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DISTRIBUTIONAL NATIONAL ACCOUNTS (DINA) WITH HOUSEHOLD SURVEY DATA: METHODOLOGY AND RESULTS FOR EUROPEAN COUNTRIES

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This paper builds Distributional National Accounts (DINA) using household survey data. We develop a transparent and reproducible methodology that uses only publicly available sources, provides highly comparable results well suited for policy analyses, and can be applied when administrative tax data are not available for research. We apply this methodology to build synthetic micro-datafiles for European countries that cover the entire distribution, include all income components separately, are consistent with national accounts, and preserve the detailed socioeconomic information available in the surveys. We discuss the methodological steps and their impact on the income distribution. In particular, we highlight the effects of imputations and the adjustment of variables to national accounts' totals. Furthermore, we compare the different income concepts of the DINA and the EG-DNA approach in a consistent way. Overall, aligning household incomes with national accounts' totals and imputing incomes from other sectors increases inequality in most countries, which underlines the importance of reconciling income distributions with macroeconomic aggregates.

JEL codes: C55, D31, E01

Keywords: Distributional National Accounts, survey data, income inequality

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1. Introduction

More than two decades have passed since Antony B. Atkinson reminded the economics profession of "bringing income distribution back in from the cold" (Atkinson, 1997). Since then, matters of income and wealth inequality have gained in importance, both in the field of economics and in the public debate. A recent milestone in this line of research are Distributional National Accounts (DINA), which aim to complement national accounts with information on the socioeconomic heterogeneity within economies. They allow for the analysis of the distribution of core macroeconomic indicators such as national income in a consistent way.

So far, this endeavor has been pursued by two different initiatives. On one hand, a group of prominent scholars such as Thomas Piketty, Emmanuel Saez, and Gabriel Zucman established the World Inequality Database (WID), which collects work on DINA for many countries. On the other hand, national statistics offices and the OECD installed the Expert Group on Disparities in a National Accounts Framework (EG-DNA) to compile distribution measures for household income, consumption, and savings within the framework of national accounts. Both initiatives aim at computing distribution measures consistent with macroeconomic aggregates, but differ in their scope, concepts, and methodology. Against this backdrop, it is important to know how these differences shape our understanding of the developments of inequality.

Equally important, both initiatives have different aims. The work collected by WID focuses on building historical time series to track long-run developments of inequality. They emphasize the importance of the top tail of the income and wealth distribution, and thus use tax data and Pareto imputation techniques. When data availability is limited, they often focus on the distribution of aggregate income measures, and correct for high incomes. The EG-DNA initiative, on the contrary, builds its analysis on survey data collected and maintained within statistical offices. Based on their long-time experience with both surveys and national accounts, they aim to enhance their standard reporting on the development of living conditions. Consequently, they plan to publish regularly updated inequality indicators and information on income, consumption, and savings for quintiles of the income distribution.

Obviously, both approaches have their virtues and are well suited to answer specific research questions. From the perspective of this paper, however, they also share a common weakness. Both often lack information on the composition of incomes and the contribution of different income sources to the distribution, or on the joint distribution of income with policy-relevant socioeconomic characteristics at the household level. This information, however, is necessary for social impact analyses, which have become a vital tool to support policymakers in their decision-making process.

The aim of this paper is to build on the insights of both the DINA and the EG-DNA initiative to develop a transparent and reproducible methodology for constructing DINA with survey data. This methodology uses only publicly available data, provided by European institutions, and can be applied when administrative tax data are not available for research. We build enhanced micro-data sets that cover the entire distribution, include detailed information on the composition of incomes, and are consistent with national accounts. Furthermore, these data sets preserve the detailed socioeconomic information available in the surveys and are thus well suited for policy analyses. We discuss the results for the income distribution in several European countries, compare the methodological choices and assumptions of the DINA and the EG-DNA initiative, and analyze their impact on the measured distribution. In particular, we highlight the role of imputing and adjusting the separate income components to national accounts' totals, as well as their importance for national income. Moreover, we compare the results for the income concepts and units of analysis used by the two approaches in a consistent way.

Our analysis stands on the shoulders of previous contributions to the literature related to DINA. The origins of this line of work go back to Kuznets (1955), who was one of the first scholars compiling inequality statistics, and was also prominent in the process of developing the system of national accounts. Several decades later, Atkinson (1971), Piketty (2003), and Piketty and Saez (2003) compiled time series of top income and wealth shares for the UK, France, and the US. These contributions breathed new life into inequality research and brought the topic back to the center stage in economics. They, however, came under criticism for focusing on the top and not representing the developments in the bottom- and middle-income segments of the population. Around the same time but from a different angle, the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz *et al.*, 2009) concluded that aggregate measures such as GDP do not adequately picture the progress of well-being, and more prominence should be given to the distribution of macroeconomic indicators. National accounts traditionally do not include such distributions. Surveys and tax data, on the contrary, provide information on distributions, but are not consistent with national accounts.

The recent work on DINA can be interpreted as an attempt to address these shortcomings. It aims at providing statistics on the entire income and wealth distribution in line with macroeconomic aggregates. Since the publication of the general methodology (Alvaredo *et al.*, 2016), DINA have been built for a great many countries. The pioneers of this line of research use administrative tax data (Alvaredo *et al.*, 2017; Piketty *et al.*, 2018; Garbinti *et al.*, 2018), on which their methodology relies as primary source of information. In a great variety of countries, however, tax data are not available for research, at least not in the level of detail necessary to adopt the original DINA methodology. Recent contributions (Piketty *et al.*, 2019; Blanchet *et al.*, 2019, 2020) thus develop a more aggregated approach, focusing on the distribution of national income, and using tax data or "rich lists" to correct the incomes at the top end. Even if tax data are available, however, the definition of taxable income differs by country, so that the DINA methodology needs to be adjusted for national idiosyncrasies. Furthermore, tax data are often only accessible through special arrangements with local authorities, so that comparable cross-country research is impeded. The other prominent approach, the EG-DNA initiative, aims at using harmonized survey data to publish comparable distributions for all OECD countries in line with national accounts (Fesseau *et al.*, 2013; Fesseau and Mattonetti, 2013a; Zwijnenburg *et al.*, 2017). Some countries, such as Australia, the UK, and the US, are already publishing their results on a regular basis (Seneviratne, 2016; Tonkin and Wildman, 2016; Fixler *et al.*, 2020).

This paper contributes to this literature in three ways. First, we develop a transparent and reproducible methodology to build synthetic micro-data sets with survey data (European Union Statistics on Income and Living Conditions [EU-SILC] and Household Finance and Consumption Survey [HFCS]), using only harmonized and publicly available sources. This approach allows us to compute and compare the results for many European countries, without relying on access to tax data or other idiosyncratic information. Second, our data cover the entire distribution, include all income components separately at a granular level, and are consistent with national accounts. These data can potentially be used for policy impact analysis. Third, we compare the methodology and the results for the DINA and the EG-DNA approach, providing insights into the impact of their different methodological choices on the income distribution.

We find that matching micro-variables to national accounts and imputing additional variables from other sectors of the economy to households increase inequality in most countries. This underlines the importance of reconciling income distributions with macroeconomic aggregates. The impact of a single income component on the distribution, however, varies across countries, depending on its distribution in the original survey data, its coverage by the surveys, and its contribution to national income. Accounting for each source of income separately thus increases the quality of the results for measured income distributions.

