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Distributional National Accounts for Belgium

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BE-PARADIS formulates a renewed and profound inquiry of existing and available data, concepts, and methods. This allows us:

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- To align Belgium with the international research agenda and its output in the form of DINA's (Distributional National Accounts).
- To enlarge and deepen the conceptual framework of distributional analysis by going beyond mere household disposable income.

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Abstract

Belgium often stands out as an exceptional case in comparative studies on both the level and the evolution of inequality. Contrary to the rise in income inequality in many OECD countries, publicly available sources mostly report a rather stable and low level of income inequality in Belgium between the mid 1980's and mid 2010's. In this paper, we reconsider the evolution of income inequality in Belgium between 1995 and 2019 by applying the methodology of Distributional National Accounts (DINA) as documented in Alvaredo et al. (2021). We construct DINA by inserting the distributional information from the two main survey datasets (ECHP and SILC) into the income information contained in the National Accounts. This allows to identify the role of important missing or incompletely reported income components as an explanatory factor for the perceived stability of inequality. Our preliminary results highlight the importance of calibrating the distributional information contained in the survey data to the National Accounts aggregates. Especially after the financial crisis we find that the DINA-approach unveils a previously undetected rise in Belgian income inequality. Remarkably, the timing of the turning point in the evolution of inequality depends on the income concept. For pre-tax income we find a rise in inequality since 2010. For post-tax and transfer disposable income, the increase only starts in 2014.

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1 Introduction

The debate on income inequality in Belgium is characterized by a tension between the general public opinion stating that inequality is increasing and, on the other hand, the lack of strong empirical evidence underpinning this statement. As summarized by Assal et al. (2023), most existing empirical evidence on income inequality in Belgium shows a rather stable trend. These findings are predominantly based on after tax and transfer household disposable income, recorded as response in surveys which aim to be as representative as possible for the population of households. Undeniably, these income surveys, like EU-SILC, have been an invaluable tool to investigate the evolution of the income distribution during the last decades. Besides detailed income information, they also come with a large set of socio-demographic covariates which are of great importance for research.

But these surveys also have their limitations. They might suffer from unit non-response and from item non-response and misreporting, especially at the top of the income distribution. Additionally, there is a gap between the total income aggregate recorded in household surveys and the macro-economic concept of net national income (hereafter, NNI) recorded by the system of National Accounts. This implies that the existing evidence on income inequality is only based on a 'slice' of the total net national income 'pie', available for distribution among residents in a country. Yet, only relying on aggregate information in the National Accounts themselves is, for obvious reasons, a non-starter for distributional analysis.

To remedy the latter shortcoming, a new methodology for distributional analysis has been proposed which tries to keep the best of both worlds: national accounts determine the size of the pie to be distributed, but aggregate information is enriched with distributional information from auxiliary sources (surveys, but also administrative tax records). As so often in distributional issues, the initial idea and push to link surveys with national accounts came from the late Tony Atkinson (see e.g. Atkinson et al. (1995) section 3.6). But the concrete elaboration and certainly fast dissemination of the approach has mainly been the work of what has now become the *World Inequality Lab* (WIL hereafter), under the direction of Atkinson's pupil, Thomas Piketty.

In fact, the process started with the realization that the success of the increasing availability of survey data and their processing through fastly increasing personal computing power, had somewhat pushed Kuznets' original contribution into oblivion. Indeed, in a seminal paper, Kuznets and Jenks (1953) had combined national accounts and tabulated income tax data to estimate the evolution of the top income share in the United States over the period 1913-1948. The rebirth of interest in national accounts data to feed into distributional analysis could hence be seen as a return to the origins of this early empirical distributional analysis.

In practice, Atkinson and Piketty (2007, 2010) started with building top income series for an ever-increasing number of countries, leading to the creation of the *World Top Incomes Database* (WTID). But the project quickly moved beyond the exclusive focus on the upper tail, and

transformed into an attempt to deliver estimates of the entire income and wealth distribution. This impressive research effort resulted in the establishment of an international research network, known as the World Inequality Lab, the public availability of a continuously expanding and updated *World Wealth and Income Database* (available on-line: see https://www.wid.world/), an annual report on inequalities (e.g. Chancel et al. (2022)) and, maybe most importantly, a unified methodology to construct what is now commonly known as *Distributional National Accounts* (hereafter, DINA).

The attempt to introduce a uniform methodology has obviously been inspired by the standardization of the national accounts, and its main aim is to increase the international comparability of the results. Naturally therefore, this methodology, described in detail in Alvaredo et al. (2021) also forms the backbone of this paper. By bridging the gap between the micro- and macro-level of income information we aim to provide additional evidence on the distribution of *total* income, as measured by NNI, in Belgium. We use the Belgian national accounts from 1995 onwards, since that is the starting point for publicly available macro-data in the ESA 2010 standard. We link the National Accounts with survey data from ECHP (1995-2000) and EU-SILC (2003-2019), to provide distributional information of these national account aggregates for Belgium over a period of 25 years (1995-2019).

The growing World Inequality Lab-community fostered a rapid propagation of the DINA-methodology. Important applications, among others, are the ones for the United States (Piketty et al., 2018) and France (Garbinti et al., 2018). But also China (Alvaredo et al., 2017), Russia (Novokmet et al., 2018), India (Chancel and Piketty, 2019) and the Middle East (Alvaredo et al., 2019) are covered. Blanchet et al. (2022a) constructed DINA for 26 European countries, among which also Belgium. But this amazing productivity in the WIL in Paris did not prevent individual countries to further explore their country-specific DINA series. Quite the contrary. By making all assumptions explicit and as transparent as possible, WIL laid the foundation stone for this more detailed investigation of country-specific DINA series.[1] Recent examples include Austria (Jestl and List, 2023), Germany (Bach et al., 2023), Italy (Guzzardi et al., 2022) and the Netherlands (Bruil et al., 2022). These papers produce new DINA-series by, e.g. using additional (simulated) micro data to distribute some macro aggregates at a more granular level than in the WID-approach. Our paper joins this line of research.

Indeed, in what may at first might appear to be a replication of the WID work for Belgium, we have attempted to deepen the insight by adopting a more refined approach based on both thorough research into and knowledge of the underlying micro-data. For example, unlike WID,

[1]Note also that, besides the DINA approach of the WIL, other attempts to combine macroeconomic data with micro data exist in parallel, such as for the US (Fixler et al., 2019) or the EG DNA approach coordinated by the OECD (Zwijnenburg et al., 2021). This latter initiative shares a lot of similarities but one major difference is the income concept for which they compile distributional results: the EG DNA approach only looks at the income of the household sector (S14) whereas the DINA approach also include income from other domestic sectors (Zwijnenburg, 2019).

we have relied on more detailed national accounts data of benefits and taxes. We also used a microsimulation model to determine tax liabilities and benefits at the micro-level of the household. The price we have paid for this more detailed approach is that - at least at this stage in the DINA-research - we have limited ourselves to injecting distributional information from the existing income surveys into the national accounts. This means that we have postponed the correction of those surveys by means of statistical techniques - also mainly developed in WIL - until a later stage of the Belgian DINA research. We are thinking in the first place of the correction of the top of the distribution based on administrative tax data, as described in Blanchet et al. (2022b). But, contrary to the published series for Belgium in the WID-dataset, we also refrained to transcend obvious methodological breaks between different surveys based on, for example, machine learning harmonization techniques such as XGBoost, used by Blanchet et al. (2022a) to construct the series for Belgium and other countries.

This means that the empirical results in this paper should be interpreted with great caution. As will become clear in the discussion of the results in section 4, they undoubtedly illustrate the importance of inflating and extending survey income aggregates to the level of the NNI. But, as we will argue in the concluding paragraph (section 5), we want to take important additional steps in the DINA construction for Belgium. The fact that we are yet publishing these first results is mainly motivated by our desire to document this method as thoroughly and in detail as possible.

This paper is organized as follows. In section 2 we focus on the evolution of net national income and different underlying income components. We also explain the different DINA-concepts of income, corresponding to different stages between market income, and final post-tax and transfer disposable income. In section 3, we discuss the DINA methodology, as applied in this paper, and the different data sources. section 4 summarizes our new findings on inequality in Belgium based on the DINA methodology. We look at inequality in pre-tax income, and at different forms of income after redistributive activities of the welfare state. We also discuss the sensitivity of the results for other choices of inequality indicators, of equivalence scales, and of the reference population. section 5 concludes by giving a first tentative answer on the question whether the larger scope of inequality research in the DINA-framework can solve some of the 'paradoxes' of Belgian inequality: do the claims that Belgium is one of the least unequal countries and that inequality is not increasing hold up? We also mention our future research plans to further extend the DINA-analysis.

2 Levels and trends of aggregate income concepts in the National Accounts

The essence of the DINA-approach is that it aims to distribute the entire income of an economy, not only the part registered in household surveys through the answers of the respondents. The income aggregate which is distributed is net national income (*hereafter* NNI, code $B.5_{n,S1}$ in the NA's).[2] In this section, we first describe the evolution of NNI as compared to GDP in subsection 2.1, and the evolution of components of NNI in subsection 2.2. In subsection 2.3 we explain how NNI can be studied at different stages of the macro-economic circular flow of income, leading to four distinct income concepts in the DINA-methodology. The Belgian national accounts follow the ESA 2010 standard and in this standard they are available from 1995 onwards.[3] By default we refer to NA aggregates in real terms by deflating the nominal values with the GDP deflator with base year 2015. If we use nominal values, we mention it explicitly.

2.1 From Gross Domestic Product to Net National Income

Net National Income (NNI) differs from gross domestic product (GDP) by subtracting depreciation - that is: moving from 'gross' to 'net' - and adding net foreign income - that is: moving from 'domestic' to 'national'. A divergent evolution of NNI as compared to GDP might give a first clue to understanding why GDP growth figures, which are prominently present in the public debate, do not mesh with public feelings about income growth. Unless mentioned explicitly, we refer to both GDP and NNI as measured at 'market prices', in the sense that we include net taxes on production and imports into both aggregates.[4]

In Figure 1 we display cumulative growth - in the form of an index starting at 100 in 1995 - of GDP, NNI and depreciation. Table 1 provides the levels in billions at the start and end of the period, and the average growth rates for the same three variables over the whole period 1995-2019, and for two subperiods 1995-2007 (from the start of the analysis up to the financial crisis) and 2010-2019 (from after the financial crisis up to the end of the analysis). All aggregates are for the entire domestic economy (sector S1 in the NA's), except for the line at the bottom of Table 1 which displays the aggregate 'Net disposable income' of the household sector (sector

[2] We use the standard NA-codes when referring to specific aggregates, with, where needed, the second subscript referring to the institutional sector. A brief introduction to national accounts concepts is available in Annex A.

[3] We retrieved the NA-data from NBB.stat from several tables: the *Annual detailed sector accounts* under 'National Accounts' → 'Sector Accounts', the *Breakdown of paid social benefits*, the *Received taxes and actual social contributions by kind* and the *Government spending by functions and transactions* under 'Public Finance' → 'non-financial government accounts'.

[4] The main reason to include net taxes on production and imports into NNI, is because these indirect taxes appear as the major component - next to net property income which is often negative - of the net balance of primary income of government sector S13 ($B.5n_{S13}$). Hence, to distribute the whole of NNI, these net indirect taxes have to be included. In essence, these production taxes only introduce a wedge between factor prices and consumer prices, and do not impact the evolution of NNI or GDP in volume. There might of course be a distributional impact of price changes, and therefore we do need to devote attention to the allocation of net indirect taxes across households (see subsection 3.2 below, and Alvaredo et al. (2021) p. 56-59 for an in depth discussion).

S14).[5] All aggregates are expressed in in real terms by deflating them with the GDP-deflator with base year 2015.

FIGURE 1: EVOLUTION OF MAIN AGGREGATES IN NATIONAL ACCOUNTS 1995 AND 2019 (INDEX 1995=100)

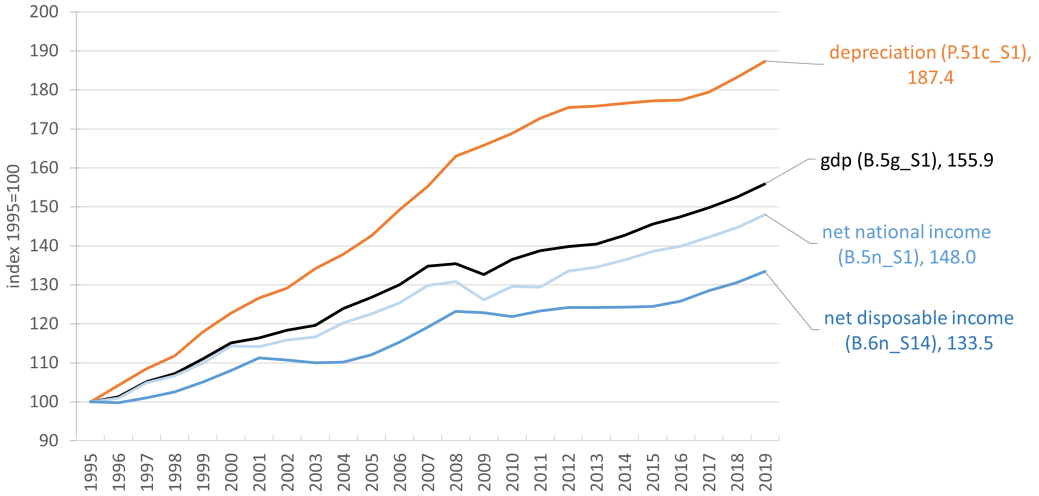


TABLE 1: GDP, NNI, DEPRECIATION AND HOUSEHOLD DISPOSABLE INCOME IN THE NA'S (1995 AND 2019)[a]

	levels in bn €		in % of gdp		average annual growth (%)		
	1995	2019	1995	2019	1995 - 2019	1995 - 2007	2010 - 2019
Gross domestic product (S1)	286.2	446.3	100.0	100.0	1.9	2.5	1.5
Depreciation (S1)	44.6	83.6	15.6	18.7	2.6	3.7	1.2
Net foreign income	6.3	4.3	2.2	1.0	-1.6	-1.3	-3.6
Net national income (S1)	247.9	367.0	86.6	82.2	1.6	2.2	1.5
Net disposable income (S14)	175.8	234.6	61.4	52.6	1.2	1.5	1.0

[a] Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. Variables in levels are deflated with the GDP-deflator with base year 2015.

Figure 1 and Table 1 indeed reveal, that in the period under consideration (1995 to 2019) the growth rate of NNI, the national income pie to be distributed to the residents, is below the one of GDP (1.6% compared to 1.9%). The main reason is that depreciation grows at an annual rate of 2.6% and hence accounts for an increasing share of GDP: it rises from 15.6% of GDP in 1995 to 18.7% in 2019. The numbers for the subperiods indicate that this was especially the

[5] We calculate net disposable household income by subtracting from gross disposable household income (code $B.6_{g,S14}$ in the NA's) the consumption of fixed capital in sector S14 (code $P.51_{c,S14}$). Note that this concept of 'disposable income' in the national accounts does not coincide with 'disposable income' of households in surveys.

case in the first subperiod (up to 2007).[6] In the last decade this accelerated pace of depreciation vanished. But it is important to realize that erecting a distributional analysis on NNI, implies that we neglect possible distributional effects of this increasing importance of depreciation.

The role of the second element in the difference between GDP and NNI, net foreign income (*hereafter* NFI), is less clear-cut. Overall, NFI declines between 1995 and 2019 and its share of GDP more than halved from 2.2% to 1.0%. Across the whole period, average yearly growth of NFI equals -1.6%, but the yearly movements are highly volatile, with - in nominal levels - e.g. a decline from 2010 to 2011 from €5.6 bn to €602 million and the following year 2012 a rebound to nearly €9 bn.[7] By using NNI as the reference income to be distributed, we do include NFI in the distributional analysis. Note however that we have not yet taken up the corrections suggested by Zucman (2013) to ensure that all income flows from offshore wealth, balance out at the world level. We shelve the proposed type of correction for future research.

Lastly, Figure 1 and the bottom row of Table 1 also provide information on the NA-concept which comes closest to - but does not coincide with - the income concept, most frequently used to depict a distributional picture based on survey information: disposable income of households. The yearly growth rate of household net disposable income (in real terms) is even further below the yearly growth rate of NNI: 1.2% compared to 1.6% for NNI (and 1.9% for GDP), reflected in a decline of the share of households' disposable income from 61.4% to 52.6% of GDP. The split into two subperiods reveals that the gap between growth of household disposable income and both GDP and NNI was present in both subperiods.

Besides the fact that with disposable income we have moved from a pre-tax concept to a concept after taxes and transfers, the difference also comes from the fact that with household disposable income we confine the income measurement to the household sector (labelled S14 in the NA's). Indeed, significant parts of NNI, such as undistributed profits, do not arrive inside households: for 2019 net disposable income of households amounts to €235 bn or 64% of the €367 bn of NNI. To further highlight the importance of this, we now turn to a decomposition of NNI into its constituent income components.

