and observations from administrative sources are used instead of interview data as HFCS output variables. This makes it possible to carry out an assessment of the reasons behind the differences between Financial Accounts and HFCS data, namely population coverage and sampling bias. Since no interview data were collected, the assessment does not cover reporting bias.

The HFCS/FA coverage of both listed shares and investment funds per capita is almost 90% in Finland, which is exceptionally high compared with other euro area countries. By comparison, in more than half of the HFCS countries, the survey per capita totals are less than 50% of corresponding Financial Accounts totals.

A decomposition of register data on these two items shows that the difference between Financial Accounts and HFCS totals is mainly down to different household definitions. The impact of the sampling bias is much lower than for the aggregate difference between Financial Accounts and HFCS. The Financial Accounts total for listed shares is very close to the register total (including non-residents and institutional households). On the other hand, the register total for mutual funds is 6% lower than the Financial Accounts total. After adjusting the register data for the differences in the Financial Accounts and survey household definitions, the remaining bias of the HFCS data is minor. A comparison between the share of assets held by the top 10% and that held by the top 1% implies that the small difference between register and survey totals is mainly caused by the survey not covering households at the very top of the distribution.

Table 7

Comparison between register, Financial Accounts and HFCS data in Finland

	Listed shares		Investment funds	
Total value				
	EUR millions	**%**	**EUR millions**	**%**
Financial Accounts	29,389	100	16,424	100
Register data				
- Total	28,979	99	15,446	94
- Resident population	26,965	92	14,901	91
- Private households	26,805	91	14,789	90
- HFCS sample (weighted)	26,903	89	14,691	89
Top 10% share (of households owning the asset)				
Register data	80.2%		70.4%	
HFCS sample (weighted)	79.8%		68.7%	
Top 1% share (of households owning the asset)				
Register data	45.3%		33.6%	
HFCS sample (weighted)	43.5%		32.0%	

Source: Statistics Finland.

In Ireland, the HFCS/FA coverage ratio for deposits was only 29%. Consequently, the Central Bank of Ireland compared the HFCS data with the granular deposit-level dataset to assess distributional information and to identify potential areas of under-reporting by different parts of the population. These data were collected temporarily in the year 2014 for analytical purposes. The dataset could not be matched with HFCS identifiers, as the basic unit in the dataset is an individual bank customer and their deposit with one bank, instead of a household and the total deposits held by the household across all banks. However, the exercise provided some important insight into the under-reporting patterns in Ireland.

The Irish case study concluded that while the distributional information from the HFCS cannot be invalidated by the comparison with administrative data, some possible caveats were recognised. Under-reporting of larger deposits was observed to be higher than under-reporting of lower value deposits. The coverage rate for deposits is lowest for the top decile, but only a few percentage points lower than the total coverage rate. Higher under-reporting among older age groups was observed, but the results are not significant enough to be a key explanatory factor. Regional differences in under-reporting behaviour were detected.

5.3 Administrative data: the way forward

While the above examples are country-specific, they demonstrate the potential usefulness of administrative or other granular data sources. Even if they are not available on a regular basis, they make it possible to assess potential sources of gaps in the micro-macro comparisons. They can therefore give useful guidance on possible additional adjustments to be made so that distributional results can be compiled which are closer to the National Accounts totals. In an ideal case, administrative data make it

possible to assess the distributional information from the survey data, under-reporting patterns by household groups and sampling bias.

Furthermore, even if such data are available for single instruments only or, conversely, if they are not available at micro level but at a more aggregated level, the data can be used to improve the micro-macro linkage or provide input into adjustment methods such as the Pareto estimation described in Chapter 4. Examples of more aggregated indicators derived from administrative data sources to improve the accuracy of estimation models include the share of wealth held by the top percentiles and the share of individuals/households with wealth holdings above a certain threshold. Such indicators could be accessible from granular level data sources which, as such, cannot be accessed by NCBs or NSIs.