Our methodology substantially increases the income of households at the top of the distribution compared to the original survey data, because it has a considerable impact on mixed income and capital income, both of which are highly concentrated. Households at the bottom also benefit because of the inclusion of social transfers in kind and collective consumption, albeit to a much smaller extent. The results for the income distribution of post-tax income are similar for the DINA and the EG-DNA approach. Conceptually, however, there are substantial differences, which, as our results show, partly neutralize each other. Overall, our methodology is well suited for building synthetic micro-data sets which can be used for policy analysis. However, it should be applied with caution when analyzing longer-term trends in inequality.

This paper is structured as follows: Section 2 summarizes our methodology, comparing it to both the DINA and the EG-DNA approach. Section 3 discusses our results for the income distributions with respect to different income concepts, data sources, and units of account. Moreover, it explores the impact of the income components on the distribution. Section 4 concludes.

2. Methodology

2.1. *Data, Income Concepts, and Units of Analysis*

Our methodology builds on both the DINA (Piketty *et al.*, 2018) and the EG-DNA approach (Zwijnenburg *et al.*, 2017). To check for the robustness of our results, we use two different data sources: the EU-SILC, provided by Eurostat, and the HFCS, conducted by the European Central Bank, both of which are extensively applied for distribution analyses.

The EU-SILC contains a detailed breakdown of the income and a range of socioeconomic characteristics of households on a yearly basis, and provides data for 230,000 households and 570,000 individuals. The HFCS includes incomes and wealth for 84,000 households and 210,000 individuals in 20 countries. We compute our results for 2010 and 2014, the first two waves of the HFCS. The surveys are reconciled with annual data from the non-financial sectoral accounts, which are provided by Eurostat and include incomes and expenditures for all institutional sectors of the economy (households, non-financial and financial corporations, and the state). These data are widely used as key indicators for economic development and well-being.[1]

The DINA and EG-DNA initiatives analyze distributions for different income concepts, all of which can be computed applying our methodology. The first approach uses national income as their key concept, which includes the incomes of all sectors of the economy. The motivation for using this concept is that all income ultimately accrues to households and individuals in one way or another. The DINA literature focuses on four different definitions of national income. Pre-tax factor income (PRTFI) includes the primary income of all domestic sectors of the economy, net of depreciation and including net income flows from other countries. Pre-tax national income (PRTNI) adjusts for the effects of the social security system by adding benefits and subtracting contributions. It is particularly useful to compare incomes in countries with notable differences in their pension systems. Private pensions are part of PRTFI, so that countries with a substantial share of private pensions exhibit a lower inequality than those which rely more on public pensions. PRTNI corrects for this effect and is considered the primary variable to analyze pre-tax distributions in the DINA literature.[2]

Post-tax disposable income (POTDI) deducts direct and indirect taxes. It thus has a substantially smaller value than the other three income concepts. The size of the public sector varies widely across countries, which makes POTDI difficult to compare. The DINA literature thus focuses on post-tax national income (POTNI), which includes social transfers in kind and collective consumption and is used as the key indicator to describe post-tax distributions.

The EG-DNA initiative uses two income concepts: disposable income (DINC) and adjusted household disposable income (ADINC). Both account for the income of households, but do not include other sectors. DINC consists of income from employment and self-employment, imputed rents, capital income and monetary transfers, and net of social contributions and taxes. It thus comes close to the definition of POTDI used by the DINA literature. Adjusted DINC includes also social transfers in kind. Table 1 provides an overview of the different income concepts of the DINA and the EG-DNA approach.[3]

[1]For a detailed description of the survey data, see Eurostat (2019) for the EU-SILC and Household Finance and Consumption Network (2016) for the HFCS. The non-financial sectoral accounts are described in Eurostat (2013).

[2]Piketty *et al*. (2018) define two types of PRTNI. The first, narrower definition considers only the pension system. The second includes the entire social security system. We use the second definition, but deviate from the DINA guidelines in that we include all monetary transfers (D62) and social contributions (D61), but leave private pensions (D442) aside because of data limitations.

[3]The definitions of primary income and DINC before adjustment to national accounts (i.e., “PRINCO” and “DINCO” in our terminology, see below) closely correspond to the pre-tax and disposable household income measures reported by the OECD.

We use three different units of analysis to compute the distribution for all income concepts. The first two, the equal and individual split, follow the DINA methodology. The first divides total household income equally between adult individuals. The second attributes personal income to individuals and splits income that is only available at the household level equally. The equal split is similar in concept to the third unit of analysis, used by the EG-DNA approach, equivalized households. The former, however, weighs all adults of a household equally, and thereby abstracts from any economies of scale of living in the same household.[4]

2.2. *Matching Survey Data with National Accounts*

We assign each micro-variable to a corresponding variable from national accounts. Because the variables are usually defined differently in micro- and macro-data, this assignment is only the closest possible approximation. Furthermore, the two surveys, SILC and HFCS, use different variable definitions, so that their correspondence to national accounts deviates (Table 2).[5]

Gross wages and salaries (D11) include cash- and non-cash employment income. The latter is only separately available in SILC data, which split employment income into cash- (PY010G) and near-cash income (PY010N). Furthermore, we include gross income of people younger than 16 years, provided at the household level (HY110G). In HFCS data, gross cash employee income (PG0110) is the only source of income assigned to gross wages and salaries in national accounts.

The gross operating surplus (B2G) includes own production of accommodation services by owner-occupied households (imputed rents), as well as income from rent. It corresponds to income from rent (HY040G) and imputed rents (HY030G) in SILC data. The HFCS includes only income from real estate property (HG0310). We thus compute imputed rents from real estate ownership, following the capital market approach (see the following subsection).

Gross mixed income (B3G) consists of the surplus or deficit of unincorporated enterprises recorded in the household sector. It includes also the surplus from underground- and own-production. The corresponding variables in SILC data are gross cash benefits or losses from self-employment (PY050G) and the gross value of goods produced for own consumption (HY170G). HFCS data cover only the gross self-employment income (PG0210). The surveys do not cover income from underground activities, which is one of the reasons for the low coverage rate of this variable (see Section 3).

Interest received, not adjusted for FISIM (D41G, received), and the distributed income of corporations (D42) correspond to the summary variable for gross interest, dividends, and profits from capital investment in unincorporated businesses in SILC data (HY090G), and gross income from financial investment (HG0410) and gross income from private businesses other than self-employment

[4]Another difference between the two approaches is the definition of the population included in their analysis. The DINA methodology includes individual adults, aged 20 or above. The EG-DNA approach includes all children, weighed by a factor, to define the size of the equivalized household. Furthermore, they exclude transactions by people in institutions, see Zwijnenburg (2019). We follow Piketty *et al*. (2018) in defining the target population for computing all our results.

[5]The differences in variable definitions are inherent in any methodology that uses micro-data both from administrative sources or surveys and reconciles them with national accounts.