2.2 Net National Income and its components from an income perspective

Above we defined NNI starting from the production of value added, that is: reading it off from account $II.1.1$, the *Generation of income account* in the NA's and applying the operations to move from gross to net and from domestic to national. But to study distributional issues based

[6] This high level of depreciation up to 2007 is driven mostly by the strong growth of depreciation in the corporate non-financial sector (annual growth of the consumption of fixed capital in S11 in nominal values was 6% between 1995 and 2007, compared to 5.5% for the whole economy, and 5.1% for the household sector S14. However, expressed as a fraction of gross value added, it was household sector S14 which showed the fastest increase: from 21.4% in 1995 to 30.4% in 2019, compared to an increase from 16.6% to 20.8% for sector S11 and from 15.6% to 19.5% for the entire economy. The reason is that with an annual growth of 2.6%, the denominator of S14 ($B.1g_{U,S14}$ in the production account) grew much slower than the value added for the entire economy (annual growth of 3.5%)

[7] This is the main reason why we omit NFI from Figure 1. In Figure F.19 in Appendix F we show the

on the NA's, it seems more sensible to start from NNI as the sum from all net primary incomes 'received' as resources by all five institutional sectors (the non-financial corporate sector S11, the financial corporate sector S12, the government sector S13, the household sector S14 and the non-profit sector S15). Even before allocating these income components to households or individuals in the genuine DINA-exercise, the evolution of the aggregates themselves might reveal divergent evolutions of the different income components, and hence changes in the relative importance of these components. The way in which we reconstruct NNI as the sum of the underlying income components in account $II.1.2$, the *Allocation of income account*, is explained in the left-hand side of Table B.11 in Appendix B.[8] We first decompose NNI by institutional sector, then by income component and finally also touch upon the allocation of NNI among the production factors labour and capital.

Net National Income by institutional sector

In Table 2 we decompose NNI into primary income of the five institutional sectors.[9] It illustrates how the choice of the NNI as pie to be distributed allows to consider all income received by economic agents resident in Belgium. Considering only primary income from households - that is, before any redistribution through taxes or transfers has taken place - would have left significant parts of national income out of the scope of the analysis: in 2019 primary income of the corporate sector (sectors S11 and S12), which are mainly the undistributed profits, amounts to € 40.4 bn. Overall the share of primary income in the household sector shrinked from 88.3% to 78.5%. The first explanation for this declining share is found in the growth rate of primary income in the corporate sector which largely exceeds the one of the household sector: 3.1% (S11) and 1.6% (S12) versus 1.2% for households (S14). Certainly in the period after the financial crisis, the divergence in growth between household primary income (0.8%) and the one for the corporate non financial sector of 6.1% is striking. The second explanation for the shrinking share of the household sector in the primary income aggregate NNI, lies in the significant increase of the share of the government sector in total primary income. This is mainly explained by the decrease of the interest rates to be paid by sector S13.[10]

Net National Income by income component

The two facts noticed above, also re-appear when breaking down NNI into separate income components. This we show in Table 3, with the corresponding cumulative growth of some

contribution of changes in net foreign income, as compared to GDP and depreciation in the year-to-year change of NNI.

[8] The right part of Tables B.11 to B.14 in Appendix B contains the detailed info on the link between the NA-aggregates and the distributional information from the micro-data.

[9] Code $B.5n$ from the *Allocation of primary income account*, account $II.1.2$, for the respective sector.

[10] Although the net operating surplus of the government sector ($B.2n_{S13}$) is approximately zero, the balance of primary incomes $B.5n_{S13}$ is not. It is determined in account $II.1.2$. The resource side of the latter consists

TABLE 2: DECOMPOSITION OF NNI INTO PRIMARY INCOME OF THE INSTITUTIONAL SECTORS[a]

	levels in bn €		in % of NNI		average annual growth (%)		
	1995	2019	1995	2019	1995-2019	1995-2007	2010-2019
Corporate non financial (S11)	15.9	33.2	6.4	9.1	3.1	0.7	6.1
Corporate financial (S12)	4.9	7.2	2.0	2.0	1.6	7.6	2.6
Government (S13)	8.3	38.1	3.3	10.4	6.6	10.4	3.7
Households (S14)	218.8	288.3	88.3	78.5	1.2	1.6	0.8
Non-profit (S15)	0.05	0.14	0.02	0.04	4.5	1.7	-1.6
Net National Income (S1)	247.9	367.0	100.0	100.0	1.6	2.2	1.5

[a] Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. Variables in levels are deflated with the GDP-deflator with base year 2015.

selected income components displayed in Figure 2.[11]

The average annual growth of 1.6% for NNI over the whole period 1995-2009 conceals strikingly divergent evolutions across the different constituting income components. First, net financial income, received by households nearly halved: from €34.0 bn in 1995 to €18.4 bn in 2019. Figure 2, in which the black dotted line displays the cumulative growth of NNI, clearly visualises that this decline in financial income is driven by the steeply declining curve of 'intrests received by households'. In fact this form of income nearly disappeared: the €26.4 bn in 1995 represented 10.7% of NNI, and contrasts sharply with the €1.2 bn in 2019 (or 0.3% of NNI). Average annual growth was negative up to nearly -12%, with even -21% over the last decade. Note that the other side of the coin, namely the interest paid by households, looks somewhat different. Especially in the years in which the interest rate increased (2000-2001 and 2007-2008), the increase in 'interest paid' is spectacular. In absolute terms e.g. interest paid increased from €2.0 bn in 2004 to €6.3 bn in 2008, only to fall back to €4.0 bn in 2009. The erratic course of this variable will have a considerable impact on the distributional picture we create below, because in the distributional step we will deduct interest paid from real estate income of households.

Second, the spectacular plunge of income from fixed income financial assets is not evenly matched by an increase in other forms of household's financial income. The share of dividends received by households went up from 3.4% to 4.3% of NNI (or from €8.5bn to €15.9bn), leading to a growth rate which exceeds the one of NNI (2.6% versus 1.6%). It implies that the *composition* of financial income received by households underwent a fundamental change during this period. Moreover, Table 3 and Figure 2 also reveal that by far the highest growth rate is found for *undistributed profits*. This income component nearly doubled from €20.8bn to €40.4bn (or an income share which increased from 8.4% to 11.0%). Certainly after the financial crisis, the

mainly from revenues of net indirect taxes; the uses side consists of the interests paid on government debt. The spectacular decline of the latter, not matched by a corresponding decline in revenues, drives the huge increase in the balance of net primary income of $S13$.

[11] Table 3 is a simplified version of the detailed breakdown for year 2019 displayed in Table B.11 in Appendix B.

TABLE 3: MAIN INCOME AGGREGATES IN NET NATIONAL INCOME (1995 AND 2019)[a]

		levels in bn €		in % of NNI		average annual growth (%)		
		1995	2019	1995	2019	1995-2019	1995-2007	2010-2019
+	Remuneration employees[b]	148.0	225.7	59.7	61.5	1.8	2.4	1.1
+	Net mixed income[c]	22.5	27.9	9.1	7.6	0.9	1.0	1.1
+	Net real & imputed rents[c]	9.8	9.2	4.0	2.5	-0.3	0.0	2.4
+	Financial income	34.0	18.4	13.7	5.0	-2.5	-2.3	-1.8
	+ Interests received by househ.	26.4	1.2	10.7	0.3	-12.0	-4.7	-21.0
	- Interests paid by househ.	4.6	1.4	1.9	0.4	-4.9	2.9	-11.4
	+ Dividends received by househ.	8.5	15.9	3.4	4.3	2.6	4.3	2.2
	+ Collect. invest. shareholders	3.7	2.6	1.5	0.7	-1.4	-1.1	0.3
+	Insurance & pension entitlements	4.4	6.8	1.8	1.8	1.8	5.5	-3.5
+	Net undistributed profits	20.8	40.4	8.4	11.0	2.8	2.9	5.4
+	Other income[d]	8.4	38.6	3.4	10.5	6.6	10.3	3.7
=	Net National Income	247.9	367.0	100.0	100.0	1.6	2.2	1.5

[a] Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. Variables in levels are deflated with the GDP-deflator with base year 2015. 'Net' refers to net of depreciation; see note [c] below.

[b] Remuneration of employees includes social security contributions.

[c] To obtain *net mixed income and net real and imputed rents* we subtract depreciation from $B.3g_{S14}$ and $B.2g_{S14}$ respectively. In the National Accounts of NBB.Stat, we only dispose of the consumption of fixed capital in $S14$, for both mixed income ($B.3g_{S14}$) and imputed rents ($B.2g_{S14}$) combined. However, the Belgian Federal Planning Bureau, in its medium term projections, does publish the corresponding amounts net of depreciation $B.2n_{S14}$ and $B.3n_{S14}$ from 1996 onwards. We use the difference between the gross amount in the National Accounts published by Nbb.Stat, and the net amount published by the Federal Planning Bureau as the depreciation for the two sources of income. For 1995 we used the depreciation rate of 1996 on resp. $B.2g_{S14}$ and $B.3g_{S14}$.

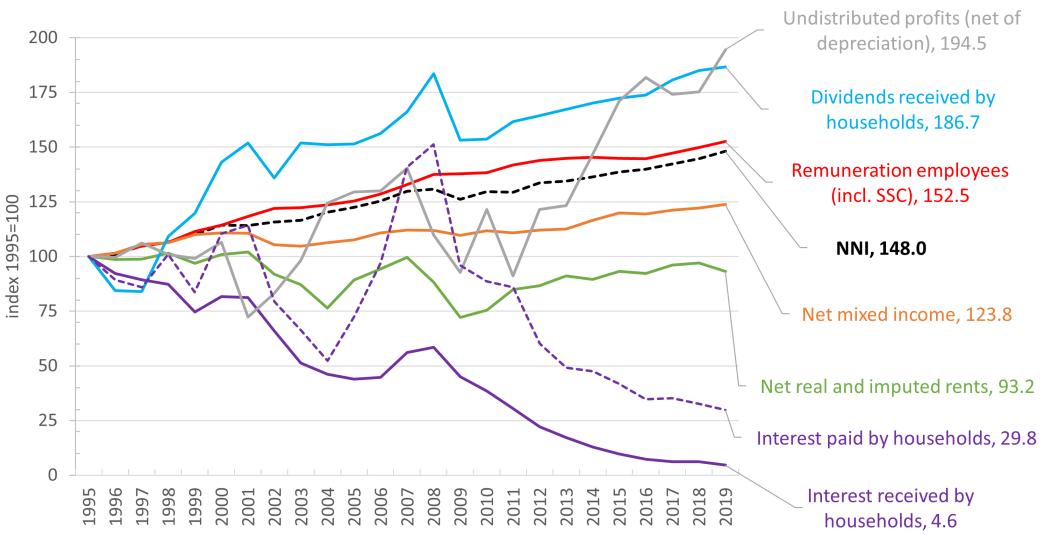
[d] As already mentioned in footnote 4, 'Other income' primarily consists of net primary income of the government sector S13, and is mainly driven by net indirect taxes minus intrest payments of S13.

annual growth rate of undistributed profits of 5.4% exceeded the growth of NNI by a wide margin. Figure 2 shows that this component is the most volatile component of the NNI-parts displayed in Figure 2. Yet, its near doubling more than justifies attempts to bring this part, together with the sharply declining intrest income into the distributional picture.

Third, somewhat surprising is the negative growth for real and imputed rents: -0.3% versus an average growth of NNI of 1.6%. The often quoted increasing prices of residential property seems not to be reflected in correspondingly higher net imputed rents for the home owners, at least not after taking into account depreciation. As noted in footnote 6 this has to do with a strongly increasing depreciation rate applied to the gross operating surplus of household sector S14.

Fourth, 'other income', which mainly consists of the balance of net primary income of the government sector S13, displays the largest yearly growth rate next to the undistributed profits (i.e. 3.7%). The increase from €8.4 bn in 1995 tot €38.6 bn in 2019 is driven by two forces. On

FIGURE 2: MAIN INCOME AGGREGATES IN NET NATIONAL INCOME: CUMULATIVE GROWTH 1995-2019



the one hand this is partly the reverse side of the medal of declining intrest payments received by households, since this steep decline evidently also shows up as decreasing intrest payments on government debt, with a positive effect on the balance of primary income for S13. On the other hand it also witnesses the increasing reliance on net production taxes as a source of government revenue.

Finally, the most stable component is the remuneration of employees, which, at 1.8%, grew slightly faster than NNI. This increases the share of this income component from 59.7% in 1995 to 61.5% in 2019. Note however that also for this income component, the split into two subperiods is revealing: after the financial crisis, annual growth of remuneration of employees was substantially below the growth rate of NNI (1.1% versus 1.5%). The stability of remuneration of employees across the entire period of analysis stands in contrast with the falling share of mixed income: the level increased from €22.5 bn (in real terms) to €27.9 bn, but this translates into a decrease in the share of this component of NNI from 9.1% in 1995 to 7.6% in 2019.

We conclude that important changes have taken place in the composition of Net National Income: retained earnings have become much more important, and within household financial income it is mainly dividends that now play a much larger role compared to fixed income investments. The probability that these structural changes have important distributional implications is high. In addition, there is the growing importance of indirect taxes as a source of government revenue.

The labour share in Net National Income

Some incomes in Table 3 are clearly linked to labour income (e.g. the compensation of employees, $D.1_{R,S14}$), others to capital income (e.g. income from real-estate owned by households in $B.2n_{R,S14}$, income from interests received by households in $D.41_{R,S14}$ and dividends received by households in $D.42_{R,S14}$). Therefore, even before moving to the genuine DINA-analysis, which distributes the NA-aggregates over the population of households or individuals, we can construct a first distributional indicator by calculating 'a' labour share in NNI. We explicitly refer to 'a' labour share, since different definitions co-exist next to each other in the literature.

We start with the labour share as described in the WID-manual, and expressed in Equation 1:

$$\lambda_{WID} = \frac{\text{labour earnings} + \alpha * \text{net mixed income}}{\text{NNI at factor cost}} = \frac{D.1_{R,S14} + \alpha * B.3n_{R,S14}}{B.5n_{R,S1} - (D.2_{R,S1} + D.3_{R,S1})} \quad (1)$$

In line with the rest of the WID-approach, values in Equation 1 come from account $II.1.2$, the *Allocation of primary income account*. The denominator of this WID-labour share is the standard NNI ($B.5n_{R,S1}$), a natural choice within the WID-approach which puts NNI at the core of the analysis. It is obtained from gross national income for the domestic economy ($B.5g_{R,S1}$) by subtracting depreciation ($P.51c_{U,S1}$). More surprising is that WID also recommends to express this NNI-concept at *factor costs*, by subtracting indirect taxes ($D.2_{R,S1}$) minus subsidies ($D.3_{R,S1}$) in the denominator. The numerator consists of all revenues allocated to residents, who are considered to be 'workers'. It is defined on the basis of resources in institutional sector $S14$, viz. the wages received ($D.1_{R,S14}$) by 'employees' and a fraction α of mixed income ($B.3n_{R,S14}$).[12] We follow standard practice by choosing $\alpha = 0.70$.[13] Given the numerator in Equation 1 all other income from NNI is allocated to the capital side: $1-\alpha$ % of mixed incomes from self-employment, undistributed profits from the corporate sector ($B.5n_{R,S11+S12}$), but also the balance of net primary income from the government and of the non-profit sector.[14]

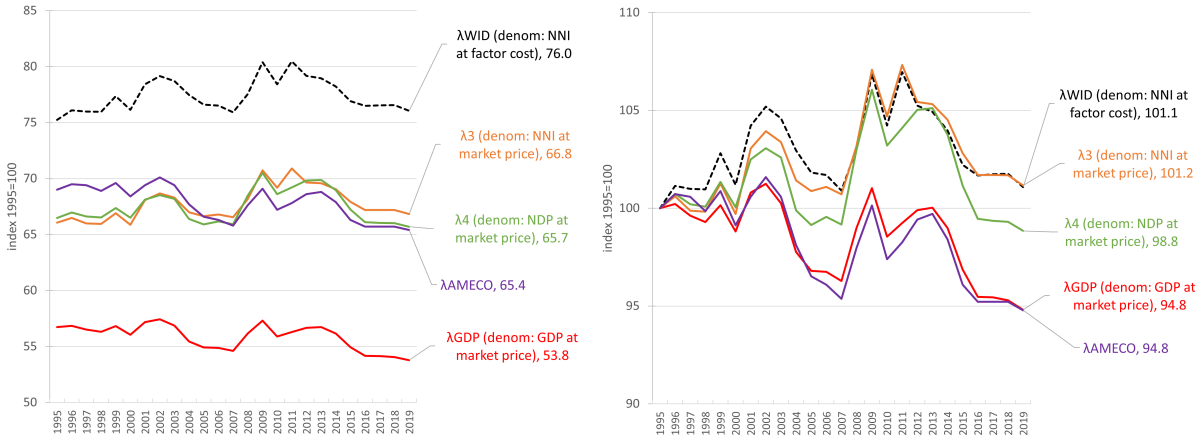
In the left panel of Figure 3 we depict the level of this WID-labour share as the black dotted line. The right panel expresses the evolution of the share by means of an index with value 100 in the starting year 1995. Over the entire period 1995-2019, this labour share is fluctuating, but the right panel allows to distinguish relevant subperiods. First, if the labour share between 1995 and 2019 has not declined, this is mainly due to the outspoken rise of the labour share during years 2008-2009 of the financial crisis, and to a lesser extent to the years 2001-2002 (the recession following the burst of the dotcom bubble). But the subperiods 2002-2007 and 2011-2019 show a clear declining labour share (from 79.1 to 75.9 in the first subperiod and from 80.4 to 75.8 in the

[12] With 'employees' one usually refers to people who work with a wage or salary contract, to be distinguished from 'employed persons', a term used - in AMECO e.g. - to indicate all 'active' people delivering the production factor labour in some from to the production process.

[13] See Note *c* at Table 3 for how we determined the share of depreciation to be applied to mixed income.

[14] To get NNI at factor costs in the denominator we subtract net indirect taxes. These net indirect taxes are the main driver on the resource side of the balance of primary income of the government sector $S13$.

FIGURE 3: LEVEL OF THE LABOUR SHARE ACCORDING TO DIFFERENT DEFINITIONS, 1995-2019



(A) LABOUR SHARE IN LEVELS (B) LABOUR SHARE INDEX 1995=100

last period). It once more shows how crucial the subperiod 2007-2009 of the financial crisis and the following recession is when assessing trends. Choosing 2007 or 2009 as the starting point for the last subperiod makes a large difference for the trend obtained.