Finally, the EG-LMM also discussed a presentation by experts from the World Inequality Database (WID) project[10]. This project generally places high importance on the use of administrative sources, in particular tax data sources, which are considered to be more reliable than survey data and the Pareto adjustments using rich list information. However, the discussions also made it clear that the use of administrative data, which is generally uneasy due to confidentiality constraints, is even more demanding for wealth studies than it is for income studies (given the lack of wealth tax data in many countries) and requires various assumptions and estimations (e.g. when applying the so-called income capitalisation and estate multiplier methods). Nevertheless, the EG-LMM concluded that the work of the ESCB may certainly benefit from the work and experiences of the WID team. The EG-LMM therefore considers this to be an area of future collaboration.

Overall, the quality of DFA estimates can be validated and improved by making use of administrative data, even if it is not at granular level. The data availability in countries is broader than expected, and some countries have made considerable progress in this field in the last few years. The options available and actions required are country-specific, and national experts are best placed to carry out this work. The work at country level should be supported by overall coordination of the efforts at ESCB level.

10 World Inequality Database.

6 User demands and distributional indicators

On the basis of a literature and publication review looking at uses of distributional results, a consultation was conducted by the EG-LMM in April 2018. It was carried out among 12 selected users in the economics and financial stability departments of the ECB (five users), the European Commission (four), the OECD (one) and Banco de Portugal (two). Although a consultation among only 12 users does not provide a representative picture of all potential future user areas, the selected expert users were able to share their specific experience in using distributional and macro-financial economic statistics in their work. Some users stressed that the distributional indicators would make it considerably easier to estimate the impact of monetary policy on households' investment behaviour and wealth across income and wealth groups. The indicators would also provide a clearer and possibly more timely picture of the distribution of debt across households – and thus of risks to debt sustainability and financial stability. The results, underlying framework and data could potentially also be used to conduct different types of macro-financial scenarios for monetary policy and financial stability purposes.

The main results of the consultation can be summarised as follows.

- Almost all respondents consider DFA potentially highly useful in their own business area. Most of these users have experience in using HFCS results, and about half of them also use results from the EU Statistics on Income and Living Conditions (EU-SILC) survey. Interest in using DFA on the monetary policy and financial stability side was slightly higher than interest in using it for other economic analysis.
- Most of the users interviewed would welcome DFA figures on an annual frequency. Three-yearly DFA results (i.e. results at the same intervals as the HFCS) would not provide significant added value. At the same time, only one of the users said they would need quarterly results.
- Most users would require DFA country data in combination with euro area aggregates. Euro area aggregates alone would not meet the needs.
- All users would require DFA stock data. The demand for flow data varies, with about half of the users considering flow data as essential. While financial stability users give priority to stock data, the monetary and economic policy users who responded to the consultation would generally prefer to obtain flow data in addition.
- Groupings of households by income quintiles and wealth quintiles are considered as especially relevant. This was followed by breakdowns by work status, housing status and age.

- Users were asked to list and rank the five most important possible DFA indicators (out of a list of 15). The results showed a clear preference for well-known concepts such as indebtedness ratios, the debt-to-asset ratio and net financial wealth measures. On the other hand, concepts that are often used in distributional analysis, such as the Lorenz, Gini and medians concepts, were not ranked highly.

- Users taking part in the consultation gave priority to broad coverage of wealth components and results for wealth and debt aggregates over results for single financial instruments. This feedback highlighted that there is a trade-off here. On the one hand, there is evidently demand among users for wealth concepts that match the broad NA concepts of wealth (total financial wealth and net worth). On the other hand, purely from a data availability and quality point of view, the DFA results focusing on a narrower concept excluding components such as non-life insurance, pensions and other accounts receivable might be preferable, as it is hardly possible to link HFCS and Financial Accounts for these components.

The following table summarises the conclusions to be taken on board in the further work on DFA.