TABLE 1
INCOME CONCEPTS

		National Accounts	HFCS	SILC
1) *EG-DNA*				
Gross wages and salaries		D11	PG0110	PY010G + PY020G + HY110G
Employer social contributions	+	D12	EUROMOD	EUROMOD
Gross operating surplus & rents received	+	B2G + D45	HG0310 + IMP	HY040G + HY030N
Consumption of fixed capital	−	P51C [part]	IMP [B2G]	IMP [B2G]
Gross mixed income	+	B3G	PG0210	PY050G + HY170G
Consumption of fixed capital	−	P51C [part]	IMP [B3G]	IMP [B3G]
Interest w/o FISIM & distributed income of corporations	+	D41G + D42	HG0410 + HG0510	HY090G
FISIM for interest received	+	D41G − D41	IMP [D41G + D42]	IMP [D41G + D42]
Other property income received	+	D43 + D44	IMP [D41G + D42]	IMP [D41G + D42]
Interest paid	−	D41G	DI1412	HY100G
FISIM for interest paid	+	D41 − D41G	IMP [D41G]	IMP [D41G]
Other property income paid	−	D4 − D41G	neutral	neutral
Primary income (net)	=	PRINC (B5N,S1415)		
Current taxes on income: employment income	−	D51 [part]	EUROMOD	EUROMOD
Current taxes on income: simulated property income	−	D51 [part]	EUROMOD	EUROMOD
Current taxes on income: non-simulated property income	−	D51 [part]	IMP [D51]	IMP [D51]
Current taxes on wealth	−	D59	IMP [D51]	IMP [D51]
Employee social contributions	−	D61 − D12	EUROMOD	EUROMOD
Pensions	+	D62 [part]	PG0310	PY100G + PY110G
Unemployment benefits	+	D62 [part]	PG0510	PY090G
Other monetary transfers	+	D62 [part]	HG0110	PY120G + PY130G + PY140G + 60G + HY070G
Other current transfers net	+	D7R − D7P	neutral	neutral
Disposable income (net)	=	DIINC (B6N,S1415)		
Social transfers in kind	+	D63	equal	equal
Adjusted disposable income	=	ADINC (B7N,S1415)		
2) *DINA*				
Primary income S14S15		B5N (S14S15)		

(Continues)

TABLE 1 (CONTINUED)

		National Accounts	HFCS	SILC
Primary income S11	+	B5N (S11)	IMP [D41G + D42]	IMP [D41G + D42]
Primary income S12	+	B5N (S12)	IMP [D41G + D42]	IMP [D41G + D42]
Net operating surplus & mixed income S13	+	B2A3N (S13)	IMP [D41G + D42]	IMP [D41G + D42]
Net property income S13	+	D4 (S13)	IMP [D41G + D42]	IMP [D41G + D42]
Net indirect taxes	+	D2 − D3 (S13)	neutral	neutral
Pre-tax factor income	=	PRTFI		
Social contributions	−	D61 (S14S15)	EUROMOD	EUROMOD
Monetary transfers	+	D62 (S14S15)	PG0310 + PG0510 + HG0110	PY100G + PY110G + PY090G + PY120G + PY130G + PY140G + HY050G + HY060G + HY070G
Difference D61 & D62	+	D61 − D62 (S14S15)	neutral	neutral
Pre-tax national income	=	PRTNI		
Net indirect taxes	−	D2 − D3 (S13)	neutral	neutral
Current taxes on income and wealth S14S15	−	D51 + D59 (S14S15)	EUROMOD + IMP	EUROMOD + IMP
Current taxes on income and wealth (other sectors)	−	D51 + D59 (other)	IMP [D51 + D59 (S14S15)]	IMP [D51 + D59 (S14S15)]
Post-tax disposable income	=	POTDI		
Social transfers in kind	+	D63 (S14S15)	equal	equal
Collective consumption	+	P32 (S13)	equal	equal
Primary surplus S13	+	D2 − D3 + D51 + D59 − D63 − P32 (S13)	neutral	neutral
Post-tax national income	=	POTNI		

Notes: The table shows the definition of income concepts and their composition at the macro- and the micro-level. Authors' presentation based on the variable definitions by Eurostat, HFCS, and SILC.

TABLE 2
Matching Macro- and Micro-variables

National Accounts		HFCS		SILC	
Gross wages and salaries	D11	Gross cash employee income	PG0110	Gross cash or near cash employee income	PY010G
				Gross non-cash employee income	PY020G
				Gross income received by people aged under 16	HY110G
Gross operating surplus	B2G	Gross rental income from real estate property	HG0310	Gross income from rental of a property or land	HY040G
Imputed rents	B2G			Gross imputed rent	HY030G
Rents (rec.)	D45				
Gross mixed income	B3G	Gross self-employment income (profit/losses of unincorporated enterprises)	PG0210	Gross cash benefits or losses from self-employment	PY050G
				Gross value of goods produced for own-consumption	HY170G
Interest (rec., w/o FISIM)	D41G	Gross income from financial investments	HG0410	Gross interests, dividends, profit from capital investment in uncorporated business	HY090G
Distributed income of corporations	D42	Gross income from private business other than self-employment	HG0510		
Interest (paid, w/o FISIM)	D41G	Interest payments	DI1412	Gross interest repayments on mortgage	HY100G
Social benefits other than social transfers in kind (pensions)	D62	Gross income from public pensions	PG0310	Gross old-age benefits	PY100G
				Gross survivor benefits	PY110G
Social benefits other than social transfers in kind (unemployment)	D62	Gross income from unemployment benefits	PG0510	Gross unemployment benefits	PY090G
Social benefits other than social transfers in kind (other)	D62	Gross income from regular social transfers	HG0110	Gross sickness benefits	PY120G
				Gross disability benefits	PY130G
				Gross education-related allowances	PY140G
				Gross family/children-related allowances	HY050G
				Gross social exclusion not elsewhere classified	HY060G
				Gross housing allowances	HY070G

Notes: The table shows the correspondence between macro- and micro-variables. Authors' presentation based on the variable definitions by Eurostat, HFCS, and SILC.

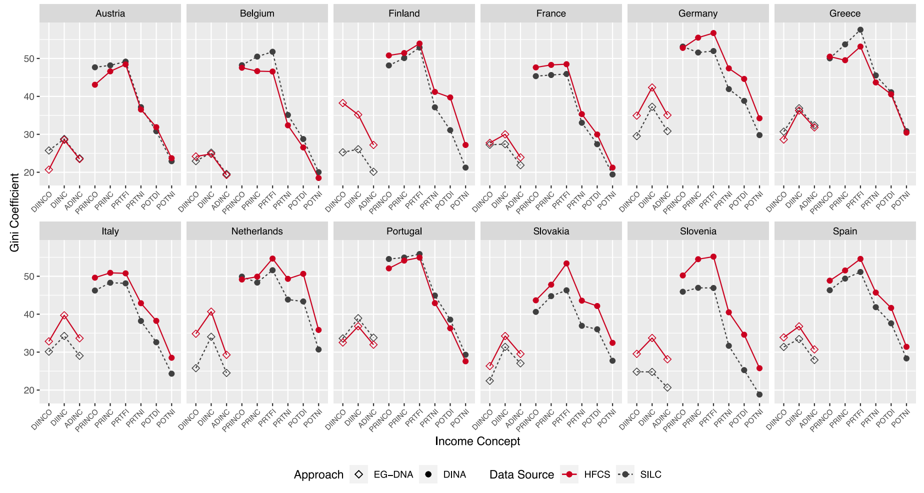

Figure 1. Inequality for Income Concepts: Gini Coefficient (SILC & HFCS, Wave 2014, Equal Split)

Notes: The graph shows the Gini coefficient for different income concepts by country. Authors' calculations and presentation using Eurostat, HFCS, and SILC data. The legend for "Approach" refers to the income concepts by EG-DNA (marked by rhombuses/squares) and DINA (marked by circles). The colors black/red refer to the data source. [Colour figure can be viewed at wileyonlinelibrary.com]