This WID-approach to the labour share is conceptually rather different from the more standard approach, which relies on the share of labour and capital as production factors in the creation of value added. This approach starts from the *Generation of income account* (account $II.1.1$) in the National Accounts. Although it usually calculates the ratio between labour incomes and gross domestic product at factor cost, in Equation 2 we first define this second labour share with gross domestic product at market prices in the denominator:

$$\lambda_{GDP} = \frac{\text{labour earnings} + \alpha * \text{net mixed income}}{\text{GDP at market price}} = \frac{D.1_{U,S1} + \alpha B.3g_{U,S14}}{B.1g_{R,S1}} \tag{2}$$

The share λ_{GDP} is that part of the value added produced by all institutional sectors of the domestic economy ($B.1g_{R,S1}$) which is used to compensate employees working in each of those sectors ($D.1_{U,S1}$) and a fraction α of the mixed income of self-employed persons ($B.3g_{U,S14}$). Measured at market prices, and before depreciation, the denominator is Equation 2 is far larger than the one in Equation 1. In the left panel of Figure 3 this shows up as a labour share (the red curve) which is far below the one based on NNI at factor costs. The right panel reveals that the downward movements of this traditional labour share in the subperiods identified above are more outspoken and come closer to the standard decreasing trend presented in the literature. This standard labour share confirms the finding above that, when one takes out the increase in the labour share from 54.6% to 57.3% between 2007 and 2009, the declining pattern in the two remaining subperiods is outspoken. From 1995 to 2007, the labour share declined from 56.7% to 54.3%. And in the last decade of our analysis (from 2009 to 2019) the labour share dropped

from 57.3% to 53.8%.

The (large) gap in levels between the two labour share definitions in Equation 1 and Equation 2 can be bridged in three steps: by moving from factor costs to market prices, by including depreciation and by moving from 'national' to 'domestic' by taking the net factor incomes from abroad (NFI) into account. To investigate the relative importance of these elements, we define two additional labour shares:

$$\lambda_3 = \frac{\text{labour earnings} + \alpha * \text{net mixed income}}{\text{NNI at market price}} = \frac{D.1_{R,S14} + \alpha B.3n_{R,S14}}{B.5n_{R,S1}}, \tag{3}$$

which could be considered a variation on the WID-labour share of Equation 1 and is displayed in orange in Figure 3a; and

$$\lambda_4 = \frac{\text{labour earnings} + \alpha * \text{net mixed income}}{\text{NDP at market price}} = \frac{D.1_{U,S1} + \alpha B.3n_{U,S14}}{B.1n_{R,S1}} \tag{4}$$

which could be considered a variation on the GDP-labour share of Equation 2 and is displayed in green in Figure 3.

Finally, in purple we also display the labour share available in the macro economic database of the European Commission (AMECO), defined in Equation 5.

$$\lambda_{AMECO} = \frac{\text{labour earnings}}{\text{GDP at market price}} * \frac{\text{employed persons}}{\text{employees}} = \frac{D.1_{U,S1}/\text{employees}}{B.1g_{R,S1}/\text{employed persons}} \tag{5}$$

The first factor in Equation 5 shows that the numerator of this labour share is solely based on labour earnings of salaried workers and does not account for a fraction α of mixed income ($B.3n_{R,S14}$).But the value added created by self-employed persons is of course included in the denominator (GDP at market prices). Therefore one includes a correction factor equal to the ratio of all employed persons (salaried + self-employed individuals) over employees (see Equation 12 for the distinction between 'employees' and 'employed persons'). In fact this means that the AMECO labour share in Equation 5 shows the share of average labour earnings per salaried worker (the numerator at the right hand side) over the average value added produced by all employed persons (the denominator of the right hand side). This labour share is therefore also called *the 'adjusted' wage share.*

Comparison of the different labour shares shows that the move from NNI at factor cost in the denominator to NNI at market prices barely makes any difference, both in levels and in evolution. The role of the net factor incomes from abroad (NFI) is more important though, since the move from NNI to NDP (both at market prices) introduces a sharper decline of the labour share, certainly in the most recent years. Or in reverse: the decline in the labour share when measured 'domestically' becomes less pronounced when measured 'nationally'. Detailed inspection of NFI shows that net labour income from abroad has indeed increased and that net property income from abroad has dropped (in 1995, Belgium was a net receiver for property

income and it became a net contributor at the end of the period). Comparison of the labour share λ_4 (which uses NDP at market prices in the denominator) with λ_{GDP} (which uses GDP at market prices in the denominator) shows that depreciation plays a role in the level but not in the change of the labour share through time. Yet, note that removing depreciation from the labour share calculation - as is done with the WID-approach based on NNI - is equivalent to consider that depreciation should not be borne by the capital side.

2.3 Four DINA-concepts of Net National Income

In line with the DINA methodology of WID (Alvaredo et al., 2021), we focused in subsection 2.2 above on Net National Income as focal concept for the pie to be distributed among residents of a country. But this NNI appears in different forms, depending on the perspective taken in the sequence of moving from pre-tax market income paid out to production factors up to disposable income of households, augmented with in kind benefits of public consumption. We summarize the different possibilities in a simplified form in Figure 4.[15]

There are two pre-tax concepts, *pre-tax factor income* (hereafter also denoted as DINA1) and *pre-tax post-replacement income* (hereafter also denoted as DINA2), and two post-tax concepts, *post-tax disposable income* (hereafter DINA3) and the *post-tax national income* (hereafter DINA4). Except for DINA3, all DINA concepts equal Net National Income ($B.5_{n,S1}$) measured at market prices. In the following subsections, we explain the four perspectives in some more detail, and continue the analysis of the evolution of underlying components over time.

Pre-tax factor income (DINA1)

Pre-tax factor income (or DINA1) being constructed from aggregates behind balances of primary income of each institutional sector of the economy, we already described its evolution and the most important components in section 2.2 (see Table 3 and Figure 2). DINA1 is a pre-tax concept. This implies that at this stage there is no redistribution of any kind: not any direct tax, nor social insurance contribution, cash benefit or use of public expenditures. Note however that, since we chose to measure NNI at market prices, net indirect taxes (on production and import) are included.[16]

Because of the complete absence of any tax on income or redistributive activity in DINA1, this concept is close to factor income.[17] Since the DINA-exercise distributes this aggregate among a population of households or individuals, it leaves people who only get income from benefits (like many pensioners) with a pre-tax factor income of zero. Distributional analysis

[15] See the left part of Tables B.11 to B.14 in Appendix B for detailed info on how the four DINA concepts are derived from the National Accounts.

[16] In Table 3 these net indirect taxes are listed under the label 'other income' in the bottom row, since this 'other income' mainly consists of the balance of net primary income of government sector S13, of which net indirect taxes are an important element.

[17] In fact we assume that net indirect taxes are distributed as factor income.

FIGURE 4: SEQUENCE OF FOUR DINA-AGGREGATES EXTRACTED FROM THE NATIONAL ACCOUNTS

Concept	Description
DINA 1	Pre-Tax factor income (= NNI at market prices)
	= all incomes going to the production factors labour and capital + all other income not directly attributable to labour or capital (income government B.5n_S13 and non-profit B.5n_S15)
DINA 2	Pre-Tax post replacement income (= NNI at market prices)
	= Pre-tax factor income (DINA 1) – social insurance contributions + social benefits acting as income replacement (e.g. pensions, unemployment & sickness benefits)
DINA 3	Post-Tax disposable income (≠ NNI at market prices)
	= Pre-tax post replacement income (DINA 2) – all forms of taxes on income (Pers. Income tax, Corporate Inc. tax, etc...) + all other remaining social cash benefits (e.g. social assistance, child benefits, ...)
DINA 4	Post-Tax National Income (= NNI at market prices)
	= Post-Tax disposable income (DINA 3) + social benefits in kind (e.g. expend. on health, education, etc...) + collective consumption (e.g. expend. on defence, police, gen. public service + government balance

based on the DINA1-concept is therefore sensitive to the age structure of the population, since, all other things being equal, the ageing of the population will show up in a growing fraction of the population with zero pre-tax labour income. Inequality analysis for the entire population has to take this into account. Therefore it is not unusual to restrict the analysis based on DINA1 to the population at working age, especially if one wants to study the distribution of market income (in subsection 3.2 we discuss the definition of the population in more detail).

Pre-tax post-replacement income (DINA2)

DINA2 or *Pre-tax post-replacement income* is the second DINA concept and builds upon the pre-tax factor income (DINA1), by subtracting all social contributions (both paid by employer and by employee) and adding some social benefits. Table 4 shows in a simplified way the construction of DINA2 with the level and relative weight of its main aggregates in 1995 and 2019, and the annual growth rates in the rightmost part of the Table.[18]

The social benefits brought into the scope of DINA2 are mainly labour-related benefits: pensions, unemployment benefits, sickness and invalidity benefits and career-break benefits. In this sense DINA2 tries to approximate an income concept which takes into account the aspects of the safety net which are mainly motivated by insurance arguments, to be distinguished from explicitly redistributive motives.[19] Child allowances e.g. will therefore only enter the perimeter of the third DINA-concept. Note that in the bottom line of Table 4 we also add the gap (positive or negative) between aggregate contributions and aggregate benefits such that DINA1 equals DINA2.

From Table 4 we learn that over the entire period, social security contributions grew at the same rate as NNI. They amount to €85 bn in 2019, or 23.2% of NNI. However, since the financial crisis, the growth rate of social contributions fell much behind the one of NNI (+0.5% compared to +1.6% for NNI), due to various policy changes aimed at reducing employers' social security contributions. At the benefit side, pension-related benefits are by far the largest expenditure (€36.4bn in 2019). In line with the ageing of the population, the annual growth rate of pension expenditure (+2.8% annually) exceeds the one in net national income. As a share of NNI, pension expenditure grew from 7.6% to 9.9%. Yet, the growth in sickness and disability benefits - be it from a lower total of €3.4 bn in 1995 - even exceeds the one of pensions (4% over the whole period, and even 4.8% in the period since the financial crisis). At least part of this increase might be the back side of the decrease in unemployment benefits and career break benefits: their

[18]The left-hand side of Table B.12 in Appendix B explains in detail how DINA2 is constructed from the National Accounts.

[19]Evidently, the empirical split between redistributive and insurance elements in social security contributions and benefits is less straightforward that the neat conceptual distinction suggests. Numerous explicit redistributive elements, such as minimum floors and caps at the benefit side, erode the insurance element of replacement incomes such as unemployment benefits, pensions or sickness and invalidity benefits. Allocating them to DINA2, because DINA2 precedes the explicit redistributive role of the welfare state, is therefore a simplification.

Table 4: DINA2 - pre-tax post-replacement income - 1995 and 2019[a]

		levels in bn €		in % of NNI		average annual growth (%)		
		1995	2019	1995	2019	1995-2019	1995-2007	2010-2019
+	DINA1 (= NNI)	247.9	367.0	100.0	100.0	1.6	2.2	1.5
-	social contributions (all)[b]	58.5	85.0	23.6	23.2	1.6	2.3	0.5
+	Cash Social Security benef. (D621)[c]	30.8	52.3	12.4	14.2	2.2	2.1	1.6
	+ Sickness, invalidity	3.4	8.7	1.4	2.4	4.0	2.7	4.8
	+ Unempl. Benef., Career breaks	7.7	6.0	3.1	1.6	-1.1	1.1	-5.5
	+ Pension benefits	18.9	36.4	7.6	9.9	2.8	2.4	2.9
+	Other social benefits (D622)	14.9	20.3	6.0	5.5	1.3	2.5	0.1
	+ Pension ben. (employer scheme)	5.1	9.6	2.1	2.6	2.7	3.2	1.7
	+ Other Benefits	9.1	9.6	3.7	2.6	0.2	2.0	-1.5
+	Balance social contrib. and repl.inc.[d]	12.8	12.5	5.2	3.4	-0.1	2.6	-2.8
=	DINA2 (=NNI)	247.9	367.0	100.0	100.0	1.6	2.2	1.5

[a] Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. Variables in levels are deflated with the GDP-deflator with base year 2015.

[b] Ideally, in line with the split we try to introduce at the benefit side between insurance-related and non-insurance related benefits, we would subtract only the contributions related to insurance related benefits. At this stage, we simplify by subtracting *all* social insurance contributions.

[c] In DINA2 we do not consider child allowances as part of replacement income, and hence do not include them. In Belgium, child allowances were in the social security perimeter before their transfer to the Regions in 2015. Therefore, in the National Accounts, up to 2014, they were included in the social security benefits in cash received by the household (D621 and D622). We therefore removed child allowances from codes D621 and D622, and added them to cash social benefits registered under code D623. This benefit will re-appear in the post-tax DINA concepts, such as DINA3 and DINA4.

[d] This balance has no real-world counterpart in the financial accounts of the social security administration. It is the balance obtained from subtracting all benefits retained in this table, from all revenues retained in this table, such that in total we are back at Net National Income.

share in NNI even halved from 3.1% to 1.6%.

Post-tax disposable income (DINA3)

Post-tax disposable income is a post-tax concept: starting from pre-tax post-replacement income (DINA2), it subtracts all remaining taxes (such as direct taxes on income, property or corporate profits etc., but also indirect taxes on production and imports), and adds all remaining cash social benefits. Part of government revenue is not used for benefits, but pays for 'in kind benefits' such as education or subsidized health care and for collective services such as general government administration, police, defense, etc.[20] Since this government spending is not yet added - this will be done in DINA4 - the DINA3 aggregate is no longer equal to NNI. This is

[20] In the National Accounts a distinction is made between on the one hand government expenditures which can still be considered as 'personal' or 'individualized' (e.g. education or health care) and which are called 'social transfers in kind', and on the other hand the so-called pure public goods such as government administration or defence which are called 'collective consumption'.

illustrated in Table 5 by comparing the bottom-line where we display the value of DINA3 with the top row where we display the value of DINA2. In 2019 e.g. DINA3 equals €266.5 bn or €100 bn less than the NNI of €367 bn.[21]

TABLE 5: DINA3 - POST-TAX DISPOSABLE INCOME - 1995 AND 2019[a]

		levels in bn €		in % of NNI		average annual growth (%)		
		1995	2019	1995	2019	1995-2019	1995-2007	2010-2019
+	DINA2 (= NNI)	247.9	367.0	100.0	100.0	1.6	2.2	1.5
-	Taxes on production & import	35.2	59.9	14.2	16.3	2.2	2.9	1.7
-	Subsidies on production & import	-4.9	-16.7	-2.0	-4.6	5.3	7.0	1.8
-	Taxes on Income	44.6	67.9	18.0	18.5	1.8	2.4	1.8
	- Income taxes (persons)	34.2	46.7	13.8	12.7	1.3	1.8	0.5
	- Taxes on movable prop. (hh)[b]	3.3	3.4	1.3	0.9	0.2	-1.8	3.2
	- Corporate income tax	6.6	16.5	2.7	4.5	3.9	5.9	5.8
	- Other income taxes	0.5	1.1	0.2	0.3	3.3	5.5	2.4
-	Other Taxes[c]	1.2	2.0	0.5	0.5	2.1	4.4	0.1
+	Social security benefits cash	8.5	12.5	3.4	3.4	1.7	1.1	1.9
	+ Family allowances	5.3	6.4	2.1	1.7	0.8	0.4	0.8
	+ Garanteed income elderly	0.3	0.6	0.1	0.2	2.3	1.5	1.9
	+ Social assistance benefit	0.4	1.3	0.1	0.4	5.5	3.2	7.9
	+ Benefit for handicapped	1.2	2.1	0.5	0.6	2.4	2.6	1.3
	+ Other benefits in cash	1.2	2.1	0.5	0.6	2.2	1.8	3.1
=	DINA3 (≠ NNI)	180.2	266.5	72.7	72.6	1.6	2.1	1.4

[a] Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. Variables in levels are deflated with the GDP-deflator with base year 2015.
[b] Consists mainly of the liberating withholding tax on income from financial assets.
[c] Consists, among others, of the taxes on income from immovable property, licence fees, etc...

Table 5 shows that DINA3 grows at the same annual rate as NNI (1.6%). But the decomposition into the underlying elements of DINA3 however, reveals some interesting differences. First, taxes on production and import grew faster than NNI (+2.2% annually), and have hence become the most important source of revenue (€59.9 bn in 2019 compared to €46.7 bn in personal income tax), whereas both revenue sources were more or less equally important in 1995. Second, still more impressive is the growth of the subsidies on production and import: from €4.9 bn in 1995 to €16.7 bn in 2019, an annual growth of 5.3%. Third, at an annual growth rate of 1.3% personal income tax revenue is growing slower than NNI, especially in the second subperiod. Combined with the increasing reliance on indirect tax revenue, this slower growth

[21] Given its construction, it is tempting to compare DINA3 with the survey-concept 'disposable income of households', the latter being the income left to households after they pay taxes on their incomes and received benefits. However, note that the perimeter of DINA3 is larger than the household sector in the National Accounts (S14), and hence DINA3 should not be read as the concept 'disposable income of sector S14' in the National Accounts. DINA3 is larger than the disposable income of S14, but lower than the disposable income of the economy.

of personal income tax revenue illustrates the shift aimed at by policy makers to move the tax system away from relying (too) heavily on labour income taxation to a tax system that relies more on taxing consumption.[22] Fourth, the slower growth of personal income tax revenue also stands in contrast to the faster growth of 3.9% of the corporate income tax revenue.[23] Fifth, taxes paid by households on their financial asset income stayed more or less constant in levels over the entire period (at €3.4 bn). Also for this revenue item, the pattern looks very different for the second subperiod (an annual growth rate of 3.2% since 2010, compared to a decrease of -1.8% in the first subperiod; reflecting the stepwise increase in the withholding tax on financial asset income from 15% in 2011 to 30% in 2017). Finally, the social assistance benefits in cash not related to replacement incomes, grew in line with NNI (+1.7% annually versus +1.6% for NNI), but slower than the growth rate for net taxes on production +2.2%). Moreover, the growth pattern of the different subcomponents of the social assistance benefits is also very heterogeneous: the social assistance benefit grew much faster than the guaranteed income for elderly people. But most striking is the fact that annual growth of child allowances is far below the one of NNI.