Table 8

Summary of the results of the DFA user consultation

Topic	Highest demand/use
Main users	Financial stability and monetary policy analysis, followed by other economic analysis
Frequency	Annual
Geographic coverage	Countries and euro area aggregate
Stock/flow	Stocks essential, flows desirable
Household groupings	Income and wealth quintiles, followed by work and housing status, age
DFA indicators	Indebtedness, gross and net wealth
Coverage of instruments	Broad, as close as possible to Financial Accounts total assets and debt

7 Conclusions and way forward

7.1 Main conclusions

In view of the potential role that distributional data can play in explaining macroeconomic developments, the Expert Group on Linking Macro and Micro Data for the household sector (EG-LMM), consisting of Household Finance and Consumption Survey (HFCS) and Financial Accounts experts from European Union countries along with experts from Eurostat and the OECD, was set up within the Eurosystem in December 2015.

The EG-LMM's mandate was twofold. As a first step, its purpose was to understand, quantify and explain the main differences between the HFCS and the Financial Accounts. A second step involved developing distributional information within the household Financial Accounts.

In the systematic comparison of the two sources carried out in this report, a distinction has been made between two main sets of factors explaining differences.

- The first set of factors concerns generic differences that potentially affect all or various components of wealth. These include differences that can be relatively easily identified (definition of population and household sector, reference periods), along with some issues that are more substantial and difficult to quantify and adjust for, such as different valuation concepts (self-assessment versus valuation defined by statistical standards), the effect of non-response or wrong responses in the survey, and the accuracy of some Financial Accounts asset categories for which statistical sources are weak. It has also proved difficult to determine the extent to which the surveys provide effective coverage of the households among which wealth appears to be substantially concentrated. In addition, the survey leaves scope for aligning its implementation to national circumstances, which results in some heterogeneity across countries. Finally, macroeconomic Financial Accounts, while more standardised across countries, are only available at a fairly high level of aggregation, which limits the scope for improving the quality of the linking by matching the sub-categories that can best be compared.

- The second set of factors concerns detailed instrument-specific definitions. The EG-LMM has developed alternative concepts of adjusted wealth (as opposed to concepts covering all instruments) which cover items that have medium or high comparability in the two sources. Items which are covered in only one of the two sources (notably currency holdings and non-life insurance reserves, which are covered only by the Financial Accounts) or which have low comparability (occupational pensions, financial derivatives, other accounts receivable/payable) are excluded from adjusted wealth. The EG-LMM produced an overall comparison covering items with high or medium comparability. This showed that, at euro area level, these items account for more than 90% of households' financial and non-financial assets together with liabilities (see also Table 9).

Table 9

Proportion of National Accounts items with high or medium comparability to HFCS

ESA 2010 code	National Accounts instrument	Relative size	
Assets	Items with high or medium comparability	% of total financial assets	% of total financial and non-financial assets
F.22 and F.29	Deposits	30%	14%
F.3	Debt securities	4%	2%
F.4	Loans	0%	0%
F.511	Listed shares	4%	2%
F.52	Investment fund shares	8%	4%
F.512 + F.519	Unlisted shares + Other equity	15%	7%
F.62	Life insurance and annuity entitlements	18%	8%
AN.211+AN.11+AN.12	Land + Fixed assets (including dwellings) + Inventories		55%
	Total financial assets	79%	
	Total financial and non-financial assets		91%
	Items excluded from the comparison		
F.21	Currency	2%	1%
F.61+F.66	Non-life insurance technical reserves + Provisions for calls under standardised guarantees	3%	1%
F.63+F.64+F.65	Pension entitlements + Claims of pension funds on pension managers + Entitlements to non-pension benefits	13%	6%
F.7	Financial derivatives	0%	0%
F.8	Other accounts receivable	3%	1%
Liabilities		% of liabilities	
F.4	Loans	91%	

In addition, estimation methods have been developed to close the remaining gaps between HFCS and National Accounts. These methods address the main potential reasons for differences between National Accounts and household survey data and experimental calculations for four countries have shown their impact on the distributional accounts. These methods would benefit from refinement at national level.

The EG-LMM has also recognised the need to collect administrative data to complement survey data in the production of Distributional National Accounts indicators.