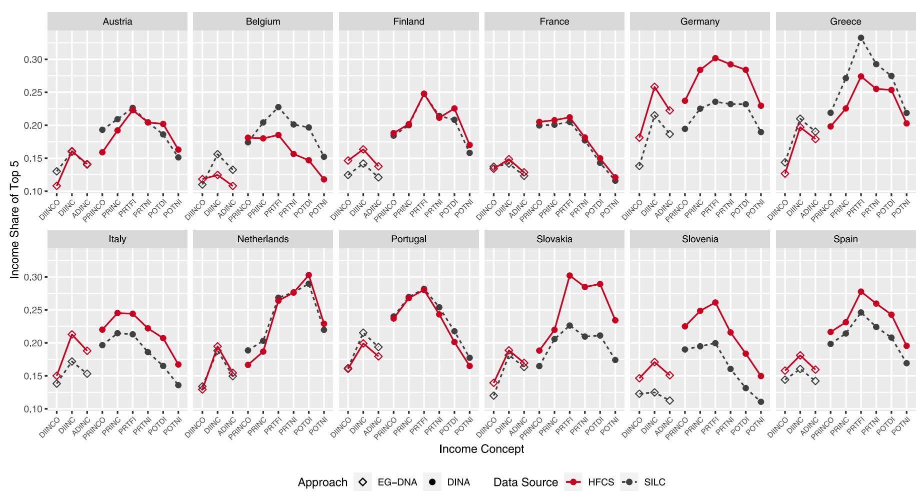

Figure 2. Inequality for Income Concepts: Top 5 Percent Share (SILC & HFCS, Wave 2014, Equal Split)

Notes: The graph shows the income share of the top 5 percent for different income concepts by country. Authors' calculations and presentation using Eurostat, HFCS, and SILC data. The legend for "Approach" refers to the income concepts by EG-DNA (marked by rhombuses/squares) and DINA (marked by circles). The colors black/red refer to the data source. [Colour figure can be viewed at wileyonlinelibrary.com]

(HY0510) in HFCS data. Interest paid, not adjusted for FISIM (D41G, paid) is assigned to the corresponding variable in SILC (DI1412) and HFCS (HY100G). Both variable definitions correspond only partly to those of national accounts.

Monetary transfers (D62) are split into pensions, unemployment benefits, and other monetary transfers according to the statistic for general government expenditure by function (COFOG), provided by Eurostat. The three parts each have a corresponding variable in HFCS data (PG0310, PG0510, and HG0110). For SILC, we use the sum of old-age benefits (PY100G) and survivor benefits (PY110G), and unemployment benefits (PY090G) as variables corresponding to the first two categories. All other social benefits in the SILC data set are then assigned to other monetary transfers in national accounts.

2.3. *Imputation of Additional Variables*

In addition to those income components covered by the surveys, we impute other variables from national accounts, following the guidelines of the DINA methodology (Piketty *et al*., 2018), but using only information provided by public European institutions. The first part of imputed variables concerns taxes and social contributions, which are not separately available in micro-data. We simulate employment taxes, capital taxes, and social contributions on the micro-level with Euromod, a widely available tax-benefit microsimulation tool for the EU, and compute average tax and contribution rates for each percentile of the income distribution. These rates are then levied on all households and individuals in the respective income segment. Finally, we split direct taxes from national accounts (D51) into taxes on employment and capital taxes, using data on taxation provided by the European Commission (2016), and use them to realign taxes to national accounts.[6] Wealth taxes (D59) are imputed according to the distribution of income taxes (D51). Social contributions are split into employer (D12) and employee (D61 minus D12) contributions, both of which have their simulated correspondents on the micro-level.

The second part of imputations involves imputed rents, which are included in SILC data, but are not covered by the HFCS. Following the capital market approach (Balcazar *et al*., 2014), we use the information on the current value of owned dwellings and outstanding mortgages, provided in HFCS data, and apply an exogenous percentage to compute imputed rents.[7] For SILC data, we deduct interest payments on mortgages from gross imputed rents to compute the corresponding variable.

A third group of imputed variables include other items of primary income, such as the consumption of fixed capital, FISIM, and other property income (D43 and D44). The first is split between gross operating surplus and gross mixed income according to their relative amounts, and imputed to households and individuals based on the distribution of these variables. FISIM and other capital income are imputed according to the distribution of interest received and the distributed income of corporations (D41 and D42). Other capital income paid is distributed neutrally.

The last group of imputed variables consists of those that are included into the income concepts of the DINA approach. Because the primary income of non-financial and financial corporations and the state partly correspond to retained

[6]See Table A.3 in online Appendix A.

[7]Following the literature (e.g., Fessler *et al*., 2016), we choose a value of 3 percent, which approximately represents the average interest rate of a risk-free asset such as a 10-year treasury bond.

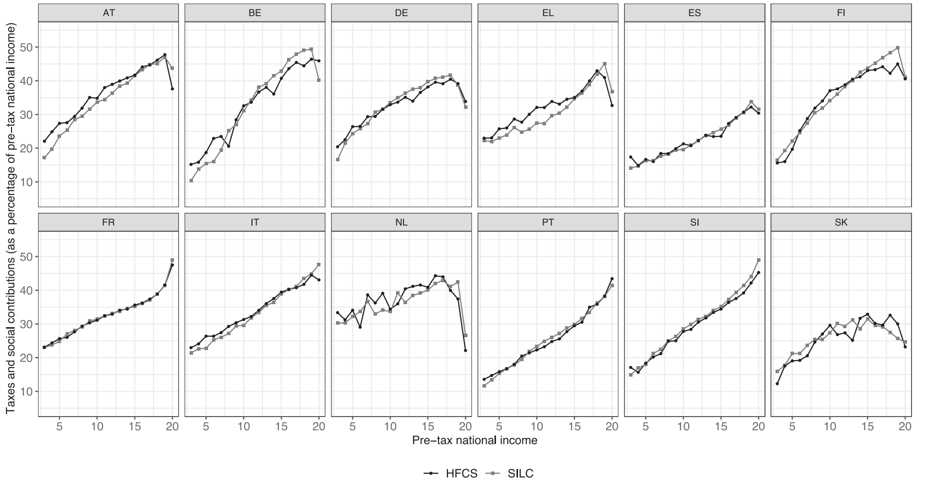

Figure 3. Effective Tax Rates (Wave 2014, Equal Split)

Notes: The graph shows the effective tax rates. The *x*-axis represents the income vingtile. The effective tax rates cover all taxes and social contributions. Because social contributions are already excluded in pre-tax national income, we add them to income before calculating the rates. Authors' calculations and presentation using Eurostat, SILC, and HFCS data.

earnings, which benefit the owners of firms, we impute them according to the distribution of capital income.[8] Net indirect taxes (D2 minus D3) are distributed neutrally, because they are related to production, not income. Lastly, social transfers in kind and collective consumption are distributed equally across households or individuals.[9]

3. Results

3.1. *Income Distributions*

The methodology of the previous section is applied to construct DINA for 12 European countries. We use two different surveys (SILC and HFCS) for two specific years (2010 and 2014), and compute data for three different units of account (equal and individual split, equivalized households) for each country.

Figures 1 and 2 summarize the distributions for different income concepts.[10] The starting point for both the DINA and the EG-DNA approach is the primary

[8]An alternative way is to distribute these variables according to stock ownership. Stocks are included in HFCS data and are a better proxy for the distribution of retained earnings, since stock owners benefit from an increase in the value of firms. Implementing this with HFCS data yields more unequal distributions of income compared to our approach in almost all countries, albeit only marginally so. For reasons of comparability with the results for SILC data, which do not include stock ownership, we use capital income as a proxy for both data sets.

