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Cashing in on Wealth: links between Wealth and Income Inequality from the Lens of Distributional Wealth Accounts

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Abstract

In past years, there have been several projects to include distributional aspects in the national accounts' framework. Household distributional information will also be covered in the forthcoming version of the System of National Accounts. Additionally, increasing emphasis has been put on covering all material aspects of welfare at the macro as well micro level in the same framework: income, consumption, and wealth. Several recent projects have followed such an integrated approach, covering these three dimensions in both micro data sources and in their application in distributional national accounts.

Our starting point is the Distributional Wealth Accounts (DWA), an experimental quarterly dataset currently under development by the European System of Central Banks. DWA integrates the Household Finance and Consumption Survey (HFCS) with macroeconomic statistics on household financial and non-financial balance sheets. In this article, using the same data sources – namely, retrieving distributional data from the HFCS – we extend the DWA framework to also cover income accounts. We estimate complete distributional non-financial accounts excluding capital account which are methodologically as well as from the data source point of view consistent with the DWA.

The rich information available in the DWA, complemented with data on income, will allow us to shed new light on the links between the income and wealth dimensions of inequality: it allows for example analysing income equality as well as the joint impact of income and wealth on inequality. In the latter part of the paper, we illustrate the potential use of this data set.

[1] 10 March 2023: preliminary/work in progress. This study builds on previous work of the Expert Group on Distributional Financial Accounts (EG-DFA). We are thankful for useful comments by Henning Ahnert, Pau Gayà Riera and Pierre Sola. Any errors or omissions remain entirely our own. The authors carried out parts of this work during their employment at the European Central Bank (ECB). Still, any views expressed in this paper are those of the authors and are not representative of the views of the ECB or the European System of Central Banks. L. Teles Morais gratefully acknowledges the financial support of the Portuguese Science Foundation (FCT) through PhD grant no. SFRH/BD/140788/2018, during which parts of this work were carried out. This paper uses data from the Eurosystem Household Finance and Consumption Survey. The results published and related observations and analysis may not correspond to results or analysis of the data producers.

1. Introduction

Distributional accounts of household income and wealth have during the past ten years been a central development area in economic statistics. Already the first G20 Data Gaps initiative covered household distributional information and set it as a priority. The currently renewed Data Gaps Initiative sets inclusion, which refers to distributional data, as a priority policy need.[2] Additionally, the future updated System of National Accounts is expected to include guidance on the distribution of household income, consumption and wealth.[3]

The distributional national accounts measures have received much political predominance. Partly strengthened by the recommendation by the report of Joseph E. Stiglitz, Amartya Sen, Jean-Paul Fitoussi (2009), the European Commission launched GDP and Beyond initiative, which included several motions to improve analysis social progress, one of them being distributional national accounts. As a result of this, Eurostat and the OECD have developed distributional accounts covering income accounts, consumption and saving.[4] The approach in this project is to break down national accounts totals and to focus overall on distribution.

Piketty, Saez and Zucman (2018) have developed distributional national accounts for several countries and these estimations are collected in the World Inequality Database. This approach differs from the other distributional accounts projects and in particular from the OECD's/Eurostat's distributional national accounts approach[5] in several senses: these account breaks gross national income by different households as the distributional accounts actual income of the households and they focus on household disposable income.[6] The other large approach difference is that Piketty et. al. focus on the income and particularly property income allocated to the richest households while the other distributional accounts aim to analyse the overall income distribution of the households.

In December 2015, in the context of the European System of Central Banks (ESCB), the Expert Group on Linking Micro and Macro data for Household Sector (EG LMM) was established to investigate the linkage between Household Finance and Consumption Survey (HFCS) - a household survey covering households' asset and liabilities launched in 2011- and Financial Accounts. Some papers concerning the data linking were written before establishing the EG LMM and they also provided a starting point for this work.[7] The work of this group did not only focus on the linkage as such but also on the main differences between the two statistics and the reasons for the gap between the two. The discussion on the gap between the two statistics focused much around missing rich as due to quite unequal wealth distribution, wealthy households might impact considerably on the distributional results.[8] The EG LMM delivered its final report in 2019 and the Expert Group on Distributional Financial Accounts (EG DFA) was established to continue this work.[9]

Development of the distributional income, saving and consumption is also already in progress by two separate expert groups led by Eurostat and the OECD, however they cannot be directly linked with the distributional household balance sheets from the experimental Distributional Wealth Accounts (DWA), the dataset prepared by the EG DFA. There are few differences between the OECD/Eurostat and ECB

[2] Recommendation 9 covers household distributional information. See: IMF, G20 DGI Recommendations and Data. IMF 2022.
[3] See: United Nations 2021.
[4] See: Coli,, Istatkov, Jayyousi, Oehler and Tsigas 2022.
[5] See about the OECD approach: Zwijnenburg, Bournot and Giovannelli 2017. Zwijnenburg, Bournot, Grahn and Guidetti 2021.
[6] More about the differences of these two approaches in: Zwijnenburg 2019.
[7] Kavonius and Törmälehto 2010. Honkkila and Kavonius 2013. Kavonius and Honkkila 2013.
[8] For example, the missing rich was applied in distributional wealth context in: Chakraborty et. al. 2016 which is available updated in: Chakraborty et. al. 2019. The methodology was further developed for instance in: Chakraborty and Waltl 2018. Cantarella et. al. 2021.
[9] The final report is available: ECB 2020.

in approaching the distributional wealth accounts. The OECD/Eurostat approach is mainly de-centralised meaning that the participating countries mainly compile the accounts and as a consequence use the best available data at country level. Only in the case of where country does not compile its accounts, the accounts compiled by these institutions by using internationally available data sources. The ECB has rather a co-ordinating the methodological development and use of the data sources where the internationally available data sources, i.e. mainly the HFCS, is used. By the same token the country comparability of these estimates is better than in the case of country-specific approach.

The purpose of this paper is to create joint distribution of income and wealth, with both conceptually and data-wise consistent with national accounts. We are using the HFCS as a source of distributional information on wealth and on income, as this is done in the case of DWA regarding wealth. The purpose is to connect these distributional income accounts with the distributional balance sheet accounts developed in the context of EG DFA. This allows us (1.) to analyse the plausibility of the estimation methods and to investigate an optimal way of estimating consistent income accounts and balance sheets; and (2.) to attempt to integrate income flows from financial investments and other household assets. We then present a few initial insights on the distribution of such income flows, as well as on the joint distribution of income and wealth, that can be obtained from this exercise. Finally, we analyse the plausibility of the results by comparing those to ones produced by OECD. The purpose of this comparison is to analyse the accuracy of the results but also to analyse how much the data estimated in this article differ from the OECD data which is compiled by using all available data sources.

This paper is organised as follows: First, we discuss the data and methodology, i.e. we provide a short description of the non-financial accounts and HFCS and how these data are connected. We also discuss the linkage of the balance sheet and income items and how the distributional wealth accounts are estimated. After this discussion, we focus on how consistent income and wealth accounts are estimated and then we discuss the results of this paper and how they compare with the results of the OECD. Finally, we conclude.

2. Data and methodology

2.1. Data HFCS and QSA

The Household Finance and Consumption Survey (HFCS) has been set up as a decentralised harmonised multi-national survey to collect micro data on household finances in the euro area as well as some EU countries outside the euro area. The survey focuses on household finances, including detailed information on assets and liabilities. The survey also covers income, few variables on consumption, demographics, inheritances/gifts and employment. Each euro area country (National Central Bank together with a survey agency or National Statistical Institute) is expected to conduct its own survey. The survey output is harmonised across involved EU countries, having a common set of target variables rather than questions, summarised in a "blueprint questionnaire". In addition, to maximise data comparability, survey methodologies across HFCS countries have been a priori harmonised to a large degree by introducing common recommendations on issues like survey mode, sampling, weighting, imputation and variance estimation. The survey is triannual and so far, there have been three survey waves on which the data have been released in April 2013, December 2016 and March 2020 respectively.

We use a combination of macroeconomic data from different sources, which together both provide accounts of the financial and non-financial assets of the household sector. This includes various aspects of households' financial balance sheets covering their evolution over time (i.e. price changes and other changes in volume), at a quarterly frequency. Finally, we also use data on income, from annual accounts of non-financial transactions, as they provide additional breakdowns compared to the quarterly accounts. For the purposes of this paper (in line with ECB practice) we label this integrated accounting systems and datasets Quarterly Sector Accounts (QSA) and Annual Sector Account (ASA).

The accounts are integrated, encompassing the transaction accounts and the balance sheet including other changes. The accounts for the euro area are compiled by the ECB according to the European System of Accounts (ESA2010), which is the European application of the System of National Accounts 2008 (SNA2008). The country level non-financial data are typically compiled by the National Statistical Offices and collected by Eurostat. The corresponding European aggregates are compiled by Eurostat. Correspondingly, the country level financial accounts data are typically compiled by the National Central Banks, in some cases statistical offices. The QSA and ASA both start in 1999, however for some countries detailed income breakdowns are available only starting from 2012.

The national accounts system is closed and the whole system covering the income accounts and balance sheet should be consistent. This consistency materialises in two ways. First, the non-financial transactions, including the income items, should be consistent with the financial transactions. However, this consistency would require financial transaction accounts, not only balance sheets, while only the latter ones are covered by the distributional balance sheets. Second, the property income flows should be consistent with the underlying assets, i.e. the income flows divided by the underlying balance sheets should correspond with the rates of returns from the other data sources.[10]

In the next subsection, we explain our proposed methodology to link the microeconomic information on distributions from the HFCS with the macroeconomic aggregates obtained from the annual and quarterly sector accounts. We rely heavily on work performed over the past years, while augmenting it to incorporate all significant components of household income.

[10] This aspect of the income flows and balance sheets have been analysed in: Kavonius and Honkkila 2016. Honkkila et. al. 2018.

2.2. Update of the linkage

In the context of the work of the Expert Group on the Distributional Financial Accounts (EG DFA), the distributional wealth accounts are already created and also applied in this paper. The corresponding estimation method and, in particular, the applied linkage is described in ECB (2020). The EG DFA work does not cover the income linkage, however the income linkage between Household Finance and Consumption Survey (HFCS) and National Accounts is presented in Honkkila and Kavonius (2013), regarding income instruments at have a close correspondence from a methodological perspective. We provide in this paper linkage also for income instruments without a direct correspondence, benefiting also from the distributional information available in the DWA as well from additional estimation models.

Table 1 shows a typology between the HFCS and national/sector accounts for all of the main components of disposable income, including instruments for which a direct correspondence between the two data sources is available - as presented in Honkkila and Kavonius (2013) - and also the instruments which do not have a direct correspondence in two statistics (marked with grey in the table).