- Administrative data should ideally be available at granular level, or at least at household group level. However, for the methodologies presented in Section 4.3, less detailed administrative information can also be useful, e.g. information on the number of households with wealth holdings over specific thresholds.
- Given the evident legal constraints in getting access to several administrative data sources, related with the high confidentiality of this information, the EG-LMM encourages assessments of the availability of such data at the national level. In addition, it believes that cooperation between National Central Banks (NCBs) and National Statistical Institutes (NSIs) would be useful, given that NSIs frequently have access to administrative data sources not accessible by NCBs.

As described in Chapter 6, a user consultation was conducted to find out which breakdowns and indicators users would like to have, and to establish when and how often they would like this information. A demand for annual time series data and for a broad coverage of household wealth components was commonly put forward.

7.2 Way forward

This Section outlines a possible plan for implementing estimates of Distributional Financial Accounts (DFA) in euro area countries, including non-financial assets, on an experimental basis over the next three years. To provide a better overview, the plan is divided into four workstreams.

Workstream A: Finalise the fine-tuned linking of the HFCS

The work performed has shed light on certain weaknesses in both datasets. Further efforts will be needed to overcome these weaknesses.

As regards the Financial Accounts, the following limitations should be addressed further.

- Estimates of unlisted shares and other equity in the Financial Accounts are lower than the HFCS results for some countries. It is questionable whether the current Financial Accounts totals can be considered a reliable benchmark for the micro-macro linking for all countries. Investigations into ways of improving data sources and harmonising valuations have already been launched by the ESCB[11] Working Group on Financial Accounts (WG FA). The EG-LMM also regards these investigations as an important part of the efforts to improve comparability between HFCS and Financial Accounts statistics. Further relevant aspects are the coverage, the valuation and the recording of dwellings held abroad as "other equity" in the Financial Accounts.
- Similarly, improving coverage of assets held abroad and estimates of the "missing" assets abroad is important for distributional accounts, as these are highly concentrated in the higher quintiles.

As regards National Accounts/non-financial assets, further work is needed in the following areas – which are the responsibility of Eurostat and the European Statistical System – to help ensure progress in compiling distributional accounts of households' wealth.

- National data on non-financial assets, including dwellings and land, are incomplete in many countries. Derogations expire by 2020 at the latest, so it is hoped that by then the mandatory requirements of the ESA[12] transmission programme will have been met by all countries.

[11] European System of Central Banks

[12] European System of Accounts

- The data in the ESA transmission programme have two main weaknesses regarding their use for DFA purposes: (i) the category “land” covers “all land”, while separate data on land underlying dwellings are not available, implying that housing wealth and a separation of this wealth from business wealth can only be roughly estimated; and (ii) data for non-profit institutions serving households (NPISHs) are not separated from those for households. The review of the ESA transmission programme envisaged in the coming years could be an opportunity to consider such changes.

On the HFCS side, potential improvements have been identified in the following areas.

- Work is under way within the ESCB Household Finance and Consumption Network (HFCN) to obtain a clearer picture of the collection of data on assets related to business activities, the aim being to make sure all of these data are recorded once and are identified as business wealth.

- In addition, collecting data on the business wealth of sole proprietors and partnerships in gross terms (i.e. recording assets separately from liabilities), identifying the main assets held and classifying these assets under the heading of “business wealth”, would significantly improve the bridge between HFCS and National Accounts.

- It is understood that in the 2020 wave, the HFCS will modify the definition of sole proprietorship in such a way that incorporated businesses can be separated from unincorporated businesses. This change is very welcome from the perspective of the link between HFCS and National Accounts.

- Enhancing oversampling or developing/identifying specific sources from which to collect more information on the wealthiest households would further improve the consistency between HFCS and National Accounts results.

In many cases, the link between HFCS and National Accounts is now as best as can be, taking into account the general limitations described above – essentially that the survey reflects households’ understanding and valuation of wealth rather than statistical definitions and valuation methods.

Nevertheless, potential for further improvements has been identified in a few areas. These are as follows.