Post-tax national income (DINA4)

The final DINA-concept, referred to as Post-tax national income or DINA4, brings us back to the concept of NNI. As previously mentioned, a portion of government revenue is allocated to individual public services and collective public goods, which were not accounted for in DINA3. Therefore, to calculate DINA4, we start from DINA3 and include these expenditures. Any distributional analysis based on DINA4 will hence require assumptions about how these public expenditures are distributed. We present a simplified version of the construction of DINA4 in Table 6. Note that, since total government revenues and expenditures do not necessarily balance, and since we want to distribute the NNI-total, we add at the bottom of the table a row with the residual and label it *Government surplus/deficit*.

The difference between evolutions during the last decade (2010-2019) and the whole period, as already mentioned several times before, is even more prominent for the subcomponents in Table 6. Compared to the annual growth of NNI of 1.6%, health and education expenditures grow faster over the whole period (2.7% and 2.0% respectively), but this is no longer the case during the second subperiod. Government spending on general public services, on defence, police

[22] This is also illustrated by the fact that the growth of personal income tax revenues is lower than the growth of gross wages and salaries in each of the periods displayed (see the first row of Table 3).

[23] The elevated growth rates of nearly 6% for the two subperiods selected in the Table, do not contradict the growth of 3.9% over the entire period 1995-2019. The reason is that we do not separately display the changes during the financial crisis. Over the two years 2008 and 2009 all taxes perceived on income declined with an annual rate of 3.6%, but for corporate taxes this was -17.9% and for the personal income tax 0.3%. The growth of revenue from corporate income tax during the period 2010-2019 (5.8%) is partly explained by the fact that the introduction in 2017-2018 of much higher penalty rates for insufficient advance payments induced many corporations to shift forward their expected corporate tax payment. This evidently only had a temporary effect on corporate tax revenues.

Table 6: DINA4 - post-tax national income - 1995 and 2019[a]

		levels in bn €		in % of NNI		average annual growth (%)		
		1995	2019	1995	2019	1995-2019	1995-2007	2010-2019
+	DINA3 (≠ NNI)	180.2	266.5	72.7	72.6	1.6	2.1	1.4
+	Individual expend. S13 & S15	38.8	71.7	15.7	19.5	2.6	3.0	1.6
	+ Health (S13)	16.1	30.8	6.5	8.4	2.7	3.3	1.3
	+ Education (S13)	15.6	25.3	6.3	6.9	2.0	2.2	1.6
	+ Other ind. exp. S13 & S15	7.2	15.5	2.9	4.2	3.3	3.9	2.1
+	Collective expenditure by S13	24.5	35.8	9.9	9.8	1.6	2.2	0.5
	+ General public service	8.4	10.4	3.4	2.8	0.9	1.5	0.1
	+ Economic affairs	6.3	10.5	2.6	2.9	2.1	2.9	0.8
	+ Defence, police, justice, etc.	8.3	10.3	3.3	2.8	0.9	1.3	0.0
	+ Other coll. expenditure	1.5	4.7	0.6	1.3	4.9	6.6	1.8
+	Balance gov't exp. & revenues	4.4	-6.9	1.8	-1.9			
=	DINA1 = DINA2 (=NNI)	247.9	367.0	100.0	100.0	1.6	2.2	1.5

[a] Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. Variables in levels are deflated with the GDP-deflator with base year 2015.

& justice grew at a rate below the one of NNI (0.9% annually over the whole period, and even slower in the second period). On the contrary spending on Economic affairs grew faster than NNI (an annual rate of 2.1%).

3 Data and methodology

In Belgium primary data on the National Accounts are available since 1953. But the dataseries within the ESA 2010 framework only starts in 1995. This explains why, for this first Belgian DINA application, we start the analysis in 1995.[24] To distribute the components of the four DINA aggregates over the Belgian population, we hence need distributional information at the level of households or individuals on the income components described above, since 1995. However, Belgium lacks a long-running consistent and comprehensive micro-data source, be it survey-based or administrative, for the period 1995-2019.

We rely on two different data sources: the European Community Household Panel (ECHP) for the period 1995-2000 and the European Union Statistics on Income and Living Conditions (EU-SILC) from 2003 onwards. For the years 2001 and 2002, we lack distributional information.[25] In section 3.1 we first briefly describe the two sources with micro-data. In section 3.2 we

[24] Within the BE-PARADIS-project we do plan to extend the analysis further back in time to 1985, which is the year of the first income-survey, see (Assal et al., 2023)

[25] Our future research objectives do contain a plan to mobilize administrative data from personal income tax forms to complement the survey information on which this paper relies. This might also allow us to bridge the gap in the years 2001-2002, and to move back further in the past with the analysis.

then explain how we insert the distributional info into the National Accounts.

3.1 Distributional info from microdata

EU-SILC is the yearly income survey conducted since 2004 by national statistical agencies of EU member countries, on behalf of EUROSTAT. We use the Belgian surveys from 2004 to 2020, reporting incomes for the period 2003-2019. In the 2019 survey (income year 2018) an important methodological change has been introduced in the Belgian survey. Prior to 2019, income information was exclusively survey-based, but from 2019 onwards the Belgian Statistical Agency introduced tax register data as primary source for most income variables.[26] A comparison of distributional results prior to 2019, with the ones of 2019 (and later when these will become available) needs therefore to be done carefully. EU-SILC does contain information on taxes and benefits, but in a rather aggregate form. We enrich and expand the information on taxes and benefits by running the tax-benefit microsimulation model EUROMOD on gross incomes and household characteristics available in the EU-SILC data.[27]

ECHP is based on the Panel Study for Belgian Households (PSBH) and consists of eight yearly waves, containing socio-demographic characteristics for the period 1994-2001 and yearly disposable income and its components for the period 1993-2000. We adjust the original data in two ways. First, contrary to EU-SILC, ECHP only includes income sources after taxes and social contributions. We estimated gross incomes in ECHP on the basis of a net-to-gross trajectory for five income variables: gross employee cash income, self-employment income, old age and survivor pension benefits, sickness and disability benefits and unemployment benefits.[28] A second correction concerns imputed rents for owner-occupied houses. This variable is not available in the ECHP survey. We therefore impute values based on a hedonic regression. [29]

Although ECHP and EU-SILC are similar in their purpose and coverage, there are also substantial differences in survey methodology and income definitions, even after the net-to-gross conversion for ECHP. These differences in survey design (such as: differences in weighting factors, in income definitions, in sample design, etc.) might and do lead to discrepancies between the two surveys. We observe e.g. large differences in the distribution of income from capital between the

[26] From 2019 onwards, the Belgian Statistical Agency StatBel used variables from the administrative dataset Belcotax for the following SILC variables (SILC-code between brackets): Employee income (PY010), contributions to individual private pension plans (PY035), pensions from individual private pension plans (PY080), unemployment benefits (PY090), pensions (PY100), survivors' pensions (PY110) and sickness and disability benefits (PY120 and PY130).

[27] Some policy years are missing in the EUROMOD-model. This is the case for the first two waves of SILC (income years 2003 and 2004) and also for income year 2010. For the income years 2003 and 2004 we therefore relied on the 2005 EUROMOD policy. For income year 2010 we used the 2009 Euromod policy.

[28] The net-to-gross trajectory relies on an 'inversion' of tax-benefit calculations available in a microsimulation model. Roughly speaking, we estimate withholding taxes as a proxy for personal income taxes, and - where relevant - add social security contributions to obtain the estimate of gross income. See appendix E.1 for more detail.

[29] More details on this hedonic regression are available in appendix E.2. Since imputed rents are also missing in the first years of SILC (2003-2005), we apply the same imputation methodology to estimate imputed rents for these three years.

two surveys: in ECHP, only 20 to 25% of households report positive capital incomes, whereas in SILC more than half of the households report capital incomes.[30] This inevitably hampers comparability of results for the 1995-2000 period with the ones obtained for 2003-2019.[31].

3.2 Methodology to insert distributional info into the National Accounts

To construct DINA we proceed as follows. First, we attempt to establish a link between each income component of Net National Income in the National Accounts and a corresponding concept in the micro dataset. We then rescale the micro-data to re-calibrate its total to the aggregate observed in the National Accounts. Finally, we define a unit of observation and population on which the distributional analysis will be based.

Linking macro and micro data

For each component of the DINA income concepts discussed above, we try to identify a variable (or sum of variables) in the micro dataset which conceptually corresponds to the macro aggregate. We document these links in detail in Tables B.11 to B.14 in Appendix B (one table per DINA-concept).[32] To discuss some of the choices made in this step, we provide a simplified snapshot of the links in Table 7 for the most important components of DINA1, DINA2 and DINA3. For income year 2019, we display the nominal value (in bn €) in the National Accounts, and compare it with the closest proxy in the SILC-survey of 2020 which refers to incomes from 2019. In the rightmost column we express the correspondence by means of a 'coverage-rate, which we calculate as the survey total divided by the NA-total.

First, for some income components, like wages and salaries ($D.11$), the link between the NA-concept and its counterpart(s) in the survey (variables $PY010G$ for cash earnings and $PY020G$ for non cash remuneration) is obvious. Also the coverage rate is testimony of this rather straightforward correspondence. Other variables which are easily linked and for which we observe a good coverage, are certain benefits, like child allowances.

At the other side of the spectrum are the parts of NNI that have no natural counterpart in an income survey where the observational unit is the household. An obvious example here are the undistributed profits, which, unlike dividends, are not registered in a survey like EU-SILC, since they do not directly flow into the household. In that case we can choose between two options.

[30] See also (Assal et al., 2023) where we discussed in detail the up to now largely unexplained difference between aggregate inequality indices calculated on the one hand on ECHP and the same inequality indices calculated on the other hand on a preceding survey (the Socio Economic Panel), or on the SILC-surveys which followed ECHP.

[31] As already mentioned in footnote 25, we do hope to solve some of these discrepancies by relying on administrative tax data to correct the surveys along the lines suggested in Blanchet et al. (2022b). We might also attempt to go further and use the machine learning algorithm (XGBoost) trained on a cross-countries and cross-time database to correct our surveys (see **?**)

[32] This linking is mainly based on the definition of National Accounts concepts and their implementation in Belgium as documented in **?** and National Bank Belgium (2017) and also inspired by previous comparisons between National Accounts and micro data as e.g. in Eurostat (2018) or Jestl and List (2023).

TABLE 7: LINK BETWEEN INCOME COMPONENTS IN NATIONAL ACCOUNTS AND SURVEYS (2019)[a]

DINA-element	NA's code	NA's bn€	Survey (SILC) code		Survey (SILC) bn€	coverage (SILC/NA)
elements of DINA1						
Wages & salaries[b]	$D.11_{R,S14}$	181.4	PY010G	cash	179.4	1.013
			PY020G	non-cash	4.3	
Mixed income[c]	$B.3n_{R,S14}$	30.0	PY050G		18.2	0.607
Real & imputed rents[c]	$B.2n_{R,S14}$	9.8	HY030G	imputed	11.8	1.623
			HY040G	actual	4.1	
Interest income hh's	$D.41_{R,S14}$	1.3	HY090G		2.7	0.148
Dividend income hh's	$D.42_{R,S14}$	17.0				
Undistributed profits	$B.5n_{U,S11+12}$	43.4	n.a.	n.a.	n.a.	n.a.
Value added tax	$D.2_{R,S13}$	32.2	n.a.	n.a.	n.a.	n.a.
Excise duties	$D.2_{R,S13}$	11.1	n.a.	n.a.	n.a.	n.a.
elements of DINA2						
SSC's households	$D.613_{U,S14}$	27.7	simulated		29.4	1.060
SSC's employer	$D.611, 612_{U,S14}$	63.5	simulated		45.4	0.715
Pension benef. (1st pillar)	$D.621_{R,S14}$	59.6	PY100G	old-age b.	59.9	1.005
Pension benef. (2nd pillar)	$D.622_{R,S14}$		PY110G	survivor b.		
Unemploym. Benefits	$D.621_{R,S14}$	6.4	PY090G		9.1	1.427
Sickn. & inval. benef.	$D.621_{R,S14}$	9.4	PY120G	sickness	2.2	1.146
			PY130G	invalidity	8.6	
elements of DINA3						
Income tax hh's	$D.51_{R,S13}$	48.8	simulated		58.8	1.204
Tax movable property hh's	$D.51_{R,S13}$	3.7	simulated		2.0	0.528
Tax fin. & capital transact.	$D.2_{R,S13}$	8.5	n.a.		n.a.	n.a.
Tax land & building	$D.2_{R,S13}$	5.8	n.a.		n.a.	n.a.
Corporate inc. tax	$D.51_{Rs13}$	17.7	n.a.		n.a.	n.a.
Child allowances	$D.623_{R,S14}$	6.9	HY050G		6.3	0.917
Social assistance benefits	$D.623_{R,S14}$	2.0	HY060G		1.4	0.709

[a] Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. All variables are in nominal levels. For some items the NA-code refers to the code of an aggregate, but the value in the table is obtained by selecting components from the more detailed series: '*Breakdown of paid social benefits*' and '*Received taxes and actual social contributions by kind*' in the National Accounts. The detailed codes can be found in Tables B.11 to B.14 in Appendix B. In the column 'code' for the survey we give the variable name when directly available in the dataset, 'simulated' when the variable is obtained by means of the microsimulation model EUROMOD, and 'n.a.' when there is no counterpart in the SILC for this item in the National Accounts.

[b] Remuneration of employees including social security contributions paid by employee, but excluding the contributions paid by the employer.

[c] Both 'mixed income' and 'imputed rents' are in *net* terms for the NA-values. See footnote c in Table 3 how we determined depreciation for $B.3g_{S14}$ and $B.2g_{S14}$ in the National Accounts. For the survey counterparts, on the other hand, no values net of depreciation are available, only gross amounts. To get comparable income concepts in the survey, we have applied the depreciation rates which we determined for $B.3g_{S14}$ and $B.2g_{S14}$ in the National Accounts on mixed income and on actual and imputed rents in the survey data. The gross values in SILC are €19.8 bn for mixed income and €32.7 bn and €4.1 bn for imputed and actual rents respectively.

Either we look for a proxy variable in the micro-data, which conceptually comes as close as possible to the NA-aggregate. For undistributed profits e.g. the natural candidate is dividend income.[33] Or, as a second option, we can distribute the NA-aggregate purely 'by assumption'.

This second possibility takes two forms. For some NA-aggregates we choose to allocate them to households in such a way that it leaves the distributional assessment by means of Lorenz-consistent (or scale-invariant) inequality measures unchanged. An important case where we apply this proportional assignment, is the one of 'other income' in DINA1 (the bottom row in Table 3). The reason is that this 'other income' mainly consists of the net balance of primary income of the government sector ($B.5_{n,S13}$), which itself contains net indirect taxes and net property income of the state (which is interests received minus interest paid). Ideally, we could allocate interests of the Belgian bonds and determine who pays the net indirect taxes. However, at this moment we fall back on a conservative (or safe) assumption which does not modify the distributional pattern of DINA1. For net indirect taxes, this proportional assignment is also underpinned by the fact that NNI is measured at market prices (including net indirect taxes). Therefore, one has to inflate factor incomes "to line up with the national income aggregate. That way, they reflect the purchasing power of pretax income at the post-tax prices that exist in the economy. Because this is pretax (before any consumption decision is made), it makes the most sense to do a uniform rescaling" (Alvaredo et al. (2021) p.59). This illustrates that the answer to the question of whether a particular distributional assumption is justified also depends in part on the DINA concept to which it is applied. Since one of the aims of the construction of DINA3 is to gain insight into the distribution of all taxes and transfers, it does of course makes sense to distribute components of indirect taxes, such as VAT and excise duties, according to the spending patterns of households. Therefore we do plan to mobilize the indirect tax tool (ITT) of the EUROMOD microsimulation model to distribute VAT and excise revenues of the government according to the distribution of VAT and excise payments simulated for the household population of SILC. At this stage of the DINA-construction though, we provisionnaly rely on the proportional scaling of indirect taxes, also in DINA3.[34] The other possibility is that we allocate the NA-aggregate on a per capita basis. This we do for several DINA4-elements of government expenditures ($P.31_{U,S13}$ and $P.32_{U,S13}$, not shown in Table 7, but see B.14 in Appendix B for details).

[33] We consider dividend itself as a proxy for the recommendation in the WID-manual to distribute retained earnings "in proportion to stock ownership, be they held directly or indirectly, in privately or publicly traded companies" see section 2.2.2.1 p.57 in (Alvaredo et al., 2021). The fact that dividend income itself is not directly observed in the micro-data, but only in a wider aggregate of 'income from financial assets', only increases the level of approximation obtained through this variable.

[34] Note 1) that the NA-aggregate $D2 - D3$ at the resource side of sector $S13$ is broader than VAT and excises, but also contains taxes paid on imports, and other production taxes and subsidies; 2) that the extension of a household microsimulation tool like EUROMOD to cover also VAT and excises, is limited to the tax liabilities of households. That inevitably pushes coverage rates for this type of taxes downward. E.g. the EUROMOD Indirect Tax Tool measures VAT payments of €16.75 bn in 2019, which implies a coverage rate of 52.0%; for excises the ITT gives €16.1 bn or a coverage of 23.9%.