Table 1. Typology between Household Finance and Consumption Survey (HFCS) and national/sector accounts

National accounts		**HFCS**
Generation of income account		
B2G	Operating surplus	Imputed based on value and size of the household main residence.
B3G	Mixed income	Self-employment income, Rental income from real estate property
Allocation of primary income account		
D11	Wages and salaries *(resource)*	Employee income
D12	Employers' social contributions *(resource)*	Not relevant, as it does not have an impact on disposable income.
D41G, D421, D422	Interest (without FISIM); Dividends and Withdrawals from income of quasi-corporations *(resource)*	Income from financial investments, Income from private business other than self-employment
D41G	Interest *(use)*	The distribution of outstanding amount of mortgages and private loans is a proxy.
D43	Reinvested earnings on foreign direct investment *(resource)*	Not relevant, as it does not have an impact on disposable income[11].
D441	Investment income attributable to insurance policy holders *(resource)*	The distribution of outstanding amount of life insurance is a proxy.
D442	Investment income payable on pension entitlements *(resource)*	The distribution of outstanding amount of voluntary pension insurance is a proxy.
D443	Investment income attributable to collective investment *(resource)*	The distribution of outstanding amount of mutual funds is a proxy.
D45	Rent *(use/resource)*	The distribution of self-employment income is a proxy.
Secondary distribution of income account		
D5	Taxes on income and wealth *(use)*	Imputed based on employee income, income from financial investments, income from private business other than self-employment.
D611	Employers' actual social contributions *(use)*	Not relevant, as it does not have an impact on disposable income.
D612	Employers' imputed social contributions *(use)*	Not relevant, as it does not have an impact on disposable income.
D613	Households' actual social contributions *(use)*	The distribution of employee income is a proxy.

[11] Reinvested earnings of households are zero for most of the euro area countries, with the exception of one country where small values are observed.

D62	Social benefits other than social transfers in kind *(resource)*	Income from occupational and private pensions, Income from public pensions, Income from unemployment benefits, Income from regular social transfers
D71	Non-life insurance premiums *(use)*	The distribution of household main residence is a proxy for the net non-life insurance premiums/claims.
D72	Non-life insurance claims *(resource)*	
D75	Miscellaneous current transfers *(resource)*	Income from private transfers
D75	Miscellaneous current transfers *(use)*	Gives alimony and charity payments

Note: The items without direct linkage are marked with grey.

Instrument with a direct correspondence

As presented in Table 1, direct linkages between sector accounts and HFCS can be established for some income instrument, however also for those instruments the linkage may not be fully one to one compatible, therefore some further information needs to be considered when applying this mapping.

Mixed income. In the context of national accounts, mixed income refers to the income sole-proprietorships and partnerships, which are classified to the household sector. In the case of mixed income, it cannot be distinguished which part of this income is compensation from the invested income and which part from the labour input. The self-employment income (and income from property rental) in the HFCS would best correspond with the entrepreneurial income of household sector but these data are available only few EU-countries. When the net property income flows to sole-proprietorships and partnerships are added to mixed income, the result is entrepreneurial income. Therefore, we keep this aggregation in our linkage exercise. We link the national accounts mixed income to the sum of the HFCS variables referring to income from self-employment and income from property rental.

Wages and salaries. The linkage between HFCS and Sector Accounts for wages and salaries is direct, however it needs to be noted that the sector accounts concept does not include employee stock options, which are covered by the HFCS. Additionally, wages and salaries in kind are included in the sector accounts, which are not a part of the HFCS.

Income from financial investments i.e. Interest (without FISIM[12]), dividends and withdrawals from income of quasi-corporations. It should be noted that the sector accounts concept of income from financial investments covers also interest and dividends received/paid by unincorporated enterprises. Additionally, in the standard sector accounts the interest flows exclude FISIM.

Social benefits other than social transfers in kind. Social benefits other than social transfers in kind have a mapping with HFCS at the total level, however theoretically, social benefits are available in sector accounts broken down by social security benefits in cash, private funded social benefits, unfunded employee social benefits and social assistance benefits in cash. However, this detail of data is not available in international sources and therefore also the linkage is provided only at the total level.

Miscellaneous current transfers (resource). This sector accounts item covers transfers from the sectors than government. However, the transfers between different households are practically consolidated in the Sector Accounts, and therefore not visible in that dataset.

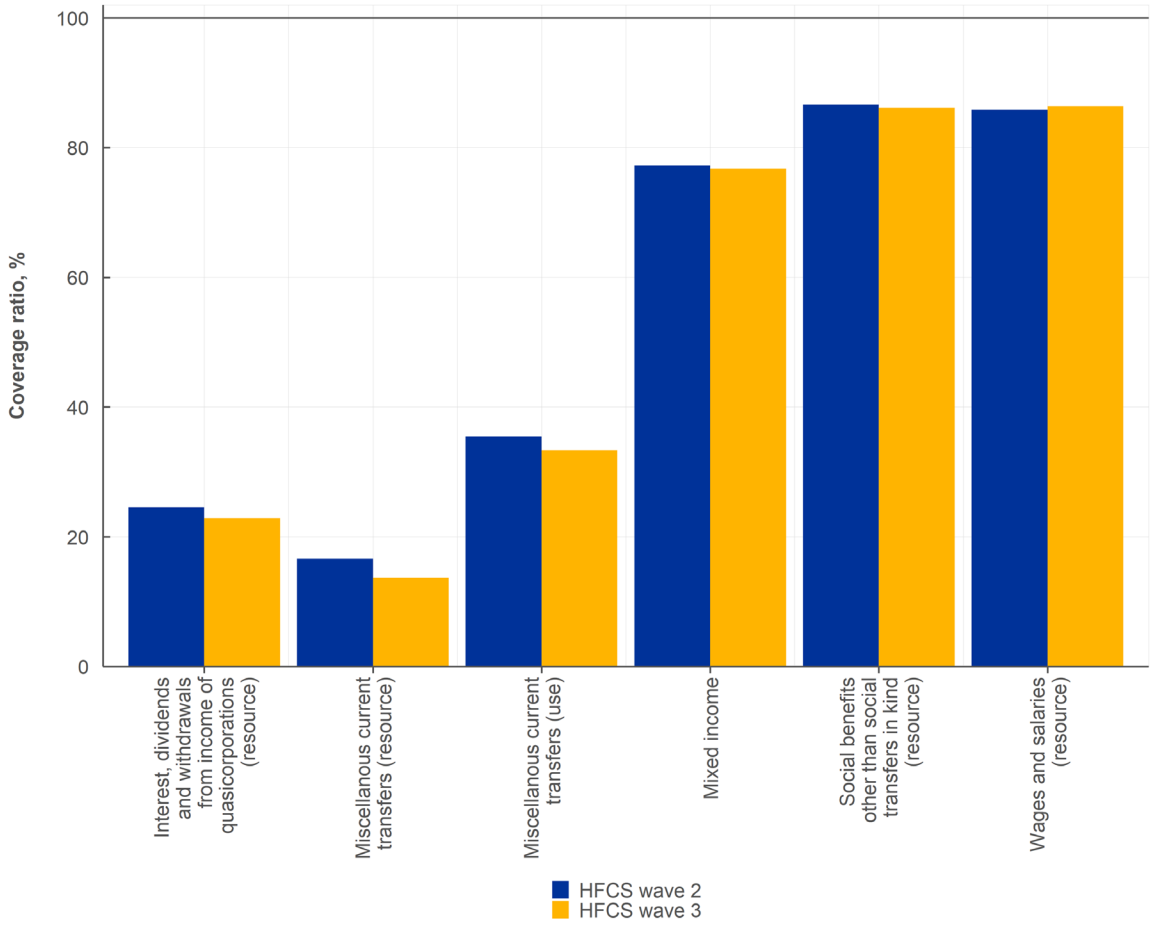
Miscellaneous current transfers (use). We link the use of current transfers with alimony and charity payments information available in HFCS, however it needs to be noted that this is only part of the

[12] FISIM stands for Financial Intermediation Services Indirectly Measured. It is an estimate of the value of the services provided by financial intermediaries, such as banks, for which no explicit charges are made, and are covered in the interest generated by certain financial assets such as deposits and loans.

transfers. In order to obtain a better linkage, also transactions such as membership payments etc. should in principle be included. However, those data are not in the HFCS.

For an indication of the comparability of HFCS and sector accounts sources, we compute the coverage ratio for each of the items with the direct linkage, i.e. the ratio of the estimate for the total in the HFCS and corresponding aggregates from the sector accounts. These are reported in Figure 1, for HFCS waves 2 and 3.

Figure 1 – Coverage ratios for income variables with direct linkage, HFCS waves 2 and 3, euro area



Source: Authors calculations based on ASA and HFCS.

Overall, the data on wages and salaries and social benefits from the micro and macro sources are quite comparable, with high coverage ratios across all countries (usually above 80%, with very few cases of over-coverage). For the other items, the gap is much wider. In particular, wide gaps are observed in income from financial investment and mixed income. Typically, the differences between property income are larger as partly due to data source limitation and partly due to unequal distribution these are difficult to capture. The mixed income is conceptually alone difficult, and it is not necessary even clear whether the target population in practice in surveys and national accounts is the same.

The coverage gaps in current transfers are also very high, with higher gap on the resources side, but those are typically very small item compared to other income sources (in the vast majority of countries, this item represent less than 3% of the total disposable income). Looking at the coverage ratios across the two observed waves, there are no major differences for any of the items.

Key features of the variables used for the comparison are given in Table 2 below, showing the totals for income from financial investments, and total financial assets (including deposits, listed shares,

investment fund shares, debt securities and unlisted equity)[13] for the euro area household sector. Values reported refer to sector accounts and totals estimated from the raw HFCS sample, respectively.

Table 2. Coverage and gross rate of return of income from financial investments and financial assets, HFCS waves 2 and 3, euro area

	Coverage ratio		Gross rate of return HFCS		Gross rate of return QSA	
	Wave 2	Wave 3	Wave 2	Wave 3	Wave 2	Wave 3
Income from financial investments	24.5%	22.9%	2.3%	1.9%	4.8%	4.1%
Financial assets	52.0%	48.8%	-	-	-	-

Source: Authors calculations based on QSA, ASA and HFCS data.

The coverage of financial assets in the HFCS is also quite low in wave 3. However, at close to 50% it is still substantially higher than the coverage of income from financial investments. This implies that the average gross return rate, computed simply as the ratio of total income to total financial assets, is much lower in the HFCS. The sector accounts return rate, 3.1%, is about double of that observed in the HFCS.

Such a difference could come from a general issue in capturing income from financial investments in the survey, or from the known under-sampling of wealthy households: the distribution of such income can be expected to be highly skewed, so this could have a large impact on the HFCS estimate of the aggregate amount.

Instrument without a direct correspondence

Concerning the rest of the income items, which do not have a direct correspondence between the HFCS and sector accounts and therefore distributional information cannot be directly derived from the HFCS, we estimate the distributions based on additional variables. Practically, to estimate distribution of these flows, one of the following approaches is used with the following priority:

a) imputations based on other available HFCS variables (e.g. taxes are imputed based on the received incomes, together with information on tax rates);

b) distributional information from the corresponding balance sheet item is used as a proxy [14] (e.g. investment income attributable to insurance policy holders is estimated to have the same distribution as stock of life insurance obtained from DWA);

c) distributional information from a related flow is used as a proxy (e.g. rent is estimated to have the same distribution as self-employment income).

Further comments on the linkage of instrument without a direct correspondence between the two data sources are presented below:

Interest (use). The HFCS does not include paid interest and therefore, the distribution of outstanding amounts of liabilities from DWA have to be used as a proxy for distribution of interests. The use of other property income is not relevant for the households.