- Data collected as part of Monetary Financial Institutions balance sheet statistics can be used to distinguish mortgage loans from other loans in Financial Accounts data (see Section 3.4) and on this basis improve the comparison with the HFCS, which makes a distinction between these components. The EG-LMM agreed to implement this in compiling the DFA.

- For sole proprietors and partnerships in the HFCS, a distinction should be made between producer households and quasi-corporations until improved information becomes available from the HFCS. The plan is to make this information available as of 2020. The underlying assumption is that sole proprietorships and partnerships which are unincorporated belong to the household sector and the

rest to the corporation sector. It was agreed that this approach would be implemented in compiling the DFA.

- Within non-financial assets, dwellings and land underlying dwellings should be distinguished as much as possible from: (i) other non-financial assets; and (ii) land not underlying dwellings. In addition, the focus should be only on those assets held by households, while those of NPISHs should be excluded. These breakdowns are not part of the ESA transmission programme (see Section 3.3). However, including these breakdowns in the compilation of the DFA at national level would be very useful as a means of improving DFA estimates.

- Leasing is generally recorded as loans in the Financial Accounts, while it is measured as separate flows in the HFCS. Investigations should be carried out to ascertain whether HFCS flow data on leasing payments can be used to derive a proxy for the outstanding loans in order to make totals more comparable.

- The distribution of holdings of currency, i.e. banknotes and coins, currently not covered in the HFCS, could be estimated in Distributional Financial Accounts for instance as being proportional to consumption or to income.

- The possibility of estimating not only the distribution of Financial Accounts positions, but also that of flows, namely transactions, other changes and revaluations, should be further considered.

- Finally, there should be further investigations into the possibility of using information available in MFI balance sheet statistics regarding loans to (and in some countries deposits by) sole proprietors. This would help to better distinguish corresponding amounts in the Financial Accounts, thus improving the link with the HFCS.

Workstream B: Fully implement, apply and improve estimation methods

The remaining gap between HFCS and the National Accounts is thought to be mainly attributable to: (i) under-reporting by the households participating in the survey; and (ii) insufficient coverage of the wealthiest households. Beyond the above-mentioned recommendations to the HFCN for improving these elements where possible, the EG-LMM recommends estimating this remaining gap in order to produce DFA consistent with the (adjusted) National Accounts wealth concept. An R-package has been developed to run these estimates at country level. The package has been designed to allow for the flexible incorporation of additional information at national level (including in particular administrative sources), where feasible. The application of the package is expected to deliver useful information where further development of the method is needed. In particular, a process table should be produced, showing the effect of each step of the estimation process on the final result, as suggested in Roymans (2016).

Workstream C: Towards experimental annual results

Within the scope of the work presented in this report, the EG-LMM was not able to devote time to developing and establishing a method for interpolating and, if possible, extrapolating DFA results outside those years which are also HFCS survey years. Obviously, this issue needs to be addressed as soon as possible, and the further work will benefit from the ongoing releases of the third wave of the HFCS.

A consultation among users has highlighted the need for DFA, focusing in particular on a list of specific indicators. In addition, the widespread interest in this information among research groups and the public has led to a situation whereby the public only has access to data estimated by academics, such as the data from the World Inequality Database. Although it is recognised that the publication by the Eurosystem of DFA results requires adequate communication to make clear the current caveats regarding data quality, the EG-LMM recommends considering at some stage publishing the results for the euro area and individual countries, with these results labelled as experimental statistics. The data would first be disseminated only within the ESCB in order to collect user feedback on the results. The feasibility of publishing these experimental statistics should be assessed on the basis of that feedback.

The ultimate aim of this workstream would be to obtain experimental annual statistics for the years from about 2010 onwards.

Workstream D: Research into consistency with estimates of distributional income accounts

As both the ESCB's work on distributional wealth accounts and the OECD's/Eurostat's work on distributional income accounts are progressing, active steps should be made to coordinate the compilation approaches and to benefit from closer cooperation. In particular, one possible area of improvement for these estimates would be to explore the feasibility of comparing results obtained by the Expert Group on Disparities in a National Accounts framework (EG DNA) on gross savings and net lending/borrowing by quintile with estimates of financial transactions by quintile. This workstream will deliver results only in the longer term, but it is important to coordinate the development of methods to minimise "reconciliation work" further down the line. In addition, some EG-LMM members should cooperate with the EG DNA in their efforts to make progress on distributional wealth.