[9]There, we deviate from the DINA methodology and follow the EG-DNA approach (Zwijnenburg *et al.*, 2017).

[10]Throughout this section, we present the results for 2014. Following Piketty *et al.* (2018), our standard unit of account is the equal split. We discuss the results for the other units of account at the end of this subsection. For the results for 2010, the individual split, and equivalized households, see online Appendixes B and C.

income of the household sector (Table 1). Primary income includes income from self-employment and capital income, both of which are unequally distributed in the survey data. Even before rescaling the variables to national accounts' totals, the Gini coefficient for primary income (PRINCO) is between 40 and 55 for the countries included in our analysis. Similarly, the share of the top 5 percent of the income distribution is between 15 and 25 percent.

Aligning the components of primary income to national accounts' totals (PRINC) increases inequality considerably in most countries. Capital income and self-employment income are usually not well covered in the survey data, so that the factor by which they are multiplied is rather high (see next subsection). Because these incomes are over-proportionately concentrated at the top end of the distribution, rescaling them increases the top 5 percent income share more than the Gini coefficient. In some cases, the effect is different for the two surveys, a fact that can be attributed to variations in the coverage ratio or the original distributions of gross mixed income and/or capital income. In the case of France, where capital income is well covered in both data sets, rescaling the variables to national accounts' totals does not increase inequality substantially.

Moving from primary income of the household sector to PRTFI, we include the income of non-financial and financial corporations and the state. This step leads to an increase in inequality in most countries, albeit with some variations. Overall, it increases the top 5 percent share more than the Gini coefficient, which is not surprising, given that the income of these sectors is imputed to households and individuals according to the distribution of capital income. We thus find similar patterns across countries as for the previous methodological step.

Differences in national accounts, however, also play an important role for these patterns across countries. For France and Italy, the effect of including the income of the other sectors is rather small. In both countries, the primary income of non-financial and financial corporations does not contribute as much to national income as in the other countries. In contrast, including the incomes of other sectors increases inequality substantially in Greece, the Netherlands, Slovakia, and Spain, all of which exhibit a large share of primary income of corporations in national income. Variations in national accounts are thus another important source for the patterns in inequality emerging in our results.[11]

Moving from PRTFI to PRTNI reflects the redistribution effects of the social security system. Including social contributions and monetary transfers decreases inequality in all countries. Overall, social contributions are regressive; that is, they reduce the incomes of households and individuals at the lower end of the distribution more than at the top (Figures A.1 and A.2). Social contributions usually depend on wage income, which accounts for a large share of the total income of the lower-income segments. Social security contributions are particularly regressive in Germany and the Netherlands, where the rates amount to 25 and 40 percent of the income at the bottom of the distribution, and nearly 0 percent at the top. In both countries, social contributions account for a large share of national income, which increases their impact on the distribution.

[11]This is a characteristic inherent in the DINA methodology. See Table A.2 in online Appendix A for the contribution of all variables to national income.

Furthermore, unemployment benefits and other monetary transfers (mostly children-related benefits) contribute little to redistribution in all countries, given that they account for only a small share of national income. Nevertheless, they exhibit a clear progressive pattern as they accrue mostly to individuals and households in the bottom half of the distribution. Pensions have the largest redistribution effect, given that they amount to a significant share of national income and are over-proportionately received by the bottom 50 percent. All in all, the redistribution effects of the social security system differ widely across countries, with the ratio of PRTNI to PRTFI ranging from 150 to 250 percent at the bottom end of the income distribution.

The redistributive effects of taxes, which are represented by moving to POTDI, are also substantial, albeit less pronounced than those of the social security system. Including taxes on income and wealth decreases both the Gini coefficient and the top 5 percent share. Effective tax rates (Figure 3) show a progressive trend in most countries, although the degree of progression varies considerably. The difference between the rates of taxes and social contributions to pre-tax income between the top and the bottom end of the income distribution ranges from almost 40 percentage points in Belgium to less than 20 percentage points in the Netherlands and Slovakia. Moreover, in many countries, the rates at the very top of the income distribution are even lower than in the middle segments. The tax system thus changes from progressive to regressive for very high incomes, and there is a significant "under-taxation" of the rich, compared to other countries. Progression is maintained until the top end only in the case of France, Portugal, and Slovenia.

Finally, moving to POTNI reduces inequality further in all countries because of the inclusion of social transfers in kind and collective consumption, both of which we distribute equally across the population. This effect is typically as large as that of the social security system.

In addition to the income concepts of the DINA methodology, we construct DINC and ADINC of the household sector following the EG-DNA approach. Moving from primary income to the former reduces inequality substantially because of the inclusion of taxes and monetary transfers (Table 1). Rescaling the variables of DINC to national accounts' totals (i.e., moving from DINCO to DINC) has a larger effect than for primary income, because this methodical procedure is now applied also to taxes and transfers. Thus, the difference between unscaled primary and DINC (i.e., PRINCO vs. DINCO) is higher than for the scaled variables (PRINC vs. DINC).[12] Adjusting DINC by including social transfers in kind reduces inequality further, as they are distributed equally across the population. The step from DINC to ADINC is nevertheless smaller than that from POTDI to POTNI, because the latter also involves collective consumption.

Interestingly, the distribution of ADINC is similar to that of POTNI for many countries. Table A.4 decomposes the differences between these two income concepts, which conceptually consist of two (groups of) variables, collective consumption and the income and taxes of other sectors (non-financial and financial corporations and the state), both of which have considerable effects on the income

[12]Given the similar income definitions, the results for PRINCO and DINCO are very close to the Gini coefficients for market income and household DINC published by the OECD on a regular basis.

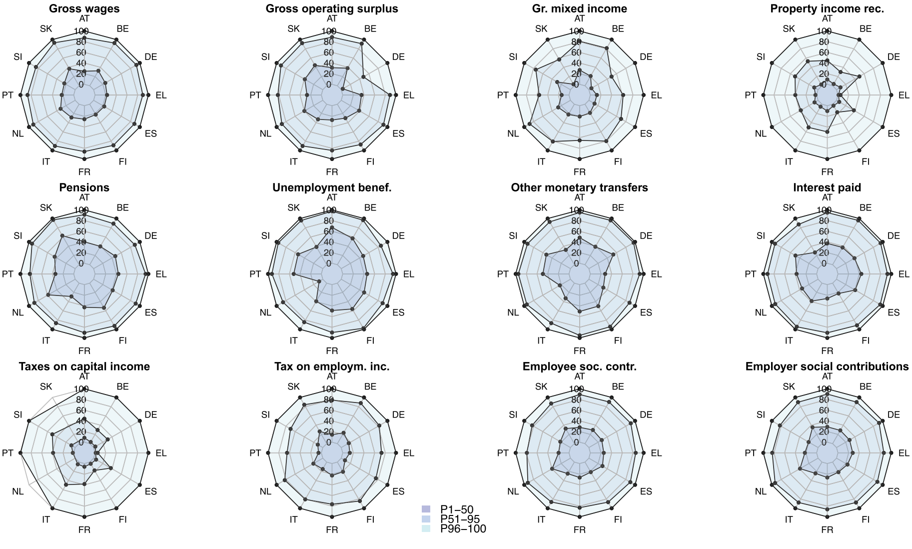

Figure 4. Original Distributions (SILC, Wave 2014, Equal Split)