[13] In the wealth inequality literature (e.g. Blanchet and Martinez-Toledano, 2023), typically the financial assets concept includes also claims linked to life insurance and voluntary pension entitlements. Here, we exclude this for consistency with the national accounts classification, in particular as income from such investments is not included in the item for income from financial investments.

[14] This is the same approach as applied in Kavonius and Törmälehto (2021, 2022).

Rent (use/resource).[15] This is a small item, related mainly to agricultural land, i.e. self-employment, therefore distribution of HFCS variable self-employment income is taken as the best proxy.

Non-life insurance premiums and non-life insurance claims. There is no direct correspondence for this income instrument in the HFCS. Also, non-life insurance is composed of different types of insurances, the largest being health, motor and property insurances (Insurance Europe, 2021), but a split between these types is not available. In lack of better information, we take the value of the household main residence as a proxy to estimate the distribution of the net non-life insurance premiums/claims.

Taxes on income and wealth and households' actual social contributions. Information on taxes and social contributions is not available in the HFCS and is therefore imputed based on underlying incomes. We follow an approach that has been used in the literature (Slacalek, 2020), which leverages data on tax wedges from external sources. These data are used to impute, for each household observation, an amount of income taxes and social contributions. In our case we use data on average tax and social contribution rates by income decile at the country level, obtained from EUROMOD (2020), so the tax rates applied will differ depending on the position of the observation in the gross income distribution. The taxes T_i and social contributions C_i for each observation *i* are then computed as follows:

$$T_i = \tau_{D_{inc}(i)} \times \left(\text{wage income}_i + \frac{2}{3}\text{self-employment income}_i\right)$$

$$C_i = \tau^{C}_{D_{inc}(i)} \times \left(\text{wage income}_i + \frac{2}{3}\text{self-employment income}_i\right)$$

where τ and τ^C represent, respectively the tax and contribution rate for each gross income decile D_{inc}. Following Slacalek (2020), as an assumption, only 2/3 of gross income from self-employment is regarded as taxable.

Operating surplus. We distribute operating surplus income based on imputed rents calculated at the household level from the HFCS. For the calculation of imputed rents, i.e. non-cash income in the form of housing services derived from owner-occupied residences (for which data is available in the HFCS), we essentially follow the procedure used in List (2023), which also uses the HFCS.[16] This procedure is based on the capital market approach, which relies on the market value of the owner-occupied residence, for which data is available in the HFCS (where it is referred to as household main residence, HMR). The procedure is summarized in the equation below:

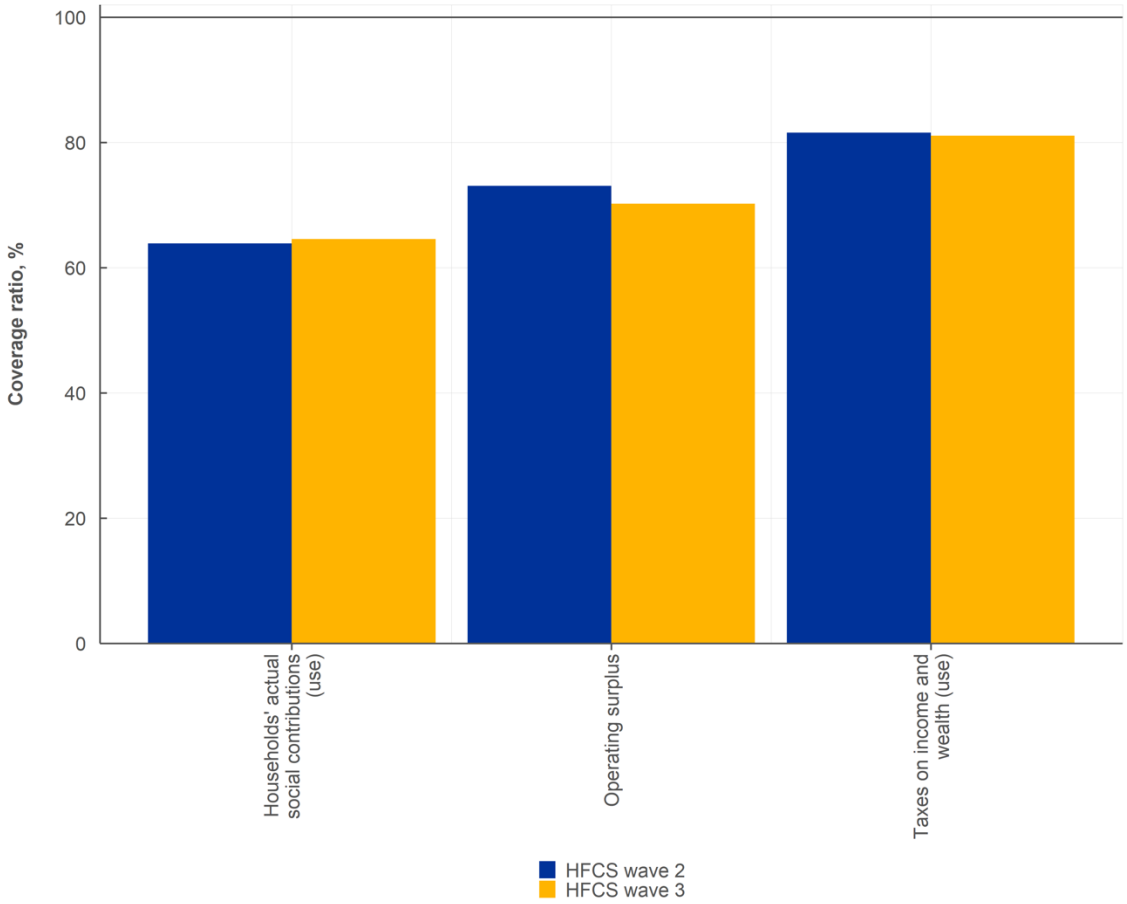
$$imputed\ rent_i = HMR\ value_i \times (r - \tau^P) - HMR\ size_i \times m$$

Where V_i is the market value of the household main residence, r is an exogenous interest rate (set at 3%), τ^P is the property tax rate, $S(V_i)$ is the size (in squared meters) of the residence, and m is a maintenance costs parameter. List (2023) also provides values for τ^P and m at the country level, [17] which we draw from.

Also for the income instrument with imputed values we assess the coverage ratios i.e. the ratio of the imputations for the total and corresponding aggregates from the sector accounts for an indication of the comparability between the two sources. These are reported in Figure 2 - Coverage ratios for income variables after incorporating imputations described above, HFCS waves 2 and 3, euro area.

[15] This does not include *rentals* namely from dwellings and underlying land, as in the national accounts, these are distinguished from *rents* pertaining to natural resources such as agricultural land (see ESA2010, p. 104)
[16] There is a small change with respect to the formula used there, as we calculate imputed rent based on the full value of the household main residence, without deducting mortgage debt.
[17] See Appendix S.1., Table A.5.

Figure 2 - Coverage ratios for income variables after incorporating imputations described above, HFCS waves 2 and 3, euro area



Source: Authors calculations based on ASA and HFCS.

For all of the three income items with imputed values, namely households' actual social contributions, operating surplus and taxes on income and wealth, the imputed values are relatively close to the sector accounts totals: we observe relatively high coverage ratios on the euro area level and also across countries (usually above 60%). The coverage ratios for imputed variables are overall of similar size as the items with direct linkage, i.e. mixed income, social benefits and wages and salaries presented in Figure 1 above.

2.3. Vertical linkages

In practice, there are two linkages between income and wealth. These linkages are called vertical linkages. The first one is the linkage between non-financial and financial transactions. The connecting balancing item is net lending/borrowing. However, the current data availability does not allow to estimate this for distributional accounts, mainly for three reasons. First, there is not enough data in the HFCS to estimate the breakdown for consumption and capital account and thus, estimate the distributional net lending/borrowing. Second, the distributional balance sheets do not cover the corresponding transactions and therefore, the estimation of distributional financial accounts net lending/borrowing is not possible. Third, at the macro level the financial and non-financial net lending/borrowing for household sector are not fully consistent.

Therefore, we focus here on a second, more specific aspect, namely the consistency of property income and underlying assets. As in Honkkila, Kavonius and Lefebvre (2018) and Kavonius and Honkkila

(2016), we focus on the consistency of interest income and underlying assets. According to ESA2010, interest (D.41) is property income receivable by the owners of certain specific financial assets for putting them at the disposal of another institutional unit. It applies to the following financial assets: (a) deposits (AF.2); (b) debt securities (AF.3); loans (AF.4) and other accounts receivable (AF.8).[18] For the other property income flows, there is not such a direct relation between the income flow and underlying assets as in the case of interests, i.e. there is no reference rate for instance for paid dividends.

This means that paid and received gross[19] interest should be consistent with these stocks, i.e. if these interest flows are divided by these stocks, the result should be either actually paid or received interest rate. It is important to notice that consistency does not mean one to one consistency with some reported market interest rate. The reason is that these "implicit paid/received interest rates" are based on interests that are paid/received on stocks which follow different interest contracts of past periods and therefore, the levels of these implicit rates cannot even correspond with the current market interest rates. The correspondence and consistency should therefore appear in the development of the actual time series. The level of actual market interest rate and the implicit interest rate should even be different, but the development/trend of these series should be similar.

2.4. Distributional wealth accounts methodology and its extension to household income items

The Distributional Wealth Accounts (DWA) are household distributional balance sheets including financial and non-financial assets and liabilities. An overview of DWA and the methodology used to build them is presented in detail by Engel et al. (2022) and in ECB (2020). We provide here a brief summary.

DWA are built by linking QSA financial data as well as data on non-financial assets for the household sector with distributional information from the HFCS. The instruments covered by the dataset currently cover roughly 90% of the total assets and liabilities of households. The remaining items, namely currency, pension entitlements and other accounts payable/receivable, were judged to suffer from low comparability between the macro and micro data sources and were therefore excluded (EG LMM Report, 2020). Moreover, social security claims are not considered here, as they are not part of household financial wealth in the national accounts.

Beyond conceptual concerns, there are further technical issues in linking the two sources. Such issues are reflected in the fact that aggregates estimated based on the HFCS do not fully cover the corresponding totals in the sector accounts, which are in general reliable. These so called "coverage gaps" vary widely, depending on the country and specific asset type. To achieve distributional statistics consistent with the national accounts, DWA include several adjustments to bridge these gaps. These linking steps are listed below:

1. **Population adjustment.** The different household populations between the HFCS and sector accounts are adjusted to correspond to the sector accounts population. This decreases the difference between the two sources roughly by one percentage point, for most euro area countries.
2. **Instrument coverage adjustments.** These are applied to both the HFCS and QSA data to ensure they are fully comparable and are mainly related to non-financial assets (e.g. regarding the institutional sector scope of the QSA data on housing, which also covers non-profit institutions); the quantitative impact of such adjustments is generally very small.
3. **Additional imputations to specific HFCS variables.** In the HFCS dataset, "managed accounts" are provided as a single variable, these are assets legally owned by the household,

[18] ESA2010, 4.42.
[19] i.e. without FISIM adjustment.

even if they are managed by an external party (e.g. a bank or investment fund). We reallocate these amounts to other balance sheet items. Similarly, bank deposits data are plagued with comparability issues, e.g. due to timing differences between the micro and macro data. A simple outlier detection and imputation model is used to adjust those data.