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Annex 1: Second Mandate of the Expert Group on Linking Macro and Micro Data for the household sector

1. In December 2015, the ESCB Statistics Committee (STC) mandated the Working Group on Financial Accounts (WG FA) to establish, in cooperation with the Household Finance and Consumption Network (HFCN), a temporary Expert Group on Linking Macro and Micro Data for the household sector (EG-LMM). The EG-LMM's first mandate focused on comparing and bridging macro and micro data. In March 2017, the EG-LMM submitted its first report to the STC. As envisaged at the outset, the STC then gave the EG-LMM a second mandate, this time with the focus on developing distributional results for household macro balance sheets.

2. The task of the EG-LMM under this second mandate is to contribute to linking macro and micro statistics for the household sector, i.e. to link the Financial Accounts (FA) and Household Finance and Consumption Survey (HFCS), building on the results of its first mandate. Two workstreams have been defined for that purpose.

   The tasks in the first workstream are as follows:

   - further assessing the impact of generic and instrument-specific differences on HFCS-FA coverage ratios and their varying impact across instruments and across countries;
   - developing recommendations for improving the link between the HFCS and the Financial Accounts and for achieving better coverage ratios for future HFCS waves;
   - assessing the availability of administrative sources for improving HFCS-FA linking.

   The tasks in the second workstream are as follows:

   - defining a set of distributional indicators for the household sector balance sheet, with a focus on items with "medium" and "high" comparability;
   - calculating for these indicators experimental results for 2010 and 2014 (or the two periods closest to the HFCS fieldwork) and assessing the feasibility of deriving estimates at annual frequency;
   - extending the comparison to non-financial assets, subject to the availability of new National Accounts data on land due at end-2017 under the ESA 2010 transmission programme;
   - seeking the views of potential ECB/ESCB users to identify their priorities.

3. The EG-LMM should consider the ongoing work of Eurostat and the OECD, and its relevant expert groups, with the objective of contributing to a joint framework for linking National Accounts and household survey data on wealth, income and consumption.

Annex 2a: Correspondence table between Financial Accounts and HFCS for financial instruments

ESA 2010 code	NA instrument name	HFCS variable(s)	HFCS variable label and/or codes	Conceptual comparability	Remarks
	Assets				
F.2	Currency and deposits				
F.21	Currency	N/A	N/A	N/A	NA: holdings of households included but estimated due to the lack of direct sources. HFCS: not collected.
F.22	Transferable deposits	HD1110	Sight accounts	HIGH	Specific conceptual differences exist but are unlikely to be significant or can be adjusted (deposit-like instruments with non-deposit-taking corporations are included in the HFCS and can be reclassified from short-term loans in FA).
F.29	Other deposits	HD1210	Savings accounts	HIGH	
F.3	Debt securities	HD1420	Bonds	HIGH	Conceptual differences are not known.
F.31/ F.32	Short-term/long-term debt securities		a – State or other general government	N/A	Maturity breakdown not covered in the HFCS Only total market value of all bonds given in HFCS/amount not split into types except in the case of Italy.
			b – Banks / Other financial intermediaries		
			c – Non-financial corporation		
			d – Other (specify)		
F.4	Loans	HD1710	Amount owed to household	HIGH	HFCS has a somewhat broader definition. Loans between households missing from NA in practice for most countries. For reclassification of some loans see F.2.
F.41/.42	Short-term/long-term				
F.5	Equity and investment fund shares				
F.511	Listed shares	HD1510	Publicly traded shares	HIGH	
F.512	Unlisted shares	HD1010	Investment in non-self-employment not publicly traded businesses (ownership only as an investor or silent partner)	MEDIUM (LOW with regard to the split between "unlisted shares" and "other equity")	- HFCS classification is based on the household's activity in the enterprise. - NA value includes assets that are classified as real wealth in the HFCS (value of self-employment businesses) - The split between "unlisted shares" and "other equity" is not available in the survey. Investments in self-employed businesses could be included in "unlisted shares" or "other equity". - The value of a sole proprietorship or partnership is spread over the different instruments in the NA if it is not considered as a separate legal entity (quasi-corporation). - HFCS provides the value for the different legal status (but legal status is not imputed in all
F.519	Other equity	HD0200	Investments in self-employment businesses		
			1 – Sole proprietorship / independent professional		
			2 – Partnership		
			3 – Limited liability companies		
			4 – Co-operative societies		
			5 – Non-profit making bodies		
			6 – All other forms (Spain)		