Notes: The graph shows the distribution of the income components in the raw survey data. The income groups are defined on the basis of post-tax national income. Authors' calculations and presentation using SILC data. [Colour figure can be viewed at wileyonlinelibrary.com]

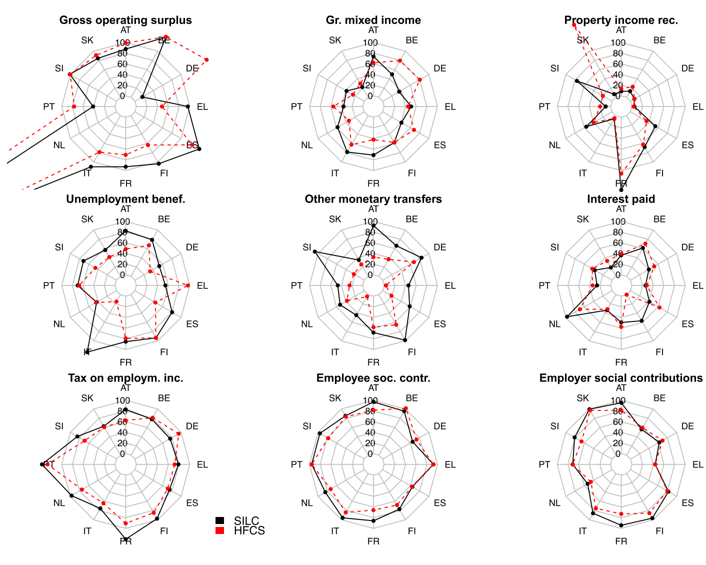

Figure 5. Coverage Rates (Wave 2014)

Notes: The graph shows the coverage rate of income components in comparison to national accounts. Authors' calculations and presentation using Eurostat, SILC, and HFCS data. [Colour figure can be viewed at wileyonlinelibrary.com]

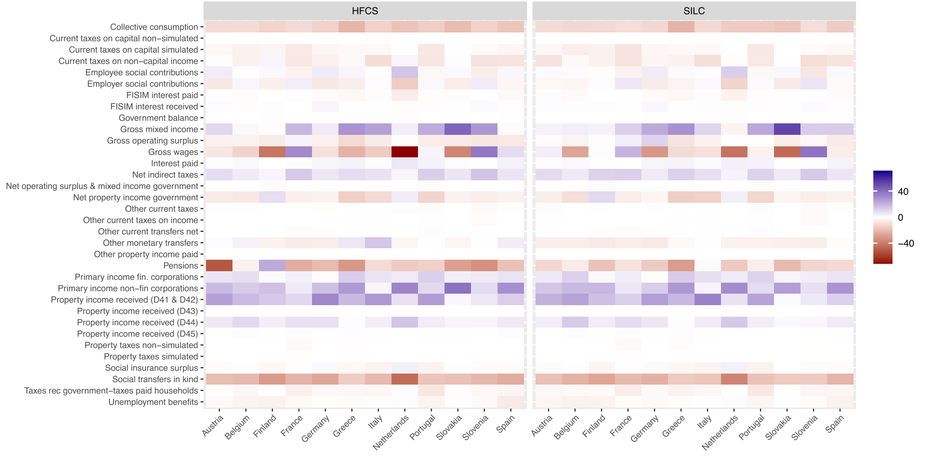

Figure 6. Contribution to Inequality of Post-tax National Income (SILC & HFCS, Wave 2014, Equal Split)

Notes: The graph shows the contributions of the variables to the distribution of post-tax national income distribution measured by the Gini coefficient. They are calculated by comparing the income distribution with and without the respective variable. Contributions marked in light gray make the distribution more equal, and those in dark grey more unequal. Authors' calculations and presentation using Eurostat, SILC, and HFCS data. [Colour figure can be viewed at wileyonlinelibrary.com]

distribution.[13] The first is distributed equally across households and individuals, and thus reduces inequality in all countries. Moving from POTNI to ADINC, deducting collective consumption increases both the Gini coefficient and the top 5 percent share. The effect of the second group of variables, however, varies. The primary income of non-financial and financial corporations increases inequality, whereas that of the state is usually negative, and thus has the opposite effect. Furthermore, other sectors' taxes reduce inequality, except in the case of the Netherlands and Slovakia, where the tax system is not very progressive.

Lastly, we can compare the results to those provided by the WID. Overall, we find that our results for the two distribution measures tend to be lower than WID estimates (Figure A.3). However, these differences vary considerably between countries, given that our results depend on the distributions of the original micro-variables, their coverage rate compared to national accounts' totals, and the contribution of the variables to national income (see the following subsection).[14] Nevertheless, a few points stand out: First, in the Netherlands and Slovakia, our

[13]Table A.4 includes also "other effects," which result from adding and subtracting the same income component (e.g., D62) to or from different income concepts (e.g., PRTNI and PRINC minus direct taxes) to calculate POTNI and ADINC, respectively. As the basis to which these variables are added (or from which they are subtracted) differs considerably, both in their total amount and in their distribution, the effect of these variables on the inequality measures is not the same. Thus, an "other effect" arises. Moreover, "other effects" include the effects of "neutrally" distributed variables, as they have a neutral effect only with respect to the income concept they are added to.

[14]Moreover, the methodology used for the WID estimates varies. For France, it is closest to the general DINA methodology (Garbinti *et al.*, 2018), whereas in most other European countries, the results are estimated based on a different, more aggregated approach, in which total incomes are aligned to national accounts' totals (Blanchet *et al.*, 2020). Accounting for the components of national income separately is an advantage of our approach over the latter.

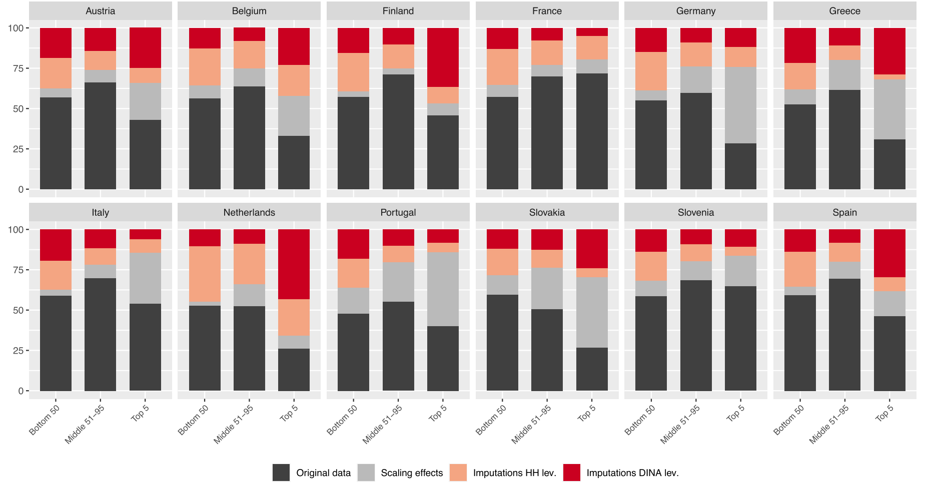

Figure 7. Effects of Scaling and Imputations (SILC, Wave 2014, Equal Split)
Notes: The graph shows the effect of the different methodical steps on the incomes of households along the distribution. The income of each group is normalized to 100 percent. Original and scaled variables: D11, D12, B2N, B3N, D41, D42r, D51, D61, and D62. Imputations at the household level: FISIM, D42p, D43, D44, D45, D51 [part], D59, and D63. Imputations at the national level: B5NS1112, B2A3NS13, D4S13, and P32, see Table 1. Authors' calculations and presentation using Eurostat and SILC data. [Colour figure can be viewed at wileyonlinelibrary.com]