4. **Missing wealthy in the HFCS.** The missing wealth rich households are included in the DWA sample using information on the richest households, supplemented by Pareto estimation procedures. [20] The HFCS covers well middle-class household but typically, it misses rich households. As wealth is typically quite unequally distributed (considerably more than income), this has a considerable impact in most countries. The impact varies depending on how inequal the country is as well as what kind of oversampling strategies the HFCS national compilers have applied in order to capture these wealthiest households.
5. **Final proportional adjustment.** Finally, the households in the DWA sample are grossed up to the level of the sector accounts for each instrument. This implies that each household receives the same proportion of assets at instrument level to cover the remaining gap between the HFCS and sector accounts. It should be noted that this might change the ranking (according to their wealth) of the households in the sample (as the adjustments for individual instruments are different).

The DWA data used in this paper are built using all of these adjustments, following essentially the same methodology as described in Engel et al. (2022) and ECB (2020). These steps are first applied separately to the datasets from each HFCS wave. Then, an interpolation/extrapolation method is used to obtain adjusted dataset for the periods between HFCS waves and after the last wave.

This method consists, in essence, in linearly interpolating the observation weights between waves. The distributional estimates for the intermediate periods are a combination of the preceding and following HFCS waves, and in each period the wave closer in time has a greater overall weight. After the period corresponding to the last HFCS wave, the micro information is the same, i.e. the distribution of individual item holdings is kept fixed. Over this more recent period, changes in the distribution of wealth result only from the aggregate dynamics of different assets and liabilities, which affect households over the distribution in varying ways due to their different portfolio compositions. More details can be found in the cited papers.

The DWA methodology is then extended to disposable income and its subcomponents, in order to obtain income distribution consistent with the distribution of wealth in the original DWA dataset. Our method does not rely on any parametric model of the joint distribution of income and wealth. Further, it leaves the distribution of wealth unchanged with respect to the basic DWA process, including the estimation of a Pareto tail. In this paper, we complement DWA with a distribution of income based on income information available in the HFCS, consistent with the adjustments made to HFCS data in building DWA, i.e. broadly following the same steps 1.-5. as described above also for the income items.

We turn to providing more details on the imputations made to the wealthy households which are incorporated in the DWA dataset.

[20] Methodology for estimation of the missing rich was applied in distributional wealth context in: Chakraborty et. al. 2016 which is available updated in: Chakraborty et. al. 2019. It was further developed for instance in: Chakraborty and Waltl 2018. Cantarella et. al. 2021.

Imputations of income variables for “add rich” households

For most countries, the base DWA micro dataset contains, beyond the HFCS sample, some “added rich” households i.e., synthetic observations generated based on the estimated Pareto tail of the wealth distribution. To these “added wealth rich” households, estimates of all the different assets and liabilities components considered in the DWA are assigned. In the data presented in this paper, these synthetic households, generated based on the marginal distribution of net wealth, are complemented with imputed values for the income variables. To be clear, the micro dataset underlying the “income DWA” reported in this paper does not include any additional synthetic income-rich households, but only the “added rich” already used in the original DWA (as presented in Engel et al., 2022).

In general, the approach taken here is to impute micro level values based on the levels of those variables observed for the wealthiest observations in the HFCS sample for the respective country. The mean value of observations in the top decile by net wealth is taken for this purpose. This value is not taken from the original HFCS but from an intermediate adjusted micro data set which already incorporates adjustments up to the Pareto estimation step (i.e. population adjustment, instrument coverage adjustments, managed accounts and deposits imputations). This approach is applied for the income data relative to operating surplus income, mixed income, wages and salaries, social benefits and other current transfers.

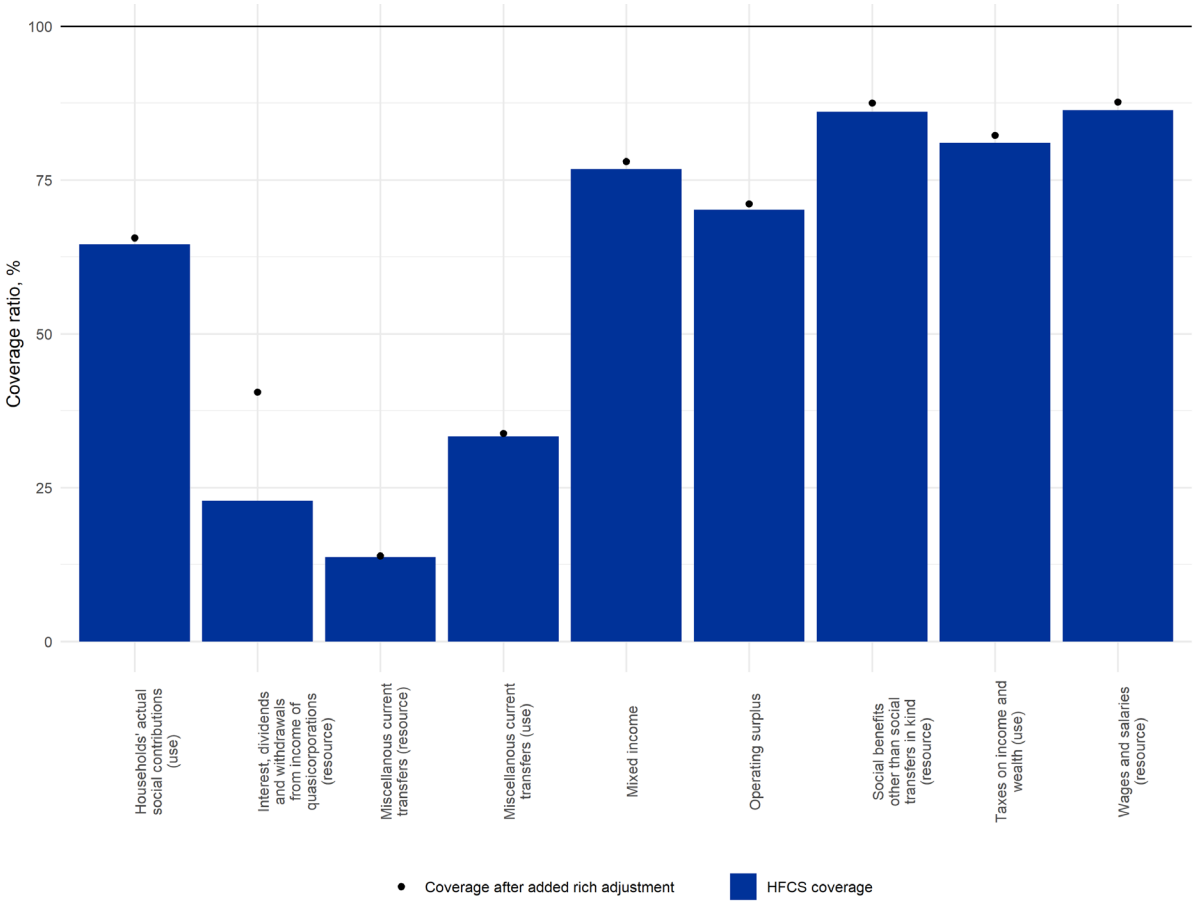
For income from financial investments, the imputations for the “added rich” households are instead based on the aggregate return rates calculated from the macro data on financial assets and the corresponding income flows. These return rates are multiplied by the financial asset amounts for each synthetic household, in order to impute financial income flow for the “added rich”.

For income taxes and social contributions, the imputations for the “added rich” are calculated based on the imputed values for the different income components, according to the same procedure used for HFCS observations.

Finally, in the case of variables which are distributed as proxies (i.e., distributional information is obtained from the corresponding balance sheet item or related income item) the final values, i.e. after all DWA adjustments, are taken. As such, they are also complemented with the “added rich”. This includes interest paid, life insurance and voluntary pensions, investment funds, social contributions, and non-life insurance premiums and claims.

The impact of the imputations of income variables for “add rich” households is presented in Figure 3, where the starting coverage ratio at HFCS level is compared with the coverage obtained after imputing the values for the added rich households. Since population adjustment has a very small impact on the improvement of the coverage ratio, it is not presented in the chart. The increase of the coverage ratio due to the added rich step is most notable for income from financial investments, as the added wealthy rich typically hold big amounts of financial assets and with this obtain high incomes from this address. Coverage for other income instruments is improved to a smaller extent.

Figure 3 - Coverage ratios for income variables in HFCS and after added rich adjustment, HFCS wave 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

3. Results and discussion

In this section, we present the results obtained from applying the described procedures to link income components in the HFCS to the annual sector accounts, in an analogous framework to the DWA. Throughout, we try to make comparison with the existing DWA time series and wealth concepts easy. We first provide an overview of the income and wealth distributions, both linked to the sector accounts, and in the second part provide additional details in the distributions of different income components and other heterogeneities. In the third part, we present the main results of this paper in the form of time series results for the distributions of income and wealth and lastly, we compare the results with the OECD distributional accounts.

We look at results for the euro area and mostly focus on results for 2017, matching HFCS wave 3 (the last currently available), with additional results comparing the last two HFCS waves mostly shown in the Appendix, and in the time series analysis we analyse the period from 2014 to 2021.

3.1. First glance at the distributions of income and wealth

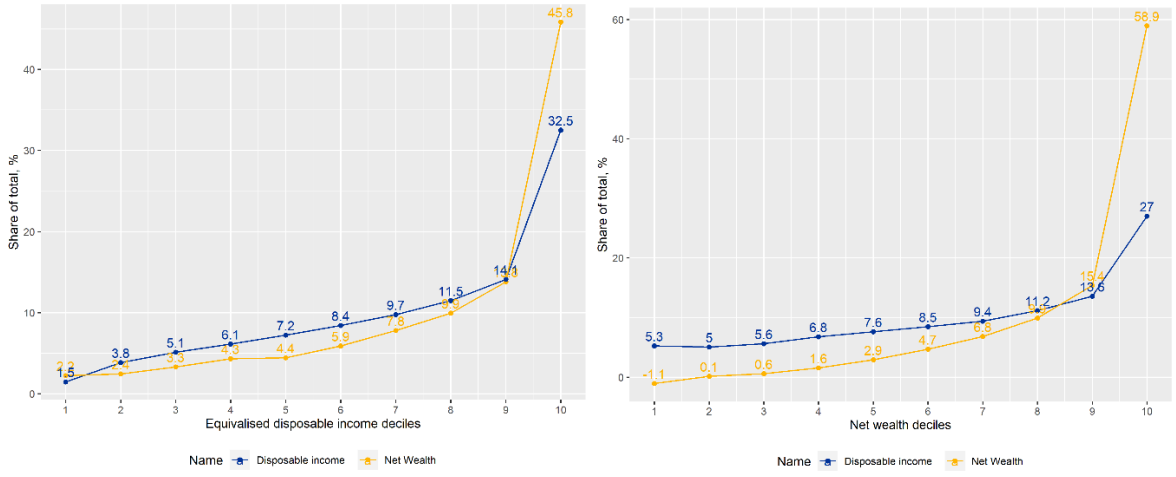
We begin by presenting the overall distributions of household wealth and income in our linked dataset. Throughout the ensuing results and discussions, household disposable income, equivalised disposable income and total net wealth refer to the following concepts:

- **Total disposable income** – in line with statistical standards, this refers to total income of a household, after taxes, social contributions and other deductions, which is available for consumption.
- **Total equivalised disposable income** – refers to total disposable income, divided by the number of household members converted into equivalised adults by using the modified OECD equivalence scale. [21]
- **Total net wealth** – refers to household wealth, i.e. financial and non-financial assets, net of liabilities. As explained in ECB (2020), assets are composed of deposits, debt securities, listed shares, unlisted shares and other equity, investment fund shares, life insurance and voluntary pension claims, housing wealth, "non-financial business wealth" (i.e. non-financial assets used for production purposes) while liabilities are composed of mortgage and non-mortgage loans.