			7 – Unknown (not imputed)		countries, so there is an "unknown" category). In addition, in the HFCS the number of employees in self-employed businesses is collected.
F.521	Money market fund (MMF) shares or units	1320c	Investments in mutual funds c – Funds predominantly investing in money market instruments	HIGH	Value dependent on fund type not imputed in every country. The breakdown by type of fund may not be available and only the total HD1330 is imputed in all countries. Hence the distinction between MMF and non-MMF funds may not be made in these countries.
F.522	Non-MMF investment fund shares/units	HD1320x	a – Funds predominantly investing in equity b – Funds predominantly investing in bonds d – Funds predominantly investing in real estate e – Hedge funds f – Other fund types (specify)	HIGH	
F.6	Insurance, pension and standardised guaranteed schemes				
F.61	Non-life insurance technical reserves	N/A	N/A	N/A	Non-life assets in FA (e.g. health insurance, term insurance) can be significant.
F.62	Life insurance and annuity entitlements	DA2109 = sum of (PF0920) over household members	Voluntary pension/whole life insurance	MEDIUM	Value reported in HFCS not clearly defined (net present value, liquidation value?). FA value likely to be higher than HFCS value.
F.63	Pension entitlements	Sum of (PF0700) over household members	Current value of all occupational pension plans that have an account	LOW	Clarification required as to what extent defined benefit schemes should be and are in fact included in this variable in the HFCS. Valuation issue as for F.62.
F.64	Claims of pension funds on pension managers	N/A	N/A	N/A	F.64 not applicable to households.
F.65	Entitlements to non-pension benefits	N/A	N/A	N/A	F.65 likely to be insignificant.
F.66	Provision for calls under standardised guarantees	N/A	N/A	N/A	F.66 not applicable to households.
F.7	Financial derivatives	HD1920	Other financial assets	LOW	Financial derivatives are not a separate item in the HFCS and are included in "Other financial assets". Definition of "Other accounts receivable/payable" not comparable with "Other financial assets" owing to different definitions.
F.8	Other accounts receivable/payable				
		HD1620	Managed accounts	LOW	May be spread over the FA balance sheet of the household depending on set-up of the management and depending on the assets invested. Does not, however, affect comparability of total financial assets.
F.L	**Liabilities**				
F.4	Loans	DL1000	Total outstanding balance of household's liabilities	HIGH	
	Short-term/long-term	DL1100	Outstanding balance of mortgage debt	HIGH	High conceptual comparability refers here to the maturity. The maturity is covered in the HFCS for the different loans with a similar concept to that in the NA: length of the loan at the time of borrowing or refinancing. Therefore, it is also
		DL1110	Outstanding balance of household main residence (HMR) mortgages		
		DL1120	Outstanding balance of		

			mortgages on other properties		possible to make the distinction between short-term and long-term in the HFCS. Maturity not imputed in every country in the survey. Matching data on mortgage loans can be derived in the FA as estimates are based on MFI balance sheet data.
		DL1200	Outstanding balance of non-mortgage debt		
		HC0220	Amount of outstanding credit line/overdraft balance		
		HC0320	Amount of outstanding credit cards balance		
		Sum of HC080$x and HC1100	Outstanding balance of non-collateralised loans		
F.8	Other accounts			LOW	May be partly included in the outstanding balance of non-collateralised loans or in the outstanding balance of credit cards in the HFCS.