Most of the variables are somewhere in between the two extremes of either having a perfect counterpart in the survey, or having to be alloactes purely by assumption. For DINA1, we already mentioned income from financial assets. Not only do we not observe dividend income and income from fixed income assets (like bonds or savings accounts) separately, also the aggregate coverage rate is quite poor: in 2019 e.g. we observe €2.7 bn of financial income in EU-SILC, which accounts for 14.8% of the financial income aggregate in the National Accounts.[35] Table 7 also shows that, despite the fact that at the conceptual level, we do have good counterparts in the SILC-survey for 'mixed income' and for 'rental income from properties', the divergence between the survey-total and the NA-total is substantial. In the case of mixed income the survey substantially under-estimates income in the National Accounts, whereas for actual and imputed rents it is the reverse. For DINA2, the aggregates in the micro-data and the National Accounts correspond quite well. For social contribution of employees this is not surprising. But also pension benefits are - in the aggregate - covered quite well. Only the aggregate amount of unemployment benefits deviates quite substantially between survey and National Accounts, with a serious overestimation in the survey. Finally, some elements from DINA3, such as child allowances, are, not surprisingly, covered quite well in the household survey. The fact that we overestimate personal income taxes by 20% when simulated by means of the EUROMOD microsimulation model, is probably due to the fact that the survey contains not enough information to implement the myriad of tax deductions and tax reductions. In fact given the poor coverage of financial income (14,8%), we consider the coverage rate for direct taxes on this financial income (52,8%) as too high.[36]

We summarize this comparison of survey-information with the NNI-total in the National Accounts in Figure 5. For 1995 and 2019 we show NNI and its components, and compare it with the parts of NNI that we find in the surveys. We focus on NNI from the DINA1-perspective.[37]

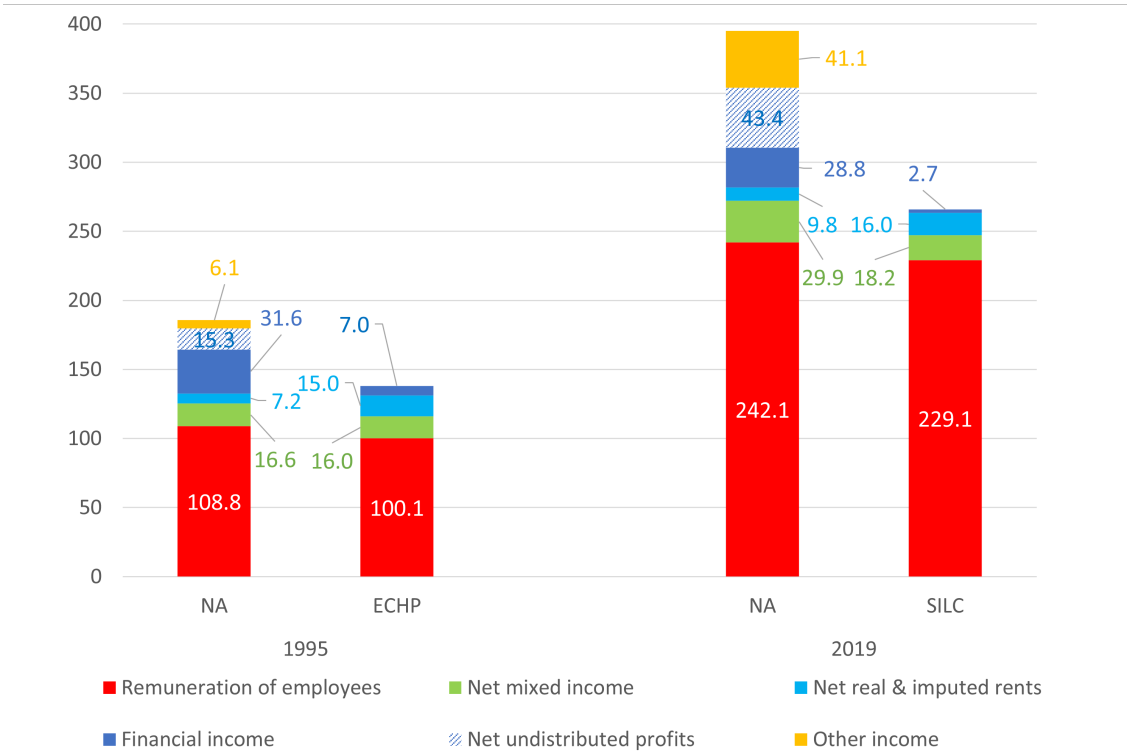
Figure 5 clearly illustrates that 'remuneration of employees' is covered well in the surveys, both in our initial survey of ECHP, as in the latter one of SILC. Moreover, Appendix D illustrates that the coverage rates for gross earnings, excluding employers social security contributions, are close to unity for the whole period. In Figure 5 we show total employee remuneration, including the - simulated - employers social contributions. Hence, the limited deviation for employee remuneration between surveys and NA's is entirely due to these simulated social contributions, which shows a coverage rate between 70% and 80%. For the other income components, the story is very different. As mentioned above, the net operating surplus of households in the NA

[35] In a next research step, we do plan to use the HFCS-survey of the European Central Bank to check whether we can improve the distributional information of income from financial assets, compared to the information available in ECHP- and SILC-surveys.

[36] Most financial incomes are taxed at 30%. Important exception are interests on regulated saving accounts where the first 980 euros are tax-free. This tax exemption is not included in EUROMOD since interest cannot be distinguished from other financial incomes. This explains why we consider the coverage rate of taxes on financial income as too high.

[37] See Table D.17 in Appendix D for yearly coverage rates for the entire period 1995-2019.

FIGURE 5: COMPARISON OF COMPONENTS OF NET NATIONAL INCOME IN NATIONAL ACCOUNTS AND IN SURVEY, 1995 AND 2019 IN BN €



Note: Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. All variables are in nominal levels. Remuneration of employees includes social contributions (both of employer and of employee). In the surveys, we have no information on depreciation. To make the survey info on mixed income and on net operating surplus of households comparable to the net amounts in the NA's, we applied the depreciation rate for $B.3g_{S14}$ and $B.2g_{S14}$ in the NA's on the survey info (see footnote c in Table 3 how we determined these depreciation rates). The interests paid by the household sector $D.41_{S14}$ are not included in the figure.

($B.5_{n,S14}$) is much smaller than the net actual and imputed rents in the surveys. Table D.17 shows that this overestimation was highest in the ECHP-period (a coverage rate of more than 2), and that during the SILC-period the initially lower level of overestimation (coverage rate of 1.30 in 2003) has considerably increased (1.62 in 2019). For net mixed income the total in the ECHP-survey is close to one and even exceeds the NA-total for some years, whereas for the SILC-period, the coverage rate hovers around 50% to 60%. Financial income is hugely underrepresented in the surveys, and both undistributed profits and 'other income' are absent. Overall the coverage rate of the survey income information was 75% in 1995, and declined to 67% in 2019. It means that the share of NNI-pie which is 'hidden' from or invisible in the hosuehold surveys has increased from one quarter to one third. In nominal values, it implies that the DINA-approach has the ambition to bring an additional €139 bn (in 1995) to €264 bn (in 2019) into the distributional picture. Needless to say that these are considerable amounts.

Distribution of the national account aggregates

The second step consists of rescaling the micro-data to re-calibrate its total to the aggregate observed in the National Accounts. Basically it comes down to creating a version of the survey with new or re-scaled variables for each subcomponent i of a DINA-concept (1 to 4), but 'observed' at the level of the observational unit h (household or individual) as follows[38]:

$$y_{h,i}^{DN} = \frac{Y_i^{NA}}{Y_i^{Sv}} . y_{h,i}^{Sv} \tag{6}$$

where $y_{h,i}^{Sv}$ is either the counterpart observed in the survey dataset (salaries e.g.), or a 'proxy'-variable for an income component of the National Accounts, not directly observed in the survey (undistributed profits e.g.), or is a variable which entirely derives from an assumption (indirect taxes, at this stage). We use capital letters to denote the aggregate for income item i (Y_i^{Sv} in the survey and Y_i^{NA} in the National Accounts).[39] The factor by which we multiply the survey observations is the inverse of what we called the 'coverage rate' for income item i in Table 7 above. It is easily verified that this proportional adjustment procedure guarantees that we now observe income distributions in the survey which sum up to the National Accounts total for income item i.

The advantage of staying at the micro-level and its corresponding observational unit to allocate the whole of NNI, is that we can now fully exploit the rich informational structure of the survey data to perform distributional analysis based on the $y_{h,i}^{DN}$. One obvious degree of freedom, to which we turn in the next paragraph, is the definition of the reference population.

Defining the reference population and the division of household income

Quite a bit of confusion in inequality analysis is caused by different underlying choices regarding the demarcation of the population or about how to divide household income among the family members. That is precisely why WID strives to make the choices made in comparative analyzes explicit, so that they can be applied homogeneously over time or across countries (see Alvaredo et al. (2021)).

The first choice concerns the delineation of a reference population. This choice is of course partly determined by the research question. For a distributional analysis at the level of DINA1 (which is pre-tax or -redistribution), it may be useful to confine the analysis to the subpopulation of those who are (or could be) still economically active. Often this is implemented by using an - inevitably arbitrary - age criterion, e.g. all adults between 20 and 65. On the other hand, it does make sense to add children and pensioners for an analysis of disposable income (DINA3, or by extension DINA4). The empirical results in this paper are mainly based on the choice of

[38] we postpone the discussion of individual versus household until the next paragraph

[39] The aggregate in the survey is calculated using the weight available for each observation to make it representative for the population.

a middle ground: we allocate income to all 'adults', defined here as everyone aged 20 or older.

The second choice has to do with how household income is distributed within the family. Several options arise here, since some income components have an individual character (e.g. earnings), whereas others are more common in nature, like returns on jointly owned assets. WID distinguishes between the following possible scenario's:

1. The ***individual-split*** scenario (also denoted as *no split*) attributes the individually earned incomes to the household member who earns it; income components which are observed at the household level are equally split among the household members. The latter intersects of course with the choice of the reference population in the previous step: if only the adult population is selected for the analysis, then the jointly earned income components are only split over the household members belonging to the chosen reference population.

2. The ***broad equal-split*** scenario first aggregates all income components from all household members, and then allocates them equally among all household members. Also here there is interference with the choice of the reference population: if only the adult population is selected for the analysis, then total household income is only allocated over these members. If one chooses the whole population (including children), then one has a per capita distribution among all individuals in society.

3. The ***narrow equal-split*** scenario is a variant of the previous one. It only splits total income of the *spouses* equally within the couple (instead of between all household members). For example, the household income of a couple living together with their adult child (20+) is split equally among the three household members in the broad equal-split scenario. In the narrow equal-split scenario, the incomes of both parents are split equally within the couple and the income of the child is fully allocated to the child itself.

Note that the WID practice deviates somewhat from what is common in international statistics on income and wealth inequality by not relying on *equivalised* disposable household income. The latter would be obtained by dividing household income by an equivalence scale which tries to capture economies of scale and different needs of the household members by age.[40] Alvaredo et al. (2021) argue that the DINA methodology does not use equivalence scales for two reasons. A first argument is pragmatic. Dividing household income by an equivalence scale makes that all incomes across individuals no longer sums up to aggregate income. The second reason is conceptual, as they state that the primary concern of DINA is to measure the income distribution and not individual "welfare" approximated by the use of equivalized household income.

As benchmark concept, WID therefore advocates to use the '*broad equal split*' in combination

[40]The databases of OECD, Eurostat and Statbel all publish Gini coefficients of equivalised disposable household income based on the total population with incomes equivalised using the modified OECD equivalence scale. The latter assigns a weight of 1 to the first adult in the household (14+), a weight of 0.5 to each other adult (14+) and a weight of 0.3 to each child (aged under 14).

with a reference population of 20+. In this paper we follow the WID suggestion and use this scenario for the empirical analysis: a 'per adult' distribution of non-equivalized and 'broad equal-split' incomes. This is in line with among others Piketty et al. (2018), Blanchet et al. (2022a) and Jestl and List (2023), although the latter define the adult population as individuals of age 16 or older (instead of 20+). We explicitly mention when another scenario is used, and we will investigate sensitivity of our results to other population definitions and/or split scenario's in subsection 4.4.

4 Results

We present the results in five subsections. In subsection 4.1 we start with the description of the inequality evolution of pre-tax income (DINA1). We then move to the inequality evolution of post-tax and transfer income (DINA3) in subsection 4.2. In subsection 4.3 we discuss the transition from DINA1 to DINA3 and investigate whether we can uncover significant changes in the working of the tax-transfer system during the period of analysis. Subsections 4.4 and 4.5 discuss the sensitivity of the results to the choice of reference population, equivalence scale, and chosen inequality measure. Whether the DINA-operation affects the position of Belgium in cross country comparisons of inequality changes is relayed to the concluding comments in section 5.

We mostly rely on the Gini-coefficient to summarize inequality. In recent years income shares have reclaimed a prominent place in the analysis of inequality. This is somewhat surprising, since income shares on their own do not satisfy the basic axioms of inequality measurement. But to align with published statistics for other countries, we do report these income shares in subsection 4.5. In that same section we also investigate the robustness of our results for the choice of inequality measure, by means of Lorenz dominance. We do keep the break between the period cover by ECHP and SILC visible, and abstain from connecting the two underlying subperiods. The reason is that we have not been able to harmonize the two micro-datasets sufficiently to ensure a proper comparison.

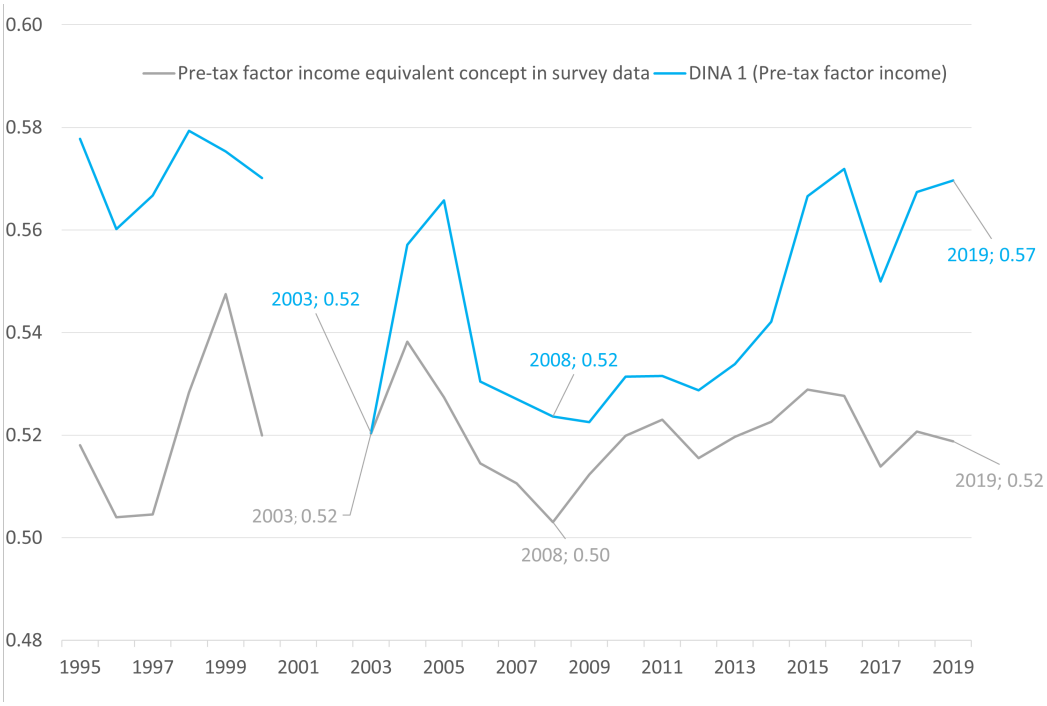
4.1 Evolution of inequality in pre-tax income DINA1

Figure 6 summarizes our basic result for pre-tax income DINA1. We compare the evolution of inequality as measured by the standard Gini between on the one hand a pre-tax income concept as close as possible to DINA1 in the surveys, and on the other hand the genuine DINA1-concept from the National Accounts, but distributed across the entire adult population (20+).[41] Compared to the survey-results, the DINA-approach affects the picture of inequality in two different ways: first, the *level* of inequality is higher and second, the *evolution* of inequality is

[41] See Appendix B for details on how the survey analogue of DINA1 has been constructed.

different.