The dataset obtained from our linkage exercise allows us to explore the distribution of overall household income and wealth including all of income components, as well as the joint distribution of income and wealth, after – in both cases –consistent with the sector accounts. In most of the analyses below, we group households into deciles, based either on their positions in the marginal distributions of equalised disposable income or based on their net wealth across the full sample (i.e. all countries) for each period/wave. When analysing the distribution across income groups, we use equivalised disposable income in order to ensure better comparability across different households' sizes and compositions.

Figure 4 shows the overall picture. The yellow lines show the distribution of net wealth, conditional on equivalised disposable income (i.e. by equivalised disposable income decile group) in the left panel and by net wealth decile group on the right panel. Likewise, the blue lines show the distribution of disposable income, conditional on equivalised disposable income on the left panel, and conditional on wealth decile on the right panel.

Figure 4 - Distributions of disposable income and net wealth by equivalised disposable deciles (LHS) and net wealth decile (RHS), HFCS wave 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

As commonly observed, the distributions of income and wealth are both strongly unequal and right skewed. In both cases, the top two deciles hold most of total income/wealth, although with a clear difference between the two, as wealth is visibly more unequal than income. The top 10% share of wealth is around 60%, while the top 10% share of income is only 32.5%.

[21] The OECD modified equivalence scale allocates a weight of 1 to the first adult, 0.5 to the second and each subsequent person aged 14 and over; and 0.3 to each child aged under 14 (OECD, 2013).

A first look at the joint distributions shows already a complex pattern. Although the sharing of wealth across income deciles is already more equal than the marginal distribution of wealth, still the highest income households are far more likely to also have high wealth – the top 10% earners hold about 46% of wealth. Conversely, the wealth-richest households have a reasonably high income, but the distance to the wealth-middle class is not so large. This is consistent with a joint distribution where wealthy households do not necessarily earn large incomes at the same time.

Some further insight into the characteristics of the joint distribution of income and wealth as estimated in our data can be obtained from Table 3, which reports how the population is distributed jointly by different income and wealth decile groups. Each cell reports the share of population belonging both to the income decile in the vertical axis and the wealth decile in the horizontal axis. Note that, if all households belonged to the same decile in the marginal distributions of both income and wealth, there would be 10% of the population in each cell of the main diagonal in the matrix in Table 3, while all others would be zero.

Table 3. Cross-tabulation of the joint distribution of population by equivalised disposable income and net wealth deciles, HFCS wave 3, euro area

		Net wealth decile										
		1	2	3	4	5	6	7	8	9	10	Total
Equivalised disposable income decile	1	2.5%	1.8%	1.4%	1.0%	0.7%	0.6%	0.5%	0.4%	0.5%	0.5%	10%
	2	1.7%	1.7%	1.8%	1.2%	1.1%	0.8%	0.7%	0.5%	0.3%	0.3%	10%
	3	1.2%	2.0%	1.4%	1.2%	1.3%	0.9%	0.7%	0.6%	0.4%	0.3%	10%
	4	1.2%	1.3%	1.4%	1.4%	1.1%	1.0%	0.8%	0.8%	0.5%	0.3%	10%
	5	1.1%	1.0%	1.2%	1.3%	1.2%	1.3%	0.9%	0.9%	0.7%	0.4%	10%
	6	0.8%	0.9%	1.0%	1.2%	1.3%	1.3%	1.2%	1.1%	0.7%	0.5%	10%
	7	0.7%	0.6%	0.6%	1.0%	1.1%	1.3%	1.4%	1.5%	1.1%	0.7%	10%
	8	0.5%	0.4%	0.5%	0.7%	1.1%	1.3%	1.8%	1.4%	1.5%	0.9%	10%
	9	0.2%	0.3%	0.4%	0.7%	0.8%	0.9%	1.3%	1.8%	2.0%	1.7%	10%
	10	0.1%	0.1%	0.2%	0.3%	0.4%	0.5%	0.6%	1.2%	2.2%	4.4%	10%
	Total	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	100%

Source: Authors calculations based on QSA, HFCS and DWA data.

Large differences between the decile position of a given household in the two distributions are relatively rare. Still, the correspondence between households' positions on the income and wealth distributions is far from perfect. Note, for example, that households from the middle quintile (sum of deciles 5 and 6) by income are well represented in the bottom 10% of net wealth (~1.9%), while the inverse occurs much less (~1.3%). Such a pattern would be consistent with the existence of a group of relatively young households with high income, who at an early stage of the life cycle have not yet accumulated substantial wealth.[22]

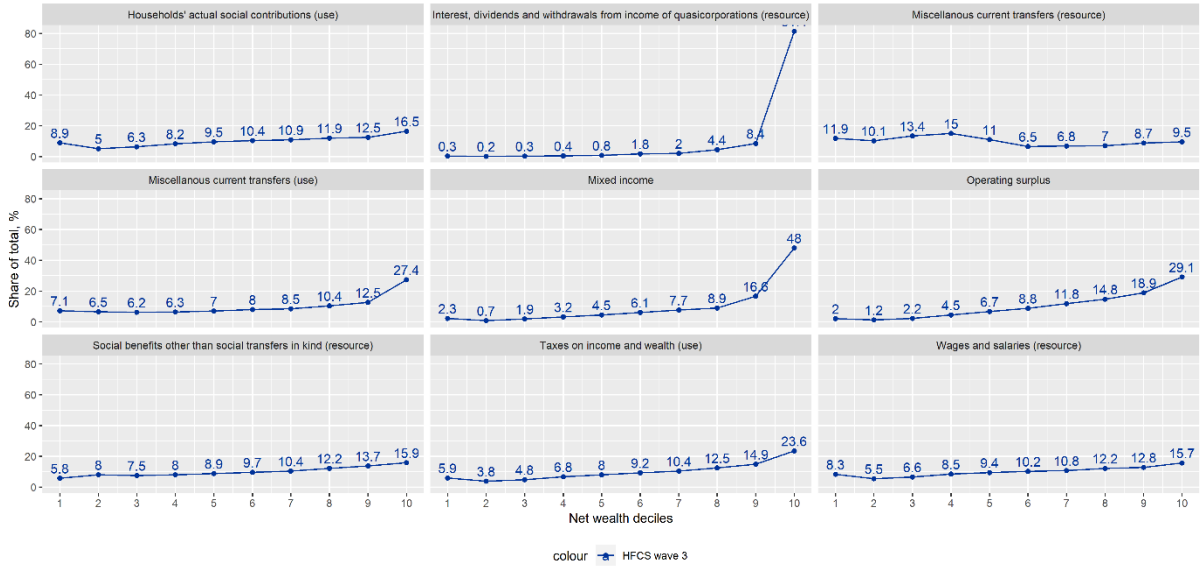
[22] We aim to complement the current analysis with a life cycle component, taking advantage of the data available in the HFCS on household characteristics including age.

3.2. Distributions of different income components and other heterogeneities

Distributions of income components

In Figure 5 below, we show the distributions by net wealth decile group of the 9 directly matched or imputed income categories listed earlier, for the period matching HFCS wave 3. This gives a first picture of the joint distribution of income and wealth in our data.

Figure 5 – Distributions of directly matched or imputed income variables conditional on net wealth decile, HFCS wave 3, euro area



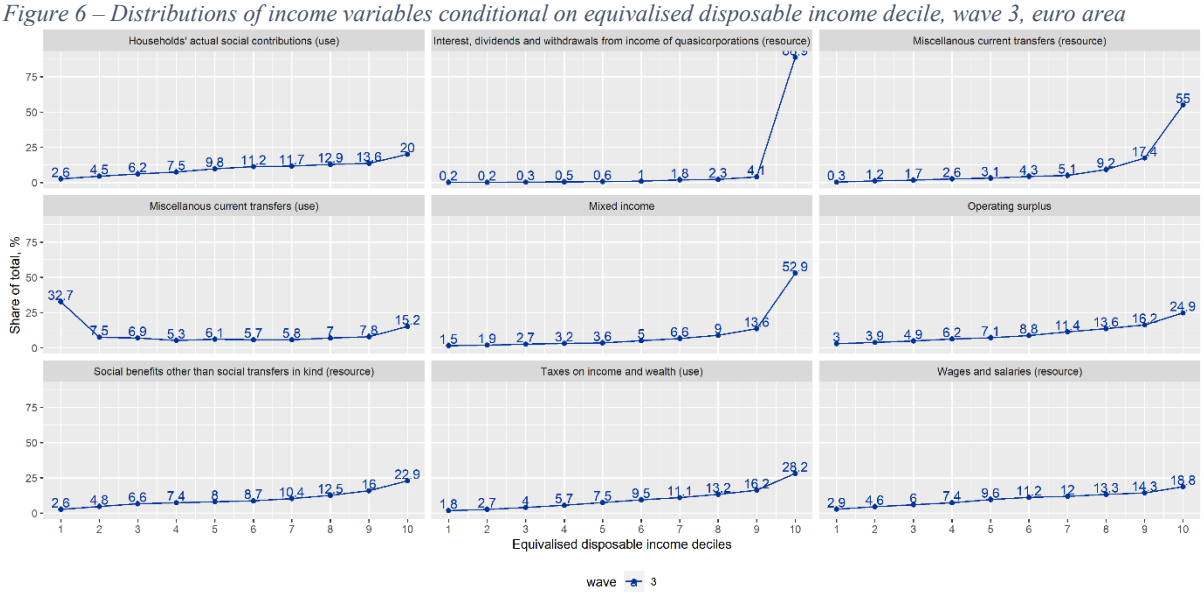
Source: Authors calculations based on QSA, HFCS and DWA data.

The distribution of income on financial investments, i.e. interest, dividends and withdrawals from income of quasi-corporations is clearly more unequal compared to the other categories, with substantially higher share of income received by the top 10% households, and also by the next 10% (decile 9). A more unequal distribution is also observed in mixed income, however to a smaller degree compared to financial investments. The observed patterns do not seem to change over time, as the picture across HFCS waves shows (Figure 12 in Appendix).

The distributions reported in Figure 5 can be compared with the distribution of net wealth reported in the previous subsection (Figure 4, right panel), in both cases by net wealth decile groups. Note that the income from financial investments and mixed income, which is generated from the wealth invested in financial and non-financial assets, is less unequally distributed than this underlying wealth. This is corroborated by the analysis of implicit return rates on financial investments performed in the next subsection.