results show a more unequal income distribution than those provided by WID. In both cases, there is one income component that increases inequality substantially: primary income of non-financial corporations in the case of the Netherlands, and mixed income in Slovakia. Both are highly unequally distributed, their coverage rates are low, and, most importantly, they account for a large share of GDP. Aligning all the income components separately to national accounts' totals thus increases inequality substantially. Second, for the other countries besides the Netherlands and Slovakia, we find that our results for the Gini coefficient for POTNI are in general considerably lower than the WID estimates. In contrast to WID, we distribute all social transfers in kind and collective consumption evenly across households and individuals instead of partly distribution-neutrally as WID, with the result of usually lower inequality measures. This effect is particularly stronger for the Gini coefficient than for the top 5 percent share, because lower-income groups benefit more from an equal distribution of these variables than those at the top. Third, our results show a tendency for being closer to WID estimates (or for being even slightly above them in some cases) for PRTNI, the top 5 percent share, and HFCS data. Because we realign each variable to national accounts' totals separately, inequality is increased in our approach if variables such as mixed income, the primary income of corporations, or capital income, which are highly unequally distributed and usually not well covered in surveys, contribute substantially to national income.

All in all, our results are similar for both years for which we construct our data sets, which shows a reassuring consistency in the survey data. Furthermore, using equivalized households instead of the equal split as unit of analysis does not change the general outcome of our methodology.[15] The distribution of ADINC differs somewhat between those two concepts (Table A.4). For SILC data, the Gini coefficients of the two concepts deviate from each other in both directions, whereas the top 5 percent share of ADINC for equivalized households is consistently smaller than for the equal split. For HFCS data, no clear patterns emerge. Using the individualized split, however, yields more unequal distributions, given that some income components remain attributed to individuals (see Section 2 and Piketty *et al*., 2018).

3.2. *Contributions to Inequality*

The previous subsection shows that the inequality measured by our approach varies considerably across countries. Furthermore, the results reveal differences with respect to the data source, because of variations in the coverage rate and the distribution of specific variables in the micro-data. This subsection discusses these effects in a more systematic manner.

For those variables that are included in the original survey data, their impact on the income distribution depends on three factors: First, their distribution in the micro-data. Second, the ratio between the sum of the variable(s) in the micro-data set and the value of the corresponding variable(s) in national accounts, i.e., the coverage rate. The inverse of the latter is the factor that is applied to rescale these variables. Third, their share in national income.

Figures 4 and A.4 show the distribution of the original variables. The inner dark area represents the share of the bottom 50 percent of the population, whereas the outer light area is the top 5 percent share. The most equally distributed variables are gross wages, monetary transfers, and social contributions. In contrast, the most unequally distributed variables are mixed income and capital income, both of which exhibit an extraordinarily high share of the top 5 percent. The distribution of the gross operating surplus, which includes imputed rents, is typically similar to that of wages. Taxes on employment income are usually more unequally distributed than taxes on capital income. Overall, both data sets show similar patterns, albeit with considerable differences in the distribution of mixed income and capital income.

Figure 5 shows the coverage rates, i.e., the ratio of the original micro-variables to national accounts' totals. The lower the coverage rate, the higher is the scaling factor and thus the impact of this variable on the income distribution. Gross wages are in general well covered by the surveys. Some countries even match survey data with tax data, so that the coverage rate is close to 100 percent. Similarly, pensions usually have a high coverage rate. Gross mixed income and capital income, in contrast, are not well covered by the surveys, with considerable differences between countries and an exceptionally high coverage rate for capital income in France. As a consequence, these variables have rather high rescaling factors in most countries. The coverage rate for the gross operating surplus, unemployment benefits, other monetary transfers, and paid interest vary considerably across countries. Finally, taxes on employment and social contributions are in general well covered, because they are simulated through Euromod.

The impact of all these variables on the income distribution is shown in Figure 6. Because mixed income and capital income are not only very unequally

[15]For the results using equivalized households as unit of analysis, see online Appendixes B and C.

distributed in the survey data, but are also not very well covered, they usually contribute most to inequality. There are, however, large differences between countries regarding the share of these variables in national income (Table A.2), which makes their impact on the distribution vary considerably. Gross wages, on the contrary, usually decrease inequality.

Those income components that are not covered by the surveys, but are imputed applying our methodology, also have a significant impact on the distribution. Above all, the primary incomes of non-financial and financial corporations increase inequality considerably in all countries, because we impute them based on the distribution of capital income. Their share in national income, however, varies substantially between countries. The same applies to social transfers in kind and collective consumption, both of which we distribute equally across the population. Both variables nevertheless decrease inequality considerably in all countries included in our analysis.

Figures 7 and A.5 summarize the impact of the variables on the income distribution by methodical procedure. Scaling effects and the imputation of variables not included in the surveys account for more than half of the income of the top 5 percent. These include mixed income and capital income, which are usually concentrated at the top and are not well covered in survey data, as well as the primary income of non-financial and financial corporations. The very exception is France (for SILC data), where the original micro-data already make up for 70 percent of the income of the top 5 percent. Overall, the scaling effects and imputed variables contribute a larger share to the income of the top 5 percent with HFCS data than for SILC data.

There are, however, large variations across countries with respect to the relative impacts of scaling and imputations. On the one end, we find countries such as Germany and Slovakia, in which imputations account for only around 25 percent of the income of the top 5 percent, whereas the scaling effects represent up to 50 percent (for SILC data). The other extreme are the Netherlands, where imputations make up for more than half of the income at the upper end of the income distribution. This again shows that there are large heterogeneities across countries with respect to the impact of the income components on the distribution.

At the bottom end of the income distribution, imputations also play a significant role, whereas scaling effects are minor. Imputations include social transfers in kind and collective consumption, both of which we distribute equally among households or individuals. These variables account for around 30 percent of the income of the bottom 50 percent of the population.

To summarize, applying our methodology to survey data to construct distributions in line with national accounts increases inequality substantially in most countries. Major effects come, on the one hand, from scaling variables such as mixed income and capital income, which are highly concentrated at the top, but usually not well covered in surveys. On the other hand, imputations of the primary income of non-financial and financial corporations as well as of social transfers in kind and collective consumption have important distribution effects. The observed variations between countries and with respect to the data source are because of variations in the coverage rate, the original distributions, and the contribution of the variables to national income.

4. Conclusion

The aim of this paper is to construct DINA with household survey data. We build on the insights of both the DINA and the EG-DNA initiative to develop a transparent and reproducible methodology, which can be used to build synthetic micro-data sets in line with national accounts when administrative tax data are not available. These data cover the entire income distribution, include all income components separately, and are consistent with national accounts. We then apply our methodology to various European countries and discuss variations in the income distribution related to the different income concepts, data sources, and units of analysis used in our approach.

Overall, realigning the components of primary income of the household sector to be consistent with national accounts' totals and imputing income from other sectors increases inequality in most countries. This underlines the importance of reconciling income distributions with macroeconomic aggregates. Primary income (adjusted to national accounts) and PRTFI are usually more unequally distributed than the income of households and individuals in the original survey data. Moving to POTNI or ADINC reduces inequality substantially because of the redistribution of the social security system and, to a smaller extent, the tax system, as well as because of the effects of social transfers in kind and collective consumption.