FIGURE 6: INEQUALITY (GINI) IN PRE-TAX INCOME DINA1: 1995-2019

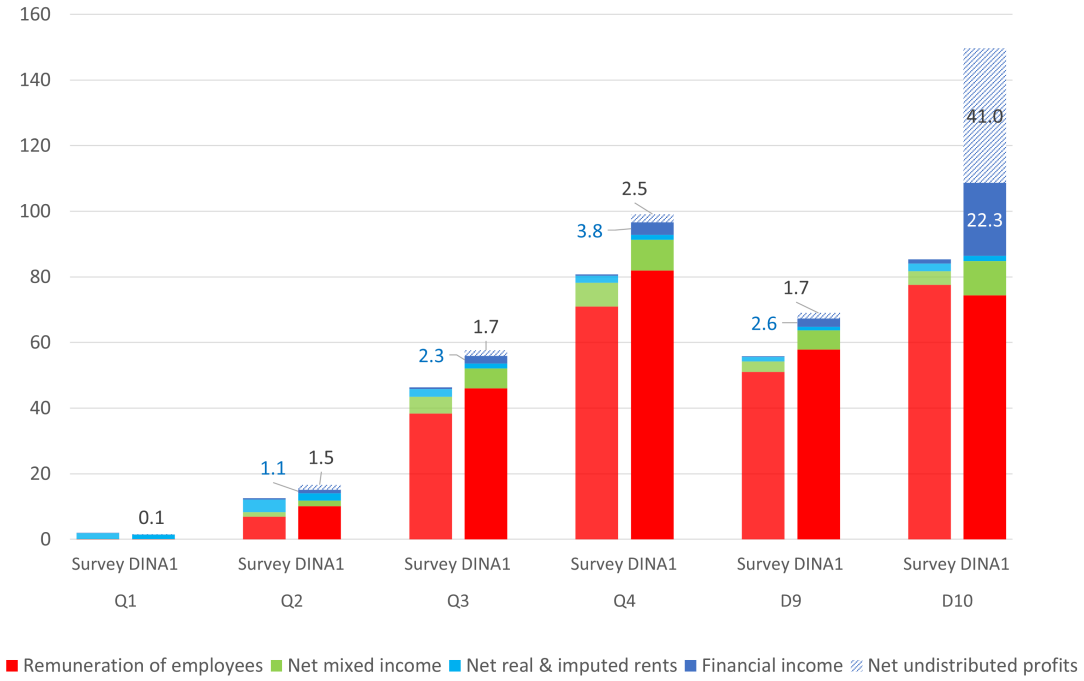


Note: Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023 and on survey information from ECHP (1995-2000) and SILC (2003-2019). In Appendix B we describe in detail how the survey analogue of DINA1 has been constructed.

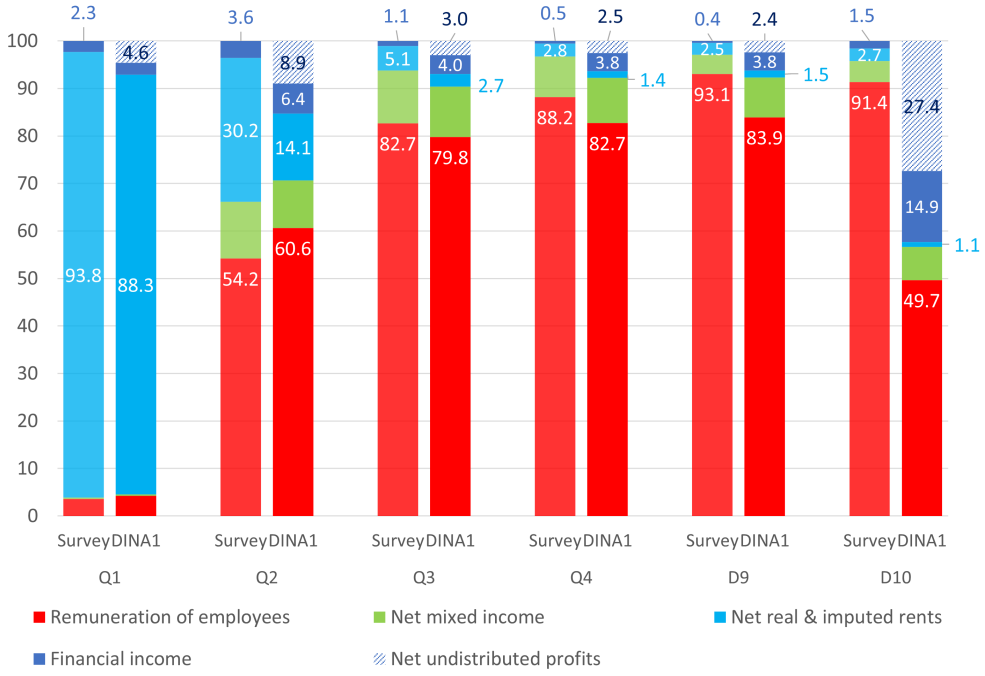
The higher level of inequality in pre-tax income is largely explained by the two panels of Figure 7. This figure shows, for 2019, how the additional income from the National Accounts is allocated across the income distribution (panel A), and how this operation affects the income composition across the distribution (panel B). We summarize the income composition in five broad categories, and depict the income distribution by means of the first four quintiles (Q1 to Q4) and the two top deciles (D9 and D10).

Both the rescaling of the survey total of capital income from financial assets, and the insertion of the unobserved income of, e.g. the undistributed profits, are operations which mainly blow up the income at the top. €41 bn (or 84.6%) of a total of €48.4 bn of undistributed profits ends up in that top decile. And the same holds more or less for the 'missing' income from financial assets. On the other hand the scaling down of the net imputed rents mainly affects the capital income at the bottom of the distribution. The result is that the income composition at the top changes drastically: whereas in the survey, the income of the top decile is still composed for 91% out of labour earnings, after the DINA-operation, this labour share falls to less than 50%. The reverse happens at the bottom of the distribution: although the bottom decile mainly has income from (non financial) capital - the pensioners who have no labour earnings, but own their

FIGURE 7: COMPONENTS OF NNI IN NA AND IN SURVEY ACROSS THE DISTRIBUTION (2019)



(A) LEVELS IN BN €



(B) INCOME SHARES

Note: Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023 and on survey information from ECHP (1995-2000) and SILC (2003-2019).

dwelling - this income share decreases. This is even more pronounced for quintile 2.

The second difference in Figure 6 between survey and DINA concerns the *evolution* of inequality of pre-tax income. Up to 2012, the difference in *level* of inequality did not translate into major differences of inequality changes. Both in the survey data and in the DINA-results, we observe a decline in inequality up to the financial crisis (2008). This decline abruptly changes direction in 2009, but up to 2012 this increase in inequality is similar in the survey data and in the DINA-data. It is from 2013 onward that we observe a clear divergence in the inequality evolution of pre-tax income. The inequality increase is much more outspoken in the DINA-results.

We try to explain the evolution of DINA1-inequality by relying on a decomposition by income source. We follow what (Shorrocks, 1984) called the 'natural decomposition of the Gini', which has been described in detail by (Lerman and Yitzhaki, 1985). The Gini G_t for period t, can be decomposed into contributions of the K income sources as follows:

$$G_t = \sum_{k=1}^{K} s_{t,k} \cdot \tilde{G}_{t,k} \tag{7}$$

where $\tilde{G}_{t,k}$ stands for the pseudo-Gini of income source y_k in period t, and $s_{t,k}$ is the share of income of source k in total income across the population:

$$s_{t,k} = \frac{Y_{t,k}}{Y_t} \tag{8}$$

The pseudo-Gini $\tilde{G}_{t,k}$ differs from the ordinary Gini of income source y_k. The ordinary Gini orders income source y_k on itself, whereas the pseudo-Gini orders the values of income source y_k on total income y.[42] The difference in rank-order position used in the pseudo-Gini as compared to the ordinary Gini, shows up in the relationship between the pseudo-Gini and the Gini:

$$\tilde{G}_{t,k} = R_{t,k} \cdot G_{t,k}, \tag{9}$$

with

$$R_{t,k} = \frac{\text{cov}\left[y_{t,k}, F_t(y_t)\right]}{\text{cov}\left[y_{t,k}, F_{t,k}(y_{t,k})\right]} \tag{10}$$

and $F(x)$ denoting the cumulative distribution function of variable x.[43]

Combing equations (7) and (9) into:

$$G_t = \sum_{k=1}^{K} s_{t,k} \cdot R_{t,k} \cdot G_{t,k} \tag{11}$$

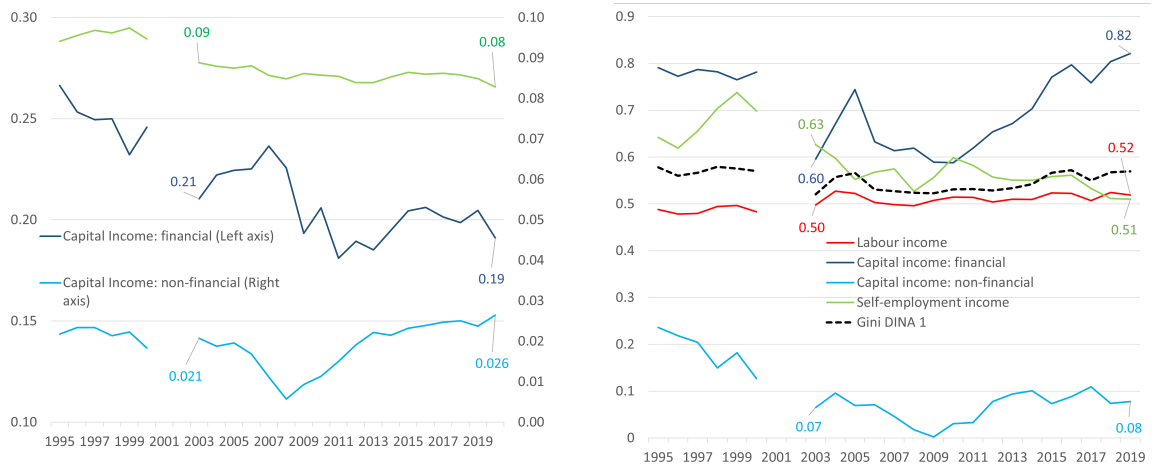
[42] In fact the pseudo-Gini is based on the concentration curve of income source y_k, ordered on total income y.

[43] The role of $R_{t,k}$ in equation (10) follows from the fact that the standard Gini can be written as a covariance between income from source k and its rank: $G_k = (2/\mu_k) \cdot \text{cov}\left[y_k, F_k(y_k)\right]$, with μ_k average income of source k. The pseudo-Gini is also a covariance between income from source k and a rank: $\tilde{G}_k = (2/\mu_k) \cdot \text{cov}\left[y_k, F(y)\right]$.

shows that a divergent inequality evolution, as measured in surveys compared to DINA, is explained by three factors: different evolutions in the shares of the income components, different evolutions of the Gini's of the income components, and different evolutions in the covariance of income components with respect to total income. Since all distributional info comes from the survey, the Gini of an income element at the lowest level of income itemisation, is identical in survey and in DINA. The different evolution is hence explained by the other two factors: income shares and re-orderings. We summarize these differences in Figure 8, where the left panel shows the evolution of shares of income sources, and the right panel the pseudo-Gini's. [44]

Figure 8 reveals some interesting facts. The increasing Gini of DINA1 since 2009 is partly explained by a growing importance of income from financial capital, but more importantly by an increasing inequality in the distribution of this financial capital income itself. Inequality in self-employment income, as summarized indirectly by the pseudo-Gini, and also its share in total income have decreased slightly. For income from real estate, inequality is rather stable, but its role in inequality changes is anyhow limited given its low income share. Note that the strong decline in the share in 2008-2009 is the re-appearance of the volatility in the macro-variable 'intrests paid by households', already noted in Figure 2 in subsection 2.2.

Figure 8: shares and pseudo-gini's for different income sources in DINA1 - 1995-2019



(a) shares of income sources

(b) pseudo-gini's

Note: Own calculations based on the DINA-series. For expositional clarity, we omitted the share of labour income in the left panel. The information can be found in Table C.15 in Appendix C. The pseudo-Gini's in the right panel are Gini's of income sources where the incomes are ordered on total income. The dotted line is the Gini of DINA1.

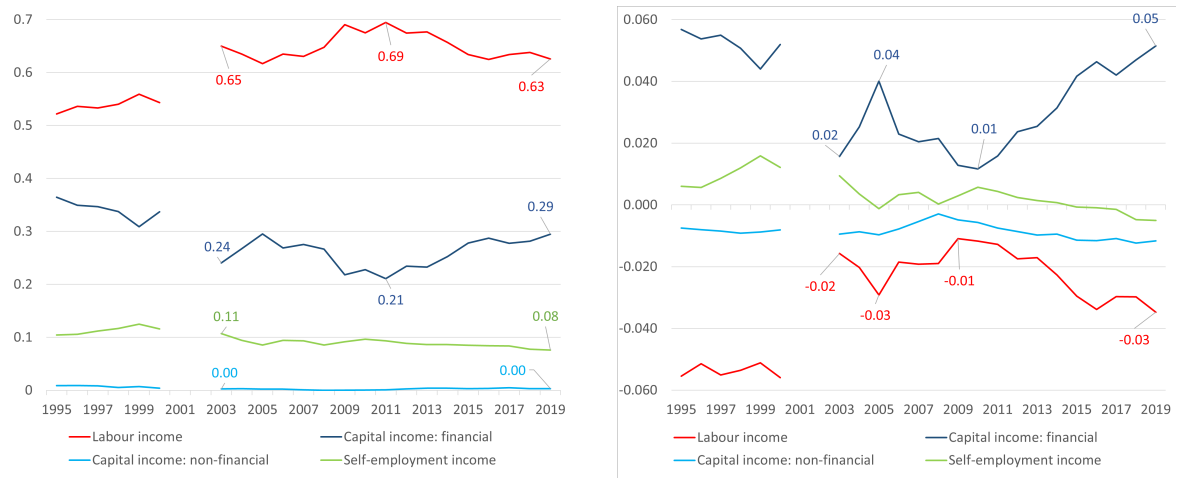
The above decomposition of DINA1 inequality can be translated into contributions of an income source to inequality in two different ways. Either we divide each term of the RHS of equation (7) by its LHS, that is, by the Gini of DINA1 in period t. This gives the *average* contribution of income source k to the level of inequality of DINA1. Alternatively we might

[44] The standard Gini's are listed in Table C.15 in Appendix C.

look at the *marginal* contribution of an income source to inequality, by calculating the change in the Gini for total income when one particular income source k increases proportionately. (Lerman and Yitzhaki, 1985) show this marginal effect to be equal to: $s_k \cdot (\tilde{G}_k - G)$. We show both contributions in the two panels of Figure 9.

The left panel of Figure 9 shows that, on average, inequality in pre-tax income is still largely explained by inequality in labour earnings (more than 60%), and this is of course due to the share of labour income in total DINA1-income. The role of labour earnings increased until 2011 and then declined. The role of income from financial capital in the level of inequality is the mirror image: it declined from 24% in 2003 to 21% in 2011, but then rose considerably to a contribution of 29% in 2019. Income from self-employment is much less important to explain the level of inequality (around 10% and declining). And for capital income from non financial assets (i.e. imputed and actual rents) this limited importance as a contributing factor to explain the level of the DINA1-Gini is still more outspoken.

FIGURE 9: CONTRIBUTIONS OF INCOME SOURCES TO INEQUALITY (GINI) IN DINA1: 1995-2019



(A) AVERAGE CONTRIBUTION (B) MARGINAL CONTRIBUTION

Note: Own calculations based on the DINA-series.

The right panel of Figure 9, which shows the marginal effect of a proportional increase in incomes from source k, amplifies the reversal of the relative importance of labour and capital income since the period of the financial crisis. Note first, that, proportional increases in labour income exert a dampening effect on inequality at the margin, whereas proportional increases in income from financial capital push the Gini of DINA1 higher. In 2005 e.g. one observes that a proportional increase of labour incomes with 1% reduces the Gini by 0.03 basis points whereas a similar increase of income from financial capital increases the Gini by 0.04 basis points.[45] Until

[45]The partial derivative $s_k \cdot (\tilde{G}_k - G)$ is derived in Lerman and Yitzhaki (1985) by taking the derivative w.r.t. to variable e_k, which itself measures the relative change in income: that is, y_k changes to $(1 + e_k) \cdot y_k$. With e_k measured in basis points, the magnitude of the derivative, displayed in Figure 9b has to be multiplied with 0.01 to arrive at the effect on Gini.

the financial crisis, these two forces gradually eroded: both the dampening effect of growth in labour income on inequality decreased, and the upward force of increases in income from financial capital on inequality, also declined. But this changed drastically since the financial crisis, when the two forces started to diverge again. The effect of changes in capital income on a higher Gini of DINA1 became much stronger again, reaching 0.05 in 2019, whereas the cushioning effect of labour income on pre-tax inequality also gained in strength, reaching minus 0.04 in 2019. Finally note that the contribution of income from real estate and from income from self-employment on the overall Gini is limited at the margin.

We close the discussion of our findings on distributional changes in pre-tax income DINA1 by showing growth incidence curves (GIC's) in Figure 10.[46] We depict GIC's in two panels, where each panel contains the distributional pattern for five subperiods: 1995-2000, 2003-2007, 2007-2010, 2010-2017 and 2017-2019. The first period (1995-2000) is the period where NA aggregates are distributed using distributional information from the ECHP period, after which we lack distributional information for two years. From 2003 onwards, we make use of the SILC microdata. We further divide the period covered by distributional information from SILC into four subperiods. A first period covers the five years before the financial crisis (2003-2007), with the second period covering the crisis years (2007-2010). The third period starts after the financial crisis (2010), but we let it end in 2017, with a final subperiod covering the remaining window 2017-2019. This additional split at the end of the period is motivated by the important methodological change in the recording of incomes implemented in SILC from 2018 onwards (see footnote 26).

[46] Growth Incidence Curves come in two flavours. Ravallion and Chen (2003) introduced them in the literature to measure the 'pro-poorness' of growth. They showed that the link with poverty measurement necessitates the use of the growth rate of *quantile values* on the vertical axis of a GIC. The popular version of GIC's though, as e.g. displayed in the 'elephant curve' of Lakner and Milanovic (2016), and also used by WID, displays the growth rate of *average income of a quantile* of the income distribution. Our GIC's follow Ravallion and Chen.

FIGURE 10: GROWTH INCIDENCE CURVES (GIC'S) FOR PRE-TAX INCOME DINA1 IN FIVE SUBPERIODS

(A) GIC DINA1 FOR POPULATION 20+ (B) GIC EARNINGS FULL TIME EMPLOYEES

Note: Own calculations based on the DINA1-series. Each bar shows the real annualized growth rate of the quantile value for a given percentile in the distribution. We display the growth in the quantile values for the bottom four quintiles (p20 to p80), for the 9th decile (p90) and for the 95th percentile (p95). The left panel includes the total adult population (20+) while in the right panel the population is limited to full-time employees. The red horizontal lines show average annualized growth of average per capita DINA1-income.