Figure 6 shows the distributions of the same items, but now ordering households by equivalised disposable income decile. The patterns look similar, even if the skewness of the distribution of labour income is now more evident. Also, in the case of income distribution, the observed patterns do not seem to change over time, as the picture across HFCS waves shows (*Figure* 13 in Appendix).

Figure 6 – Distributions of income variables conditional on equivalised disposable income decile, wave 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

The above patterns show a distribution of income from financial investments and mixed income (investments in non-financial assets) that is much more unequal compared to the income sources related to labour earnings (wages and social benefits). Top shares are more than twice as high in the capital income sources (i.e. financial investments and mixed income) than in wages. This goes in line with the expected pattern: capital income, originating in financial and non-financial wealth, which is highly concentrated at the top, appears to make an important contribution to overall income inequality.

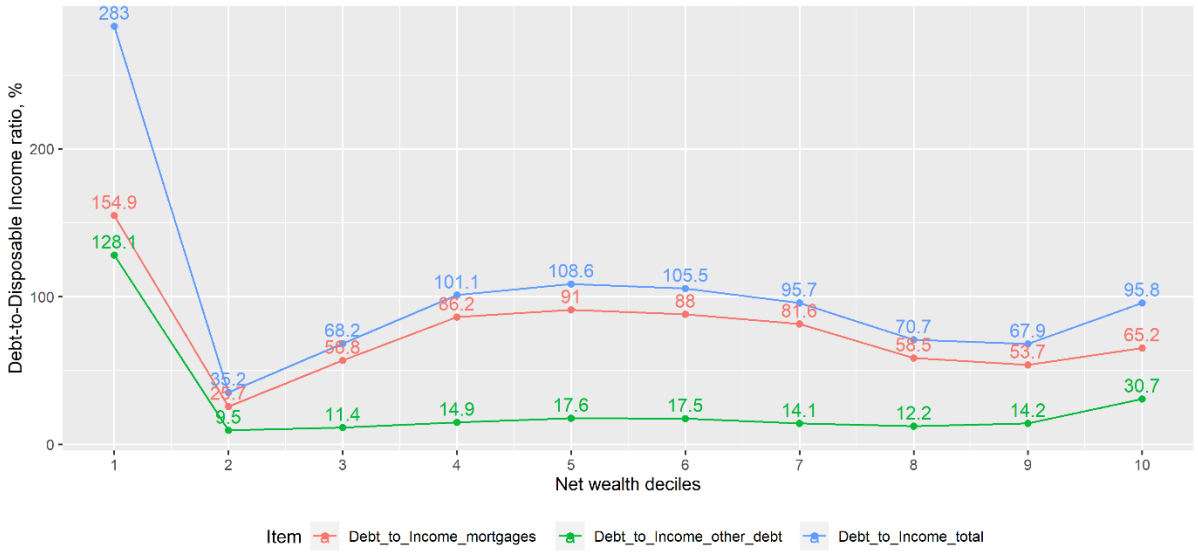
It should be noted that these results must be taken with some degree of caution. First, our imputations at the top of the distribution (income of "added rich" households, as explained in Section 2) may miss the mark. Second, the coverage gaps observed in some of the above income components are relatively high, which may suggest the distributions in the HFCS may be inaccurate or poorly comparable with their sector accounts counterparts. An important assumption in the linking procedure is that the distribution of the "gap" (i.e. the income amounts added to the micro dataset in order to match the sector accounts aggregates) is broadly similar to the pre-existing distribution in each instrument. Insofar as this assumption might miss the mark, there would be some degree of error in the presented distributions.

Debt-to-income ratios

Figure 7 and Figure 8show the development of the debt-to-disposable income ratio across, respectively, equivalised disposable income and net wealth deciles, for wave 3. This ratio presents a crude measure of debt service burden and is commonly used for analyses regarding financial stability[23]

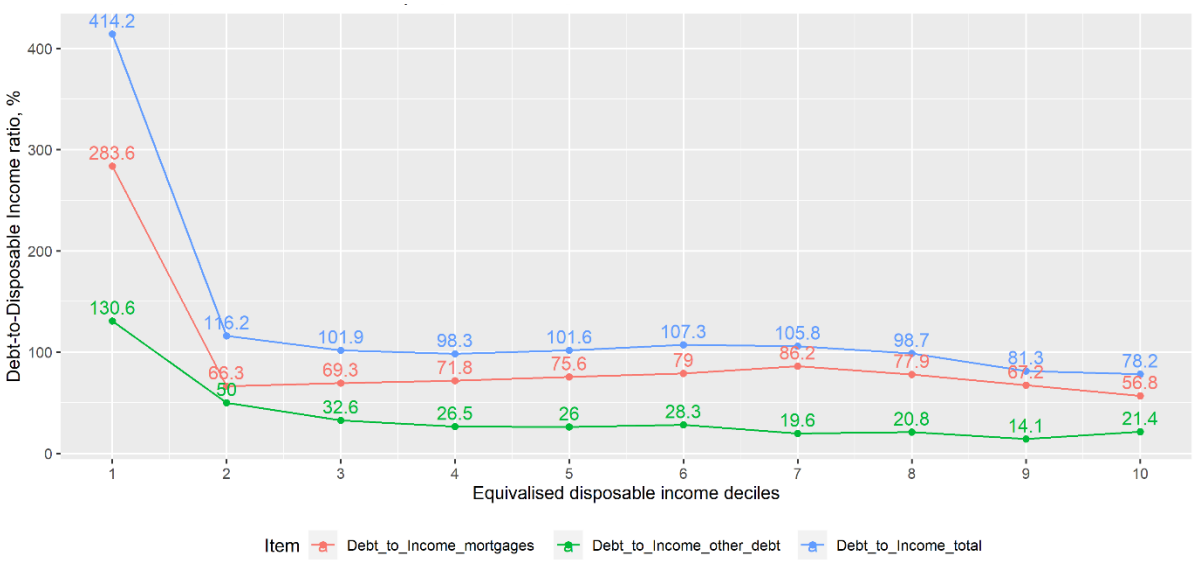
[23] An example of such an analysis for the euro area is Ampudia et al. (2016).

Figure 7 – Debt-to-disposable income ratios by net wealth decile, wave 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

Figure 8 – Debt-to-disposable income ratios by equivalised disposable income decile, wave 3, euro area



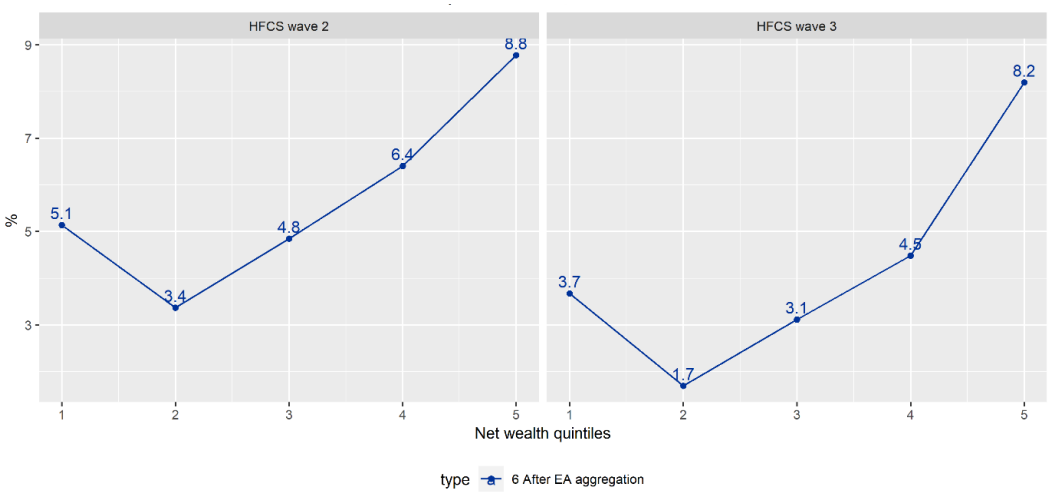
Source: Authors calculations based on QSA, HFCS and DWA data.

The ratio is decomposed in mortgage debt and other debts, shown by the red and green curves respectively, adding up to the total debt-to-income ratio, plotted in blue. A mass of very highly indebted households is located at the bottom deciles both by income and wealth. However, there is a clear difference between the income distribution and wealth distribution in this sense. Along the income distribution this ratio is rather flat for higher deciles. High income earners are slightly less indebted, but the difference is not large. Conversely, when looking at this ratio along the wealth distribution, the patterns are more complex. There is a trough in the 2nd decile, with the ratio then increasing over the first few bottom deciles (except the 1st), peaking at decile 5, and then stabilizing or declining slowly, with a second peak at the top. The plots also show that most of this pattern is driven by mortgage debt, except for the peak at the top decile where other debt seems to play a role.

Gross rates of return

In Figure 9 and Figure 10 we observe gross return rates on financial investments. These are computed at the household level as income from financial investments (which is provided as a single variable), divided by the sum of outstanding financial assets (which include deposits, listed shares, investment fund shares, debt securities and unlisted equity), across, respectively, equivalised disposable income and net wealth quintiles. Each of the figures includes two charts, one for each HFCS wave period 2 and 3.

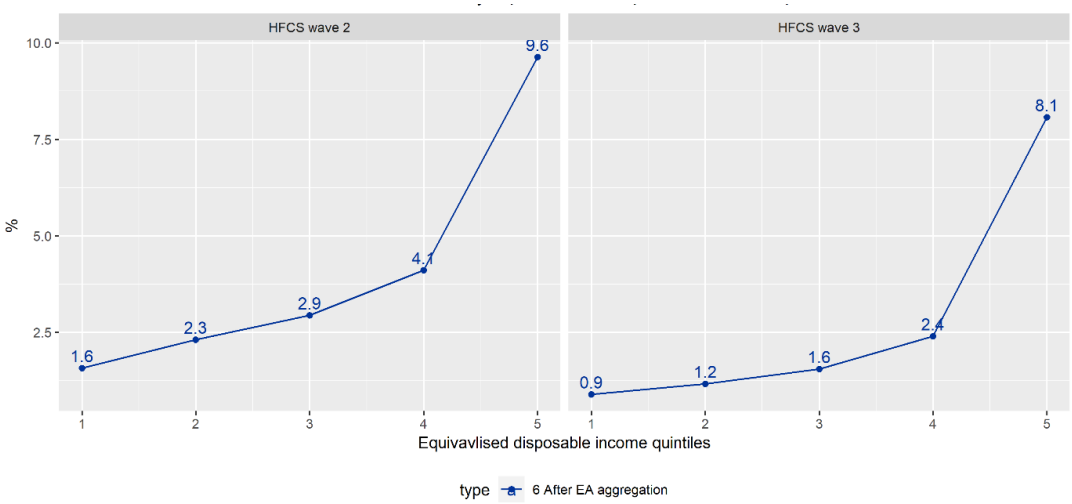
Figure 9 – Gross rates of return on financial investments by net wealth quintile, HFCS waves 2 to 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

The bottom quintile has higher returns than the next quintile. This perhaps surprising pattern suggests the presence of some highly indebted households, but relatively asset and/or income-rich in the bottom wealth quintile, who exhibit higher returns compared to other households at the bottom of the wealth distribution. This bottom "peak" in returns seems to be present in other studies of returns on wealth (see namely Fagereng et al., 2020, Fig. 2.A and OA.16.A). Then, an increasing pattern can be observed, with the highest returns observed at the top of the distribution.