The impact of these methodical steps on the income distribution varies between countries and data sources. These variations can primarily be attributed to different coverage rates of mixed income and capital income, as well as their distribution in the original data sets. Differences with respect to the contribution of these variables and of the primary income of non-financial and financial corporations to national income also play a major role for their effect on the distribution. Scaling and imputations contribute substantially to the income of the top 5 percent of the population, given that mixed income and capital income are concentrated at the top. Adding social transfers in kind and collective consumption, on the contrary, increases the income of the bottom 50 percent considerably.

We find that our measures for income distribution of POTDI, based on the DINA methodology, and ADINC, following the EG-DNA approach, are remarkably similar in many countries. Decomposing the effects of the methodical steps leading from one concept to another, however, reveals considerable variation in these measures. The incomes of non-financial and financial corporations and the state, as well as collective consumption, which are the main conceptual differences between the two concepts, increase and reduce inequality, respectively, so that their effects on the distribution broadly cancel each other out. There are, however, also significant effects coming from the successive addition and subtraction of variables to different bases, or from adding neutrally distributed variables.

Our methodology is well suited to construct synthetic micro-data sets that can then be used for policy analysis, as the latter usually needs data for a specific year. It is thus an improvement over traditional distribution analysis, which typically uses original (unadjusted) survey data. Our methodology, however, must be applied with caution when computing time series for inequality measures. The aforementioned variations in the data, both in surveys and national accounts, are likely to produce variations in the income distributions over time. Although our methodology yields similar patterns in income concepts for the 2 years included in our analysis, the levels of inequality are sensitive to variations in the data, which makes them difficult to interpret over time.[16]

Comparing our results with the literature reveals that even though our methodology is an improvement over using original survey data in distribution analysis, it is likely to underestimate the inequality with respect to the results obtained from administrative tax data. Even in the case of France, where survey data cover capital income extraordinarily well compared to other countries, the inequality measured by our approach is lower than that of the WID. This confirms the findings of the literature, which show that surveys underrepresent the income concentration at the top. In those countries, however, where mixed income and/or capital income account for a high share of national income, such as the Netherlands and Slovakia, our methodology yields higher inequality measures than WID. Our methodology treats the components of national income separately and thereby reflects the impact of these very unequally distributed income sources better than an aggregated approach. The provision of administrative tax data for inequality research would nevertheless improve the quality of our results.

References

Alvaredo, F., A. B. Atkinson, L. Chancel, T. Piketty, E. Saez, and G. Zucman, "Distributional National Accounts (DINA) Guidelines: Concepts and Methods used in WID.world." *Working Paper*. World Income and Wealth Database, 2016.

Alvaredo, F., L. Chancel, T. Piketty, E. Saez, and G. Zucman, "Global Inequality Dynamics: New Findings from WID.world," *American Economic Review*, 107(5), 404–09, 2017. https://doi.org/10.1257/aer.p20171095.

Atkinson, A. B., "The distribution of wealth and the individual life-cycle," *Oxford Economic Papers*, 23(2), 239–54, 1971. https://doi.org/10.2307/2662236.

______, "Bringing Income Distribution in From the Cold," *The Economic Journal*, 107(441), 297–321, 1997. https://doi.org/10.1111/j.0013-0133.1997.159.x.

Balcazar, C. F., L. Ceriani, S. Olivieri, and M. Ranzani, *Rent Imputation for Welfare Measurement: A Review of Methodologies and Empirical Findings*. The World Bank, 2014.

Blanchet, T., L. Chancel, and A. Gethin, "How Unequal is Europe? Evidence from Distributional National Accounts, 1980–2017." *WID.world Working Paper No. 2019/06*. 2019.

______, "Why is Europe More Equal Than the United States." *WID.world Working Paper No. 2020/09*. 2020.

European Commission, *Data on Taxation*. 2016. Retrieved 2020–02-21, from https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en.

Eurostat, *European system of accounts*. 2013. Retrieved 2020–02-21, from https://ec.europa.eu/eurostat/web/esa-2010/overview.

______, *EU-SILC Operational Guidelines*. 2019. Retrieved 2020–02-21, from https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp.

Fesseau, M., and M. L. Mattonetti, "Distributional Measures Across Household Groups in a National Accounts Framework: Results from an Experimental Cross-Country Exercise on Household Income, Consumption and Saving." *OECD Statistics Working Papers No. 2013/04*. Organization for Economic Co-operation and Development, Paris, 2013.

Fesseau, M., F. Wolff, and M. L. Mattonetti, "A Cross-Country Comparison of Household Income, Consumption and Wealth Between Micro Sources and National Accounts Aggregates." *OECD Statistics Working Papers No. 2013/03*. Organization for Economic Co-operation and Development, Paris, 2013.

[16]This is true for all contributions to the literature which use survey data to calculate time series for inequality measures.

Fessler, P., M. Rehm, and L. Tockner, "The Impact of Housing Non-Cash Income on the Household Income Distribution in Austria," *Urban Studies*, 53(13), 2849–66, 2016.
Fixler, D., M. Gindelsky, and D. Johnson, "Measuring Inequality in the National Accounts." *BEA Working Paper Series (WP2020-3)*. 2020.
Garbinti, B., J. Goupille-Lebret, and T. Piketty, "Income inequality in France, 1900–2014: Evidence from Distributional National Accounts (DINA)," *Journal of Public Economics*, 162, 63–77, 2018. https://doi.org/10.1016/j.jpubeco.2018.01.012.
Household Finance and Consumption Network, "The Household Finance and Consumption Survey: Methodological Report for the Second Wave." *ECB Statistics Paper Series No. 17*. 2016.
Kuznets, S., "Economic Growth and Income Inequality," *American Economic Review*, 45(1), 1–28, 1955. https://doi.org/10.2307/1811581.
Piketty, T., "Income inequality in France, 1901–1998," *Journal of Political Economy*, 111(5), 1004–42, 2003. https://doi.org/10.1086/376955.
Piketty, T., and E. Saez, "Income Inequality in the United States, 1913–1998*," *The Quarterly Journal of Economics*, 118(1), 1–41, 2003. https://doi.org/10.1162/00335530360535135.
Piketty, T., E. Saez, and G. Zucman, "Distributional National Accounts: Methods and Estimates for the United States," *The Quarterly Journal of Economics*, 133(2), 553–609, 2018. https://doi.org/10.1093/qje/qjx043.
______, "Simplified Distributional National Accounts," *AEA Papers and Proceedings*, 109, 289–95, 2019. https://doi.org/10.1257/pandp.20191035.
Seneviratne, A., "Australian National Accounts: Distribution of Household Income, Consumption and Wealth." *Paper presented at the DGINS 2016 Conference*. 2016.
Stiglitz, J., A. Sen, and J.-P. Fitoussi, "Report by the Commission on the Measurement of Economic Performance and Social Progress." *Technical Report*. 2009.
Tonkin, R., and J. Wildman, "The Distribution of Household Income, Consumption and Savings in a National Accounts Framework: UK Experience." *Conference Paper*. 2016.
Zwijnenburg, J., "Unequal Distributions: EG DNA versus DINA Approach," *AEA Papers and Proceedings*, 109, 296–301, 2019. https://doi.org/10.1257/pandp.20191036.
Zwijnenburg, J., S. Bournot, and F. Giovannelli, "OECD Expert Group on Disparities in a National Accounts Frame-work—Results from the 2015 Exercise." *OECD Statistics Working Paper No. 76*. 2017.

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