In the left panel of Figure 10 we depict annualized growth rates of the quantile values of DINA1 for the bottom four quintiles, for the 9th decile and for the 95th percentile. The volatile growth of the quantile value of the bottom quintile stands out clearly. Low incomes for individuals in the first two deciles which mainly consists of imputed rents (reduced by interests paid), as shown in Figure 7a for 2019, makes that small absolute changes result in large relative changes. Yet, some patterns emerge, and certainly the fact that the financial crisis can be considered a turning point. Up to 2007, and certainly in the subperiod 2000-2007, growth of pre-tax income was higher at the bottom of the distribution. Only the growth of the quantile value where top 5 percentile group starts, is the exception on a monotonically declining pattern of growth rates. But this changes drastically with, and also in the two periods after, the financial crisis of 2008-2009. Again the large decline of the quantile value of the bottom fifth deserves further scrutiny, and is probably due to (relatively) large changes in the (imputed) rents received minus rents paid. But anyhow, the more or less 'pro-poor' pattern of the period 2003-2007 disappeared. Moreover, during the last subperiod, and discarding the growth of DINA1 for the bottom quintile, income growth seems to have turned definitely 'pro-rich'. Although we do not

have a conclusive explanation for the abnormally high growth in the lowest quintile, we prefer to display this growth at the bottom to illustrate - once more - the importance of methodological breaks in the surveys (see footnote 26). Indeed, this deviant growth rate at the bottom might possibly be explained by the transition to administrative income data which introduced many more small incomes, previously not picked up in the surveys. However, further in depth analysis of the volatility of income growth at the bottom of the distribution is warranted.

In the right panel of Figure 10 we focus on the largest component of total NNI: the remuneration of employees. To clean the growth in earnings from labour market changes (i.e the share of part- and full-time workers), we only look at changes in earnings of full-time employees.[47] Again, the GIC's in the different subperiods show strikingly different paterns. The first period shows real annualized growth rates hovering around 2% across the distribution. In the period 2003-2007, up to the financial crisis, the roughly similar average growth in FTE-earnings was spread out very differently. It became outspokenly 'pro-poor' in the sense that inequality in FTE-earnings has declined. The period of the financial crisis led to negative growth in FTE-earnings, but the decline in earnings was much larger at the top of the earnings distribution, than lower down the distribution. In the first subperiod after the financial crisis, the growth of real earnings is limited for all income groups. And with a similar caveat as above about the shift from surveyed labour incomes to administrative tax records, the earnings growth since 2017 seems to have trickled down mainly at the top of the earnings distribution.

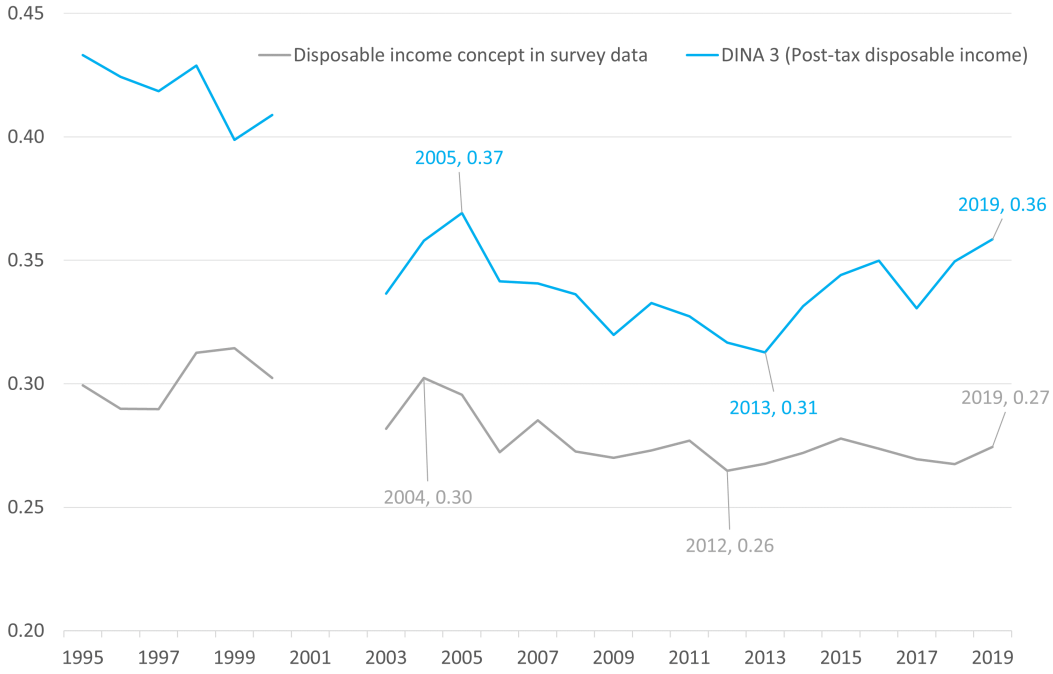
4.2 Evolution of inequality in post-tax disposable income DINA3

For Belgium, most evidence on income inequality is based on the distribution of household disposable income measured by household surveys such as ECHP and SILC. The DINA income concept which comes closest to this survey income concept is post-tax disposable income (DINA3). Figure 11 compares the evolution of inequality of household disposable income as reported in the surveys with the evolution of inequality in DINA3. Since both series are based on the same reference population (20+) and on the same scenario as far as the division of income among household members is concerned (i.e. 'broad equal-split'), differences in the level and evolution of the Gini can only be due to differences between disposable income in the surveys versus the post-tax disposable income concept in DINA.

Similarly as for DINA1 in Figure 6, the DINA series differs substantially from the series based on survey data both in level and in evolution. First, the *level* of income inequality as measured by the Gini coefficient is higher using the DINA3 concept compared to the Gini based on surveyed disposable incomes. Second, the *evolution* of inequality follows the same declining trend up to 2012 but diverges sharply from 2013 onwards. An analysis based on survey-data alone would conclude that the downward trend in inequality came to a halt in 2012, and stayed constant

[47] Detailed analysis of the different drivers of inequality is the subject of another Work Package in the BE-PARADIS-project. It builds on the construction of counterfactual distributions, as in Sologon et al. (2021).

Figure 11: inequality (gini) in post-tax disposable income dina3: 1995-2019



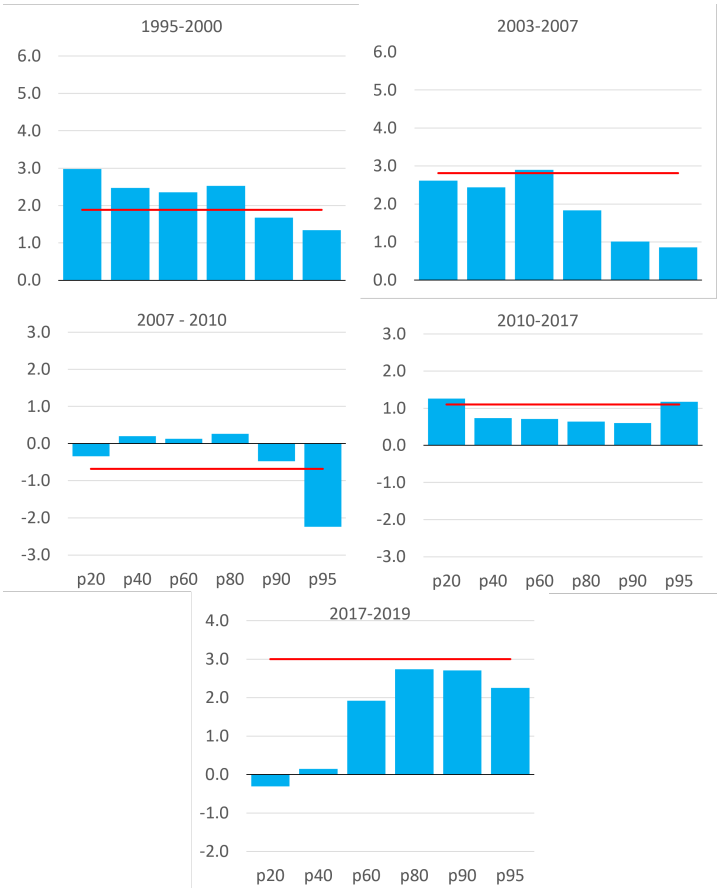
Note: Own calculations based on the DINA3-series and on survey information from ECHP (1995-2000) and SILC (2003-2019). The Gini of the disposable income concept in the survey data (grey line) is based on the reported non-equivalized disposable household income in ECHP (variable hi100) and SILC (variable HY020). Both series use the benchmark reference population of adults (20+) and the broad equal-split division of income among household members.

thereafter. A DINA-analysis reveals a sharply increasing inequality in disposable income after 2013. Compared to the Gini-evolution in DINA1 (Figure 6) where the turning point was around 2009-2010, it is interesting to see that in Figure 11 the turning point falls somewhat later, i.e. in 2013. Part of the explanation for the difference in timing of the reversal could be that DINA3 is of course co-determined by tax and transfer policies. And in 2014 a centre-right government succeeded a more centre-left oriented one.

Figure 12 shows the corresponding growth incidence curves for the same five different subperiods as already used for the analysis of DINA1. The upper part shows two subperiods with monotonically declining GIC's. In these periods, inequality in disposable income has declined. The GIC of the period of the financial crisis shows that the effect on disposable income was mainly felt at the top of the distribution. The remaining graphs show that the inequality reducing character of growth in after tax income has not been restored. The period 2017-2019 is shown separately due to use of administrative income data in SILC from 2018 onwards, mentioned above. Given the observation in Figure 11 that the turning point for the inequality evolution in DINA3 lies in 2013, we also produced GIC's for 2010-2013 and 2013-2017 separately.

They confirm this turning point.

FIGURE 12: GROWTH INCIDENCE CURVES (GIC'S) OF POST-TAX DISPOSABLE INCOME DINA3 FOR FIVE SUBPERIODS



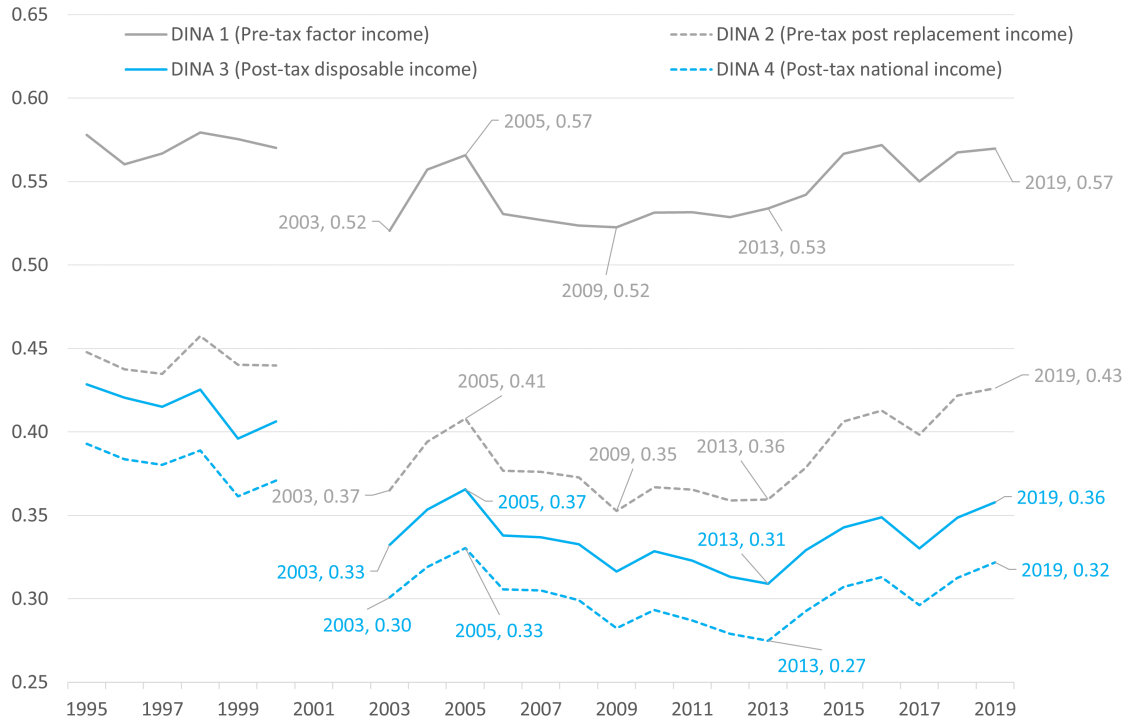
Note: Own calculations based on the DINA3-series. Each bar shows the real annualized growth rate of the quantile value for a given percentile in the distribution. We display the growth in the quantile values for the bottom four quintiles (p20 to p80), for the 9th decile (p90) and for the 95th percentile (p95). The red horizontal lines show average annualized growth of average per capita DINA3-income.

4.3 Evolution of the transition from pre-tax to post-tax income

As discussed in subsection 2.3, the pre-tax post-replacement income (DINA2) is an income concept that lies in between DINA1 and DINA3. Starting from DINA1, it subtracts social contributions and adds replacement benefits such as pension and unemployment benefits. (see Table 4). The difference with DINA3 is made up of all income taxes and all other cash benefits not yet included in DINA2. Finally, in DINA4 one also accounts for in-kind transfers and collective government expenditures. Figure 13 shows the Gini's from 1995 to 2019 for all four concepts.

Not surprisingly given the additional redistribution performed by income taxes and cash

FIGURE 13: INEQUALITY (GINI) FOR FOUR DINA-CONCEPTS: 1995-2019



Note: Own calculations based on the DINA-series. All series use benchmark reference population (20+) and the broad equal-split division of income among household members.

transfers, the Gini of DINA2 lies in between the Gini of DINA1 and DINA3. More interestingly, we again find the U-shape of declining inequality from 2005 up to 2009, and then an outspoken increase in inequality since 2013. The comparison of the dotted line of DINA2 with the blue full line of DINA3 shows that in the period 2009-2013, it is the personal income tax system and the cash benefits other than replacement incomes, which have succeeded in postponing the moment at which the decline of inequality came to a halt.

Also the Gini of the fourth DINA income concept shows a similar pattern as the preceding concepts albeit at the lowest level. We refer to Table B.14 in Appendix B for the assumptions made to distribute in kind benefits and collective expenditures. Except for health expenditures, which we distribute per capita, all other in kind benefits and the collective expenditures are distributed 'neutrally', in the sense that they leave scale invariant inequality measures unaffected.[48]

Extent of redistribution

The difference in the level of inequality between a pre-tax and a post-tax income concept can be used as a metric of the extent of redistributive activity. It is known as the Reynolds-Smolensky

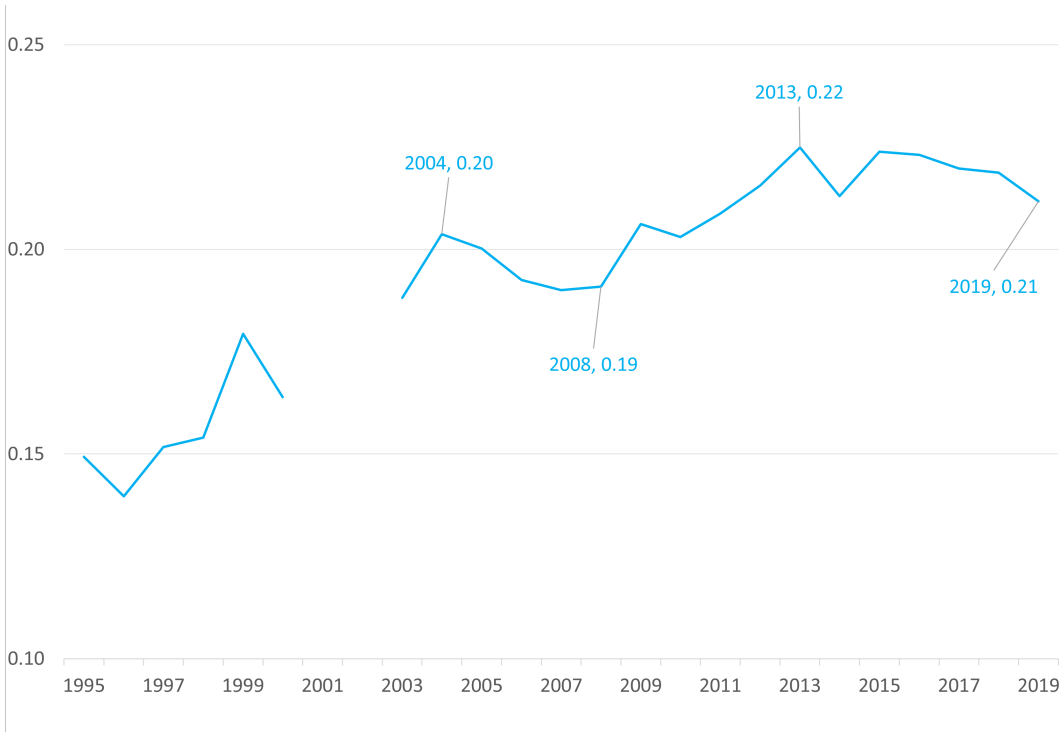
[48] In a next step, we hope to improve this allocation of public expenditures by relying on additional information

(RS) index, and is simply the difference in the Gini between pre- and post-tax income:

$$\Pi^{RS} = G_{Pre-tax} - G_{Post-tax} \tag{12}$$

Applied to the Gini's of DINA1 and DINA3 we get a measure of the redistributive activity effected by social contributions, income taxes and cash benefits. Figure 14 shows the RS-index for the period 1995-2019.