Figure 10 - Gross rates of return on financial investments by equivalised disposable income quintile, HFCS wave 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

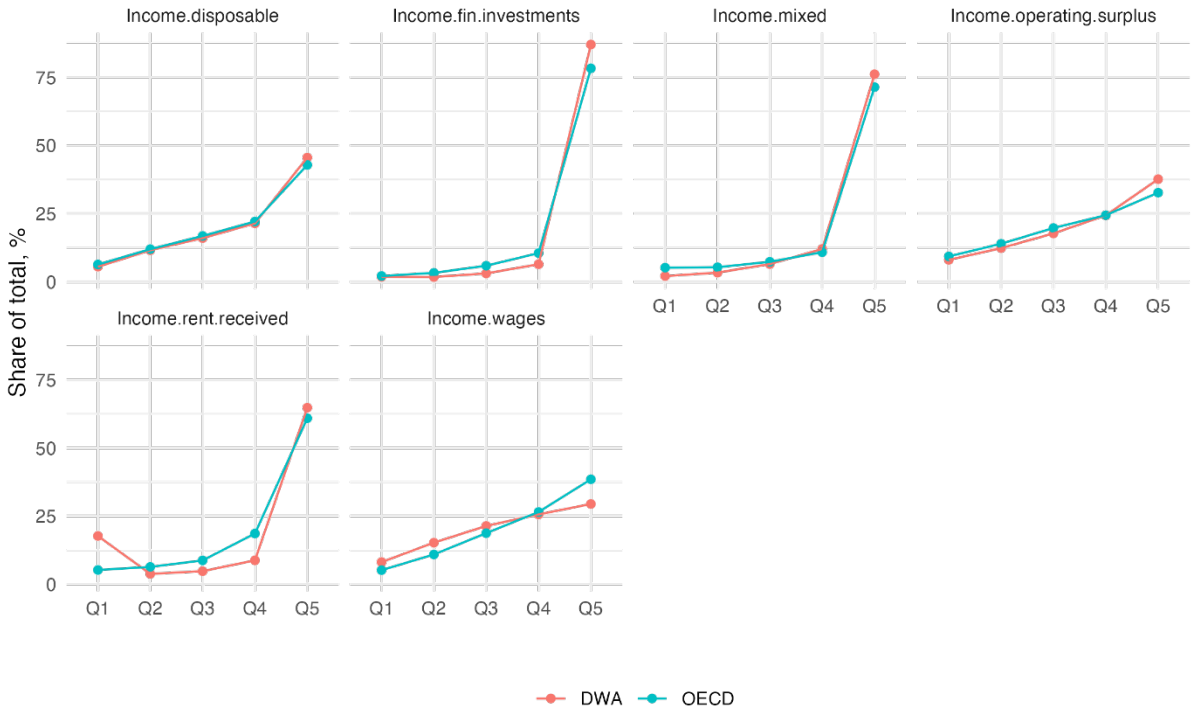
Conversely, the relationship with the income level is slowly increasing from quintiles 1 to 4, and reaching a high peak in quintile 5, as presented in Figure 10. As households' income level increases, the returns on financial wealth increase strongly, from close to zero at the bottom to levels clearly above average at the top. No clear differences emerge across waves, regarding the inequality of these returns.

Note that the very high average returns observed for top quintiles may in part be a product of our linkage exercise, given the high coverage gaps in income from financial investments. The large amounts added to the income of the richest households may lead to an overstatement of their return rates.

3.3. Comparison with OECD distributional income accounts

Finally, we compare some indicators in our dataset with the distributional income accounts data recently compiled by the OECD (Zwijnenburg et al. 2021). Since this data does not include all euro area countries, nor years matching the two waves of the HFCS, we cannot compare directly with the data presented in the previous sections. Therefore, we compare the average of the available countries, weighted by aggregate household net wealth. We look at the distributions, by quintile, of different income components, pictured in Figure 11. It should be clarified that the totals over all quintiles generally match by construction (as explained in Section 2), with some limitations due in particular to different vintages: the OECD data were compiled around 2017 and were not updated since then, while the data used for our exercise were updated up to 2022 Q3.

Figure 11 – Distribution of different income components in DWA and OECD data, average of available countries



Source: Authors calculations based on OECD, HFCS and DWA data.

As the figure shows, in general the distribution by quintile looks quite close, including for the shares held by the top quintile, for most items. This includes total disposable income and, importantly for the purpose of wealth analysis, capital income items such as mixed income and income from financial investments. The top shares are slightly higher in the DWA case, suggesting that the method used of imputing high income to "wealth rich" households does not yield very different results from a method which supplements the survey data based on a Pareto tail estimation on the income distribution, as in the data compiled by the OECD.

4. Conclusions

This paper extends the framework of the Distributional Wealth Accounts to also cover household income components required to compile household's equivalized disposable income, allowing to produce a joint distribution according to net wealth and disposable income, with both concepts matched with Sector Accounts. The first part of the paper presents the data and methodology, where the linkage between HFCS and the sector accounts income items is presented. As in DWA, the distributional information on income is obtained from the HFCS, adjusted for population differences, enhanced with the missing wealthy observation and grossed up to match the Sector Accounts aggregates. In the second part of the paper, preliminary results of these distributional income accounts are presented and discussed, focusing on both net wealth deciles as well as equivalized disposable income deciles. All the data presented refer to the euro area and for the years corresponding last two currently available HFCS waves or in the case of time series for period from 2014 to 2021.

With consistent wealth and income distributional accounts, we shed new light on economic inequalities in the euro area. Just by looking at the joint distributions of total disposable income and net wealth, we can already observe a rather complex pattern. Net wealth is more equally distributed when looking at the distribution per income deciles compared to the distribution per wealth deciles, however the highest income households are still more likely to also have high wealth. We also observe that less than a quarter of households belong to the same decile in both distributions.

With this novel dataset, we can also focus on specific subitems of income and wealth, as well as on relevant measures that can be derived from them. In this paper we focus on debt-to-income ratios and on gross rates of return, both analysed in respect to equivalised disposable income and wealth deciles. Debt-to-income ratios are rather flat across all income deciles (with the exception of the first income decile), however there are more complex patterns when looking at the wealth deciles, showing higher indebtedness of the middle- and top-income decile. In the case of gross rates of return, a strong increasing pattern may be observed in the distribution per income, whereas a concave pattern can be identified when looking at the distribution of returns per net wealth.

Overall, the join distribution of income and wealth accounts presented in this paper show promising results, especially for the more equally distributed income components which also tend to have a higher coverage, which can also be seen from the comparison with the country results based on the methodology agreed with the OECD.

References

Ampudia, M., Van Vlokhoven, H., and Żochowski, D. (2016). Financial fragility of euro area households. *Journal of Financial Stability*, *27*, 250-262.

Cantarella, M., A.Neri , and M. G. Ranalli (2021). Mind the wealth gap: a new allocation method to match micro and macro statistics for household wealth. (Questioni di Economia e Finanza (Occasional Papers); Vol. October 2021, No. 646). Banca d'Italia. https://www.bancaditalia.it/pubblicazioni/qef/2021-0646/QEF_646_21.pdf?language_id=1

Chakraborty, R., I. K.Kavonius , S. Pérez-Duarte , and P. Vermeulen (2016). Is the Top Tail of the Wealth Distribution the Missing Link between the Household Finance and Consumption Survey and National Accounts? IARIW 34th General Conference, Dresden, Germany, August 21-27, 2016. Retrieved 21 June 2022, from http://old.iariw.org/dresden/chakraborty.pdf

Chakraborty, R., I. K. Kavonius , S Pérez-Duarte., and P. Vermeulen (2019). Is the Top Tail of the Wealth Distribution the Missing Link between the Household Finance and Consumption Survey and National Accounts? Journal of Official Statistics, 35(1), 31-65. https://doi.org/10.2478/jos-2019-0003

Chakraborty, R. and S. R. Waltl, (2018). Missing the wealthy in the HFCS: micro problems with macro implications. Working Paper Series, no. 2163, European Central Bank.

Coli, A., R. Istatkov, H. Jayyousi, F. Oehler and O. Tsigas (2022). Distributional national account estimates for household income and consumption: methodological issues and experimental results. Eurostat Manuals and guidelines, OECD and Eurostat, Luxembourg.

Engel, J., P. Gayà Riera , Grilli, J. and P. Sola, (2022), Developing reconciled quarterly distributional national wealth – insight into inequality and wealth structures. Working Paper Series, no. 2687, European Central Bank.

EUROMOD (2020). EUROMOD statistics on Distribution and Decomposition of Disposable Income version no. I3.0+.

European Central Bank (ECB 2020): Understanding household wealth: linking macro and micro data to produce distributional financial accounts. Expert Group on Linking macro and micro data for the household sector. European Central Bank Statistics Paper Series No 37/July 2020, https://www.ecb.europa.eu/pub/pdf/scpsps/ecb.sps37~433920127f.en.pdf

European System of Accounts 2010 (ESA2010), Publications Office of European Union, Luxembourg 2013.

Honkkila, J., I. K. Kavonius and L. R. Lefebvre (2018). Linking Macro and Micro Household Balance Sheet Data – time series estimation. IARIW 35th General Conference, Copenhagen, Denmark, August 20-25, 2018. Retrieved 21 June 2022, from http://old.iariw.org/copenhagen/kavonious.pdf

Honkkila, J. and I. K. Kavonius (2013). Micro and macro analysis on household income, wealth and saving in the euro area. European Central Bank Working Papers No 1619, https://www.ecb.europa.eu//pub/pdf/scpwps/ecbwp1619.pdf

IMF, G20 DGI Recommendations and Data, https://www.imf.org/en/News/Seminars/Conferences/DGI/g20-dgi-recommendations-and-data#:~:text=In%202009%2C%20the%20G20%20Finance,following%20the%20global%20financial%20crisis.

IMF (2022): G20 Leaders Welcome New Data Gaps Initiative to Address Climate Change, Inclusion and Financial Innovation, https://www.imf.org/en/News/Articles/2022/11/28/pr22410-g20-leaders-welcome-ndgi-to-address-climate-change-inclusion-financial-innovation

Insurance Europe (2021). European insurance industry database, updated 5 August 2021, https://www.insuranceeurope.eu/statistics

Kavonius, I. K. and J. Honkkila (2016). Deriving household indebtedness indicators by linking micro and macro balance sheet data. Statistical Journal of the IAOS, vol. 32, no. 4, pp. 693-708, https://doi.org/10.3233/SJI-161017

Kavonius, I. K., and J. Honkkila (2013). Reconciling Micro and Macro Data on Household Wealth: A Test Based on Three Euro Area Countries. Journal of Economic & Social Policy, 2013(2), [3].