Notes: Interpretation of the conceptual comparability of instruments between the HFCS and NA.
The table only indicates the conceptual comparability of the specific instrument. Common or generic differences due e.g. to sole proprietorship or the coverage of the wealthy households are evaluated in Chapter 2.
N/A = Not comparable: item not included in either NA or the HFCS.
LOW = Low comparability: item included in both NA and the HFCS, but in different categories or the concepts differ substantially.
MEDIUM = Medium comparability: similar items included, but they differ conceptually between the HFCS and NA in regards to the items included in the asset or liability category or in the definition used.
HIGH = High comparability: comparable items included in regards to the definition used. The definition might still differ marginally between the survey and NA.

Annex 2b: Correspondence table between National Accounts and HFCS for non-financial assets

NA code	NA description	HFCS code	HFCS description
N	Non-financial assets		
AN.1	Produced non-financial assets		
AN.11	Fixed assets		
AN.111	Dwellings This covers buildings primarily used as residences and excludes land.	HB0900	Household main residence What is the value of this property, i.e. if you could sell it now how much do you think would be the price of it? Value includes land.
		HB280$x	Properties other than the household main residence Property types “house or flat”, “apartment building”, “hotel”, “building plot/estate”. Value includes land.
AN.112	Buildings other than dwellings and other structures In the household sector, these are buildings for production purposes by sole proprietorships and partnerships (and NPISHs if they are not separated from households).	HB280$x	Properties other than the household main residence Property types “industrial building/warehouse”, “garage”, “shop”, “office”, “farm” and “other”. Value includes land.
		HD080$x	Self-employment business wealth This can be a part of business wealth if respondents are asked to exclude properties belonging to a business in the section on other properties. Buildings are not separated from the rest of business wealth. Value of business provided in net terms.
AN.113	Machinery and equipment Machines and equipment used by sole proprietorships and partnerships fall into this category. Cars and other durable goods in the household sector are not included in capital stock.	HD080$x	Business wealth Machinery and equipment are part of business wealth. Machines and equipment are not separated from the rest of business wealth. Value of business provided in net terms. Cars and other durable goods may be included in business wealth.
AN.115	Cultivated biological resources Agricultural plantation without land which belongs to sole proprietorships and partnerships falls into this category.	HD080$x	Business wealth These assets are part of business wealth. They are not separated from the rest of business wealth. Value of business provided in net terms.
AN.117	Intellectual property products Intellectual property products which belong to sole proprietorships and partnerships fall into this category.	HD080$x	Business wealth These assets are part of business wealth. They are not separated from the rest of business wealth. Value of business provided in net terms.
AN.12	Inventories (in the case of households, those belonging to sole proprietorships and partnerships)	HD080$x	Business wealth These assets are part of business wealth. They are not separated from the rest of business wealth. Value of business provided in net terms.
AN.13	Valuables Valuables are produced assets that are not used primarily for production or consumption, that are expected to appreciate or at least not to decline in real value, that do not deteriorate over time under normal conditions and that are acquired and held primarily as stores of value.	HB4710	Valuables (Do you/Does your household) own any valuables such as jewellery, works of art, antiques, etc.?
AN.2	Non-produced non-financial assets		
AN.21	Natural resources		
AN.211	Land This covers all the land, i.e. land underlying dwellings and buildings as well as land used for agriculture and forestry.	HB0900	Household main residence Land included in the value of the property.
		HB280$x	Properties other than the household main residence Property types “building plot/estate”, “farm”.

			Land included in the values of other property types.
		HD080$x	This can be a part of business wealth If respondents are asked to exclude properties belonging to a business in the section on other properties. Land is not separated from the rest of the business wealth. Value of business provided in net terms.
AN.22	Contracts, leases and licences This covers patents, leases, etc. held by sole proprietorships and partnerships (in the case of the household sector).	HD080$x	Business wealth These assets are part of business wealth. They are not separated from the rest of business wealth.

Abbreviations

Countries

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

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