Kavonius, I. K. and V-M. Törmälehto (2010). Integrating Micro and Macro Accounts – The Linkages Between Euro Area Household Wealth Survey and Aggregate Balance Sheets for Households. IARIW 31st General Conference, St-Gallen, Switzerland, August 22-28, 2010. Retrieved 20 June 2022, from http://www.iariw.org/papers/2010/7aKavonius.pdf

Kavonius, I. K., and V-M. Törmälehto (2022). Is the financial market driving income distribution? – An analysis of the linkage between income and wealth in Europe. European Central Bank Working Paper Series; No. 2707, European Central Bank. https://doi.org/10.2866/934742

Kavonius, I. K. and V-M. Törmälehto (2021). Is the Financial Market Driving the Income Distribution? – An analysis of the Linkage between Income and Wealth in Europe. IARIW 36th General Conference, Oslo, Norway (online), August 23-27, 2020. Retrieved 21 June 2022, from https://iariw.org/wp-content/uploads/2021/08/iariw_kavonius_tormalehto_paper.pdf

List, E. (2023). Housing and Income Inequality in Europe: Distributional Effects of Non-Cash Income From Imputed Rents, Review of Income and Wealth https://doi.org/10.1111/roiw.12597

OECD (2013), *OECD Framework for Statistics on the Distribution of Household Income, Consumption and Wealth*, OECD Publishing, Paris, https://doi.org/10.1787/9789264194830-en.

Piketty, T., E. Saez and G. Zucman (2018). Distributional National Accounts: Methods and Estimates for the United States. The Quarterly Journal of Economics, Vol. 133, Iss. 2, Pages 553–609, https://doi.org/10.1093/qje/qjx043

Stiglitz, J.E., Sen, A. and Fitoussi, J.P. (2009). Report by the Commission on the Measurement of Economic Performance and Social Progress, https://ec.europa.eu/eurostat/documents/8131721/8131772/Stiglitz-Sen-Fitoussi-Commission-report.pdf (uploaded: 17 January 2023).

United Nations (2021). WS.2 Distribution of household income, consumption and wealth. System of National Accounts Global Consultations, https://unstats.un.org/unsd/nationalaccount/RAdocs/WS2_Dist_HH_Inc_Cons_Wealth_Paper.pdf

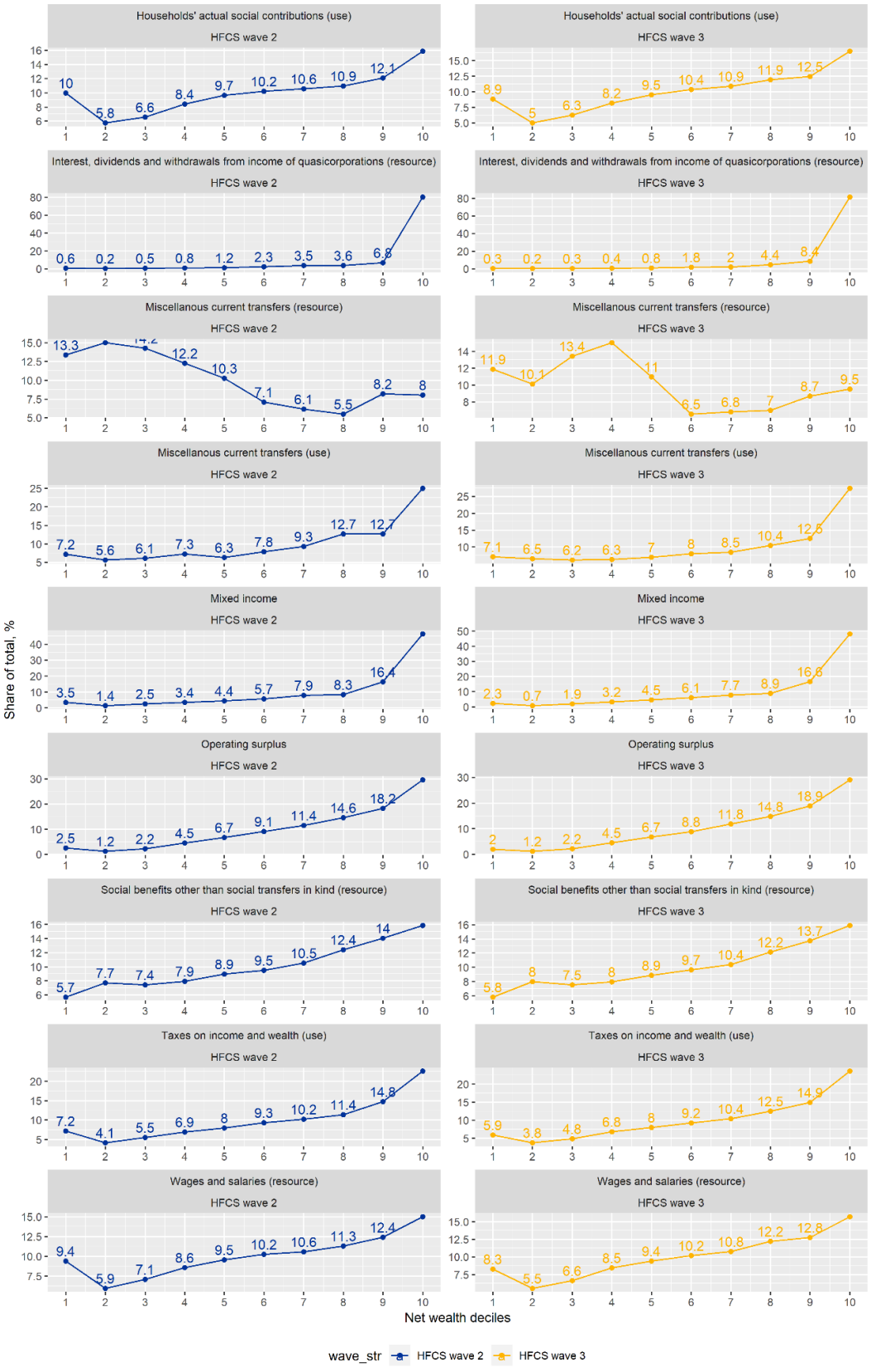
Zwijnenburg, J., S. Bournot and F. Giovannelli (2017). OECD Expert Group on Disparities in a National Accounts Frame-work—Results from the 2015 Exercise. OECD Statistics Working Paper No. 76.

Zwijnenburg, J., S. Bournot, D. Grahn and E. Guidetti (2021). Distribution of household income, consumption and saving in line with national accounts – Methodology and results from the 2020 collection round. OECD Statistics Working Papers, No 01.

Zwijnenburg, J. (2019). Unequal Distributions: EG DNA versus DINA Approach. AEA Papers and Proceedings, 109, 296– 301, 2019. https://doi.org/10.1257/pandp.20191036.

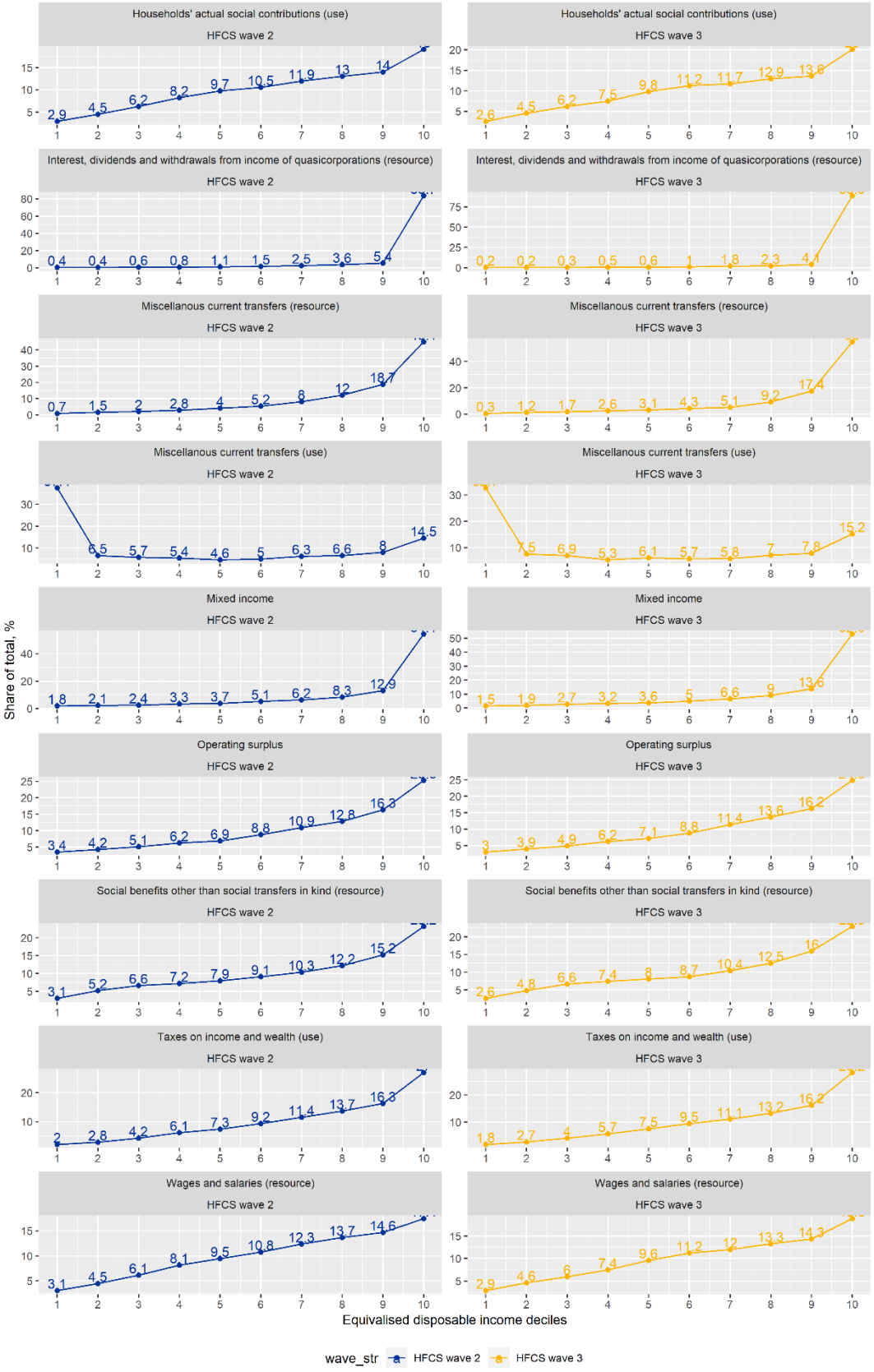
Appendix – tables and figures

Figure 12 – Distributions of income variables conditional on net wealth decile, HFCS waves 2 and 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

Figure *13 – Distributions of income variables conditional on* equivalised disposable income decile, HFCS wave 2 and 3, euro area



Source: Authors calculations based on QSA, HFCS and DWA data.

Figure *14 – Debt-to-income ratios by net wealth decile, HFCS wave 2 and 3, euro area*

Source: Authors calculations based on QSA, HFCS and DWA data.

Figure 15 – Debt-to-income ratios by equivalised disposable income decile

Source: Authors calculations based on QSA, HFCS and DWA data.

Note: log scale in y-axis