FIGURE 14: EVOLUTION OF REDISTRIBUTION (REYNOLDS-SMOLENSKY INDEX): 1995-2019



Note: Own calculations based on the DINA-series. We use the benchmark reference adult population (20+) and the broad equal-split division of income among household members.

Figure 14 confirms most of the explanations suggested above. With a declining inequality in pre-tax income up to the financial crisis, one could afford to slightly decreasing extent of redistributive activities of the tax transfer system (e.g. by means of lowering personal income taxes) and still end up with a decrease in inequality in disposable income. But once inequality in pre-tax income started to rise after the financial crisis, one had to make the tax-transfer system work harder to obtain a decline in after tax disposable income. Figure 14 shows that from 2013 onwards, the increasing inequality in pre-tax income was no longer countered by an increasing level of redistribution. This then inevitably led to the increase in inequality in disposable income as observed in Figure 11. In other words, the recent increase in the level of inequality of DINA3

sources, and by using the output of Work Package IV.4 in the BE-PARADIS project.

is not due to a decreasing level of redistribution by the government but to an increase in pre-tax income inequality which is no longer countered by an increase in the level of redistribution.

4.4 Role of reference population and equivalence scale

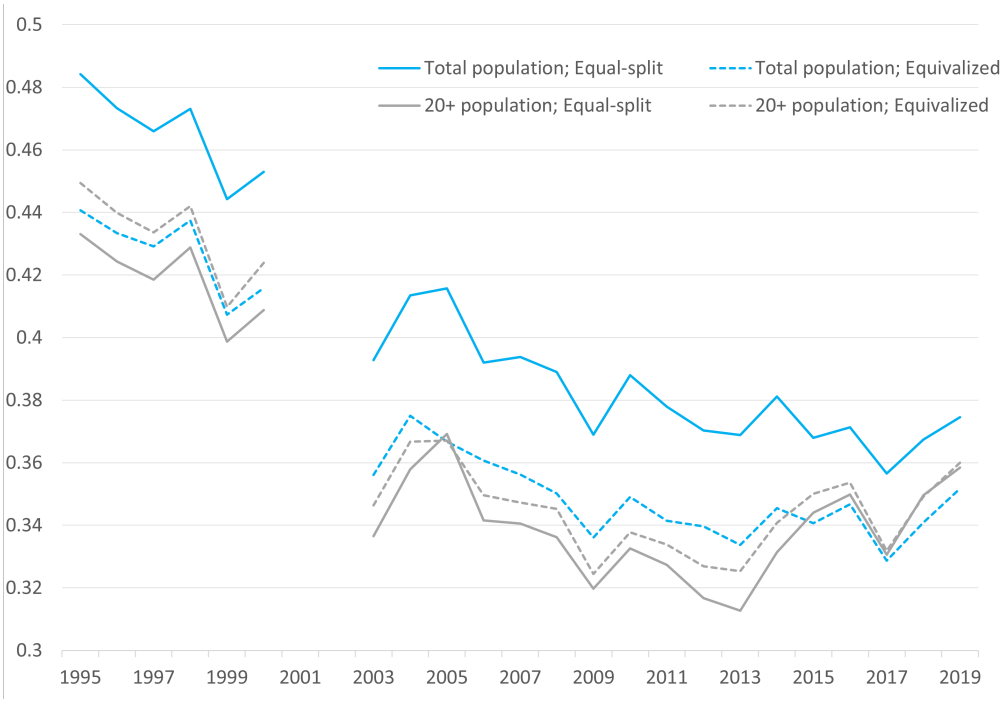
In the results above, all inequality figures are based on the distribution of income from a reference population of adult individuals aged 20+ with incomes divided equally among all (20+) household members (the broad-equal split scenario). As mentioned in subsection 3.2, in this we mainly followed the WID guidelines. However, these methodological choices on the reference population and division of income within the household differs from the ones used for the commonly known data series on income inequality as published by e.g. Eurostat and the Belgian Statistical Office Statbel. These publications usually rely on analyses based on an equivalised disposable household income concept, and use the total Belgian population of all individuals regardless of age as a reference population.

In Figure 15 we therefore investigate the sensitivity of the results to these assumptions. We limit the analysis to inequality in disposable income and the corresponding DINA3-concept in our own dataset. The full grey line replicates inequality in disposable income already discussed in Figure 11, that is: obtained under the reference scenario of adult population of individuals aged 20+ and broad-equal split income among all household members (aged 20+). We then introduce two variations. First the switch from grey to blue in Figure 15 indicates the move in the reference population from adults only, to the entire population of individuals. Second the switch from full to dashed line results from changing the assumption of 'broad equal split' to using the modified OECD equivalence scale.[49]

Figure 15 clearly illustrates that the methodological choices concerning reference population and intra-household division of income seriously impacts both the level and evolution of inequality. Certainly the first move, from adult population only to total population is crucial. Not only is the level of inequality much higher, but the U-shaped discussed above, with a turning point in 2013, disappears. The full blue line is more or less steadily decreasing over the period of analysis. The break in the declining pattern in 2013, discussed above, disappears and the decline continues. If on top we then also substitute equivalence scales for the 'broad equal split' assumption, we get the blue dotted line in Figure 15. The break in 2013 re-appears, but after 2013 we get the more or less stable inequality reported in most official publications. Since the steeply increasing pattern of inequality is only found in the two grey lines of Figure 15, we preliminary conclude from this that the choice for a reference population of adults only, is decisive. Further research, already referred to in footnote 47, has to clarify which underlying determinants can explain this finding.

[49] The broad-equal split division of incomes is equivalent to the use of an equivalence scale with a weight of one for all household members.

FIGURE 15: SENSITIVITY OF INEQUALITY (GINI) IN DISPOSABLE INCOME FOR REFERENCE POPULATION AND EQUIVALENCE SCALE: 1995-2019



Note: Own calculations based on the DINA3-series. Gini for total population or for subpopulation of adults (20 years or older). Incomes are equally split among household members or equalized by the modified OECD scale. The equivalence scale is based on all household members (also those under 20 years old).

4.5 Robustness of the results for the choice of inequality measure

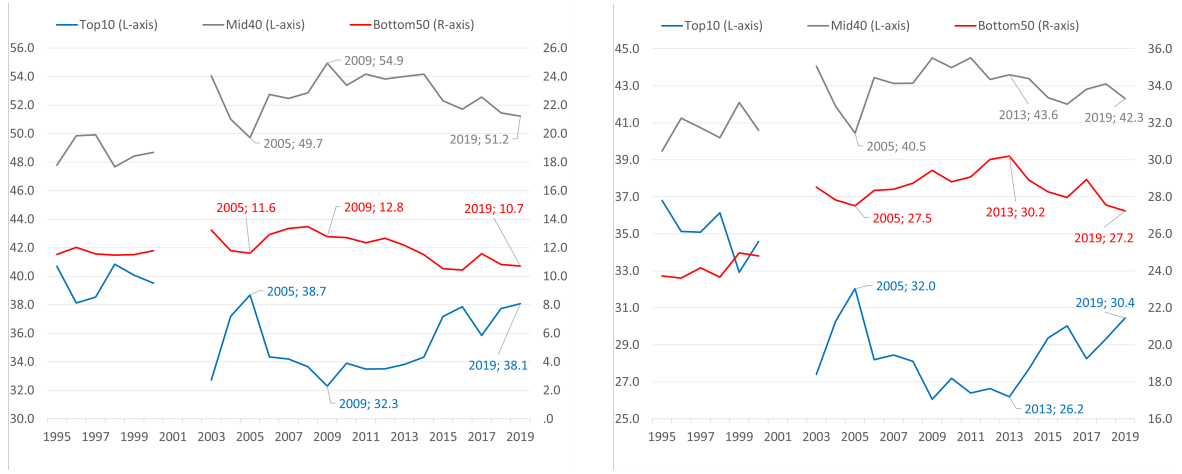
Above we relied on the Gini coefficient to measure income inequality. Naturally the question arises how robust our findings with respect to the use of other inequality measures. We follow two tracks. First, we might replicate the analysis for many other inequality measures (such as the Atkinson-measure, Generalized entropy measures, etc.). Since in recent years *income shares* have - somewhat to our surprise, since shares do not satisfy the basic Pigou-Dalton axiom of inequality measurement - regained wide popularity, in the first subsection we report the evolution of some of these income shares. Second, we widen the analysis to all Lorenz-consistent measures, by investigating Lorenz dominance between successive years in our dataset.

Do income shares give a different picture?

To depict inequality by means of income shares, we define three subgroups: the top10 and bottom50 to follow the share of income that accrues to respectively the 10% richest and 50% poorest individuals in the population, and the mid40 which indicates the share of income received by the group in between. We show the results in the two panels of Figure 16.

The left panel of Figure 16 shows the income shares of DINA1. It broadly confirms the

FIGURE 16: INCOME SHARES DINA1 AND DINA3: 1995-2019



(A) INCOME SHARES DINA1

(B) INCOME SHARES DINA3

Note: Own calculations based on the DINA1- and DINA3-series. Reference population are all adult individuals (20+) and division of household income follows the 'broad equal split' scenario.

conclusions drawn previously on the basis of the Gini. The income share of the richest 10% of the Belgian population first falls quite sharply from about 39% in 2005 to its lowest level in 2009 (32.3%). From 2010 onwards it increases again to 38.1% in 2019. This pattern is more or less mirrored by income share of mid40. But, it is interesting to see that, for pre-tax income, we find a steady decrease of the income share of the bottom 10%. As mentioned above this might have to do with the evolution of the main primary income source at the bottom which are imputed rents.

The right panel of Figure 16 - which depicts shares in disposable income - also confirms previous findings. The turning point of the U-shape (for the top 10), or the inverted U-shapes (for the middle 40 and the bottom 50) fall later, that is around 2013. Before 2013, redistributive action through the tax system, replacement incomes and other benefits, even succeeded in countering the declining share of the bottom 50% in primary income. The share of the bottom half of the distribution of after tax disposable income continued to increase up to 2013.

Analysis by means of Lorenz dominance

A much wider robustness check is obtained by checking for Lorenz dominance. The Gini-coefficient is one particular way to implement an inequality comparison obeying some basic axioms imposed on the inequality measure.[50] The full set of all inequality measures satisfying these basic axioms is covered by comparing two distributions based on Lorenz dominance. Income distribution x is said to Lorenz dominate distribution y if, for every p between 0 and 100, the bottom p percent of the population of distribution x has a larger share in total income com-

[50]The basic axioms are scale invariance, anonymity or symmetry, and Pigou-Dalton or the transfer principle.

pared to the shares of distribution y. The Gini coefficient is called Lorenz-consistent, because it satisfies the basic axioms. But so do plenty of other measures. If we obtain Lorenz dominance of distribution x over distribution y we know that the statement that "inequality in x is lower than in y" holds *for all* inequality measures which are Lorenz consistent.

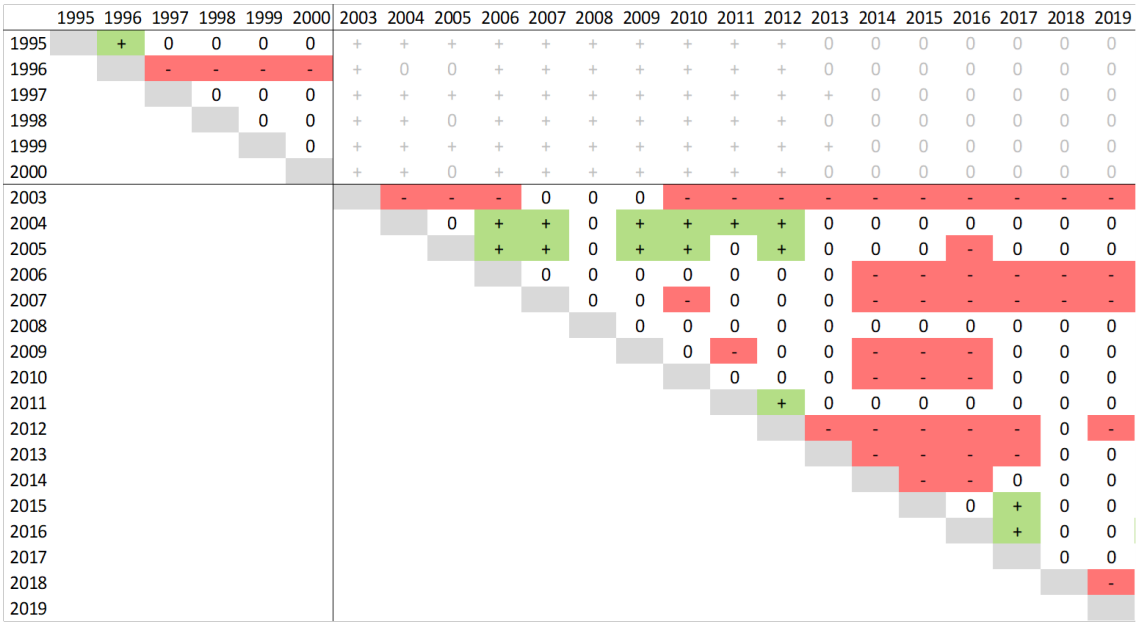
In Figure 17 we depict for all pairwise combinations of years over the period 1995-2000 and 2003-2019 whether the income distribution of one year Lorenz dominates another year, with DINA1 in panel A and DINA3 in panel B. A "+"-sign indicates that the year displayed in the column header at the top of the table Lorenz dominates the year displayed in the row header on the left of the table, and the reverse for a "-". E.g. the negative sign (-) in the bottom right corner (column with header 2019 and row with header 2018) indicates that the income distribution of 2019 is Lorenz dominated by the one of 2018 (or 2018 dominates 2019), and this both for DINA1 and DINA3. A zero indicates crossing Lorenz curves. The number of zeroes is an indication of the incompleteness of the ordering, which can be interpreted as: at least two inequality measures of the very large set of all Lorenz consistent ordering contradict each other.[51]

Let us once more concentrate only on the years since 2003. The upper panel of pre-tax income analysis shows that the earlier finding that in the second half of the period inequality was probably higher than in the first half of the period is broadly confirmed. It is true that the result is not always robust to use of other measures than the Gini (when there are zeroes), but it is difficult to deny that the red color of the minus sign dominates, and this certainly since 2013. The contrast with the lower panel, where we show the bilateral comparisons for the post-tax disposable income, is striking. There is a lot more green (of the '+'-sign) indicating that later years Lorenz-dominate earlier ones (or: inequality is declining). But this clearly changes in 2014. From 2014 onwards, we find that later years are - not always, but often - dominated by earlier years, indicating a robust increase in inequality.

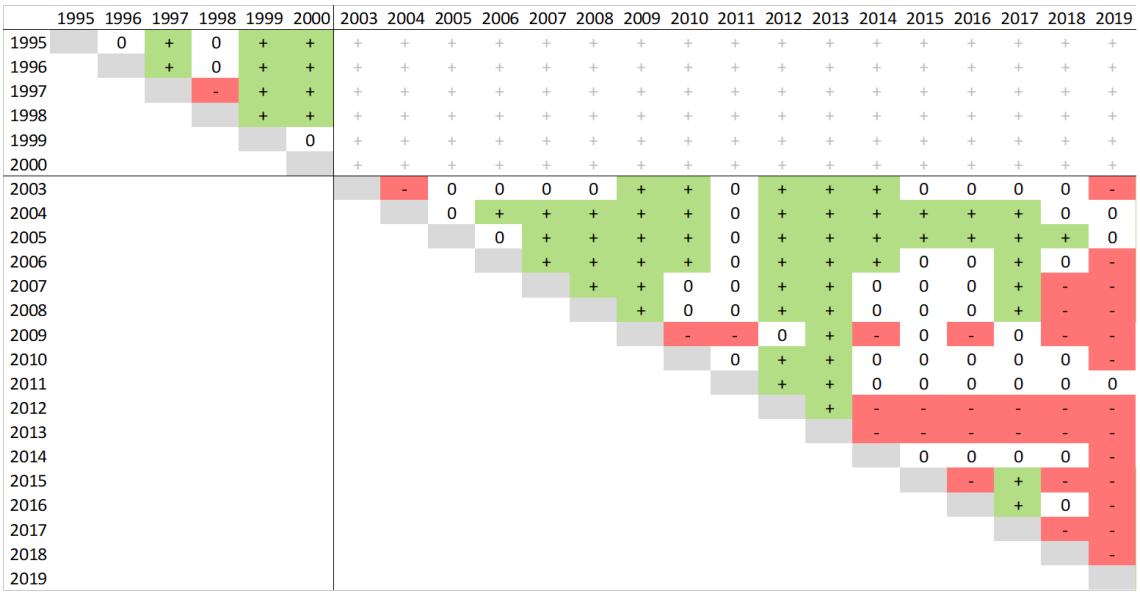
[51] Using a single inequality index avoids this possible contradiction, and hence always produces a complete ordering. But it comes with the price that one has to make the choice of one specific inequality measure.

FIGURE 17: LORENZ DOMINANCE: 1995-2019

(A) PRE-TAX INCOME DINA1



(B) POST-TAX DISPOSABLE INCOME DINA3



Note: Own calculations based on DINA1- and DINA3-series. Lorenz dominance is computed on the basis of Lorenz-ordinates for five quintiles. The table reads as follows: a year displayed in the column header Lorenz dominates a year displayed in the row header when there is a "+" at the intersection; if there is "-" the column-year is Lorenz-dominated by the row-year. A zero indicates that Lorenz curves cross. Because we avoid comparing the ECHP-years with the SILC years, we have put the results of these bilateral comparisons in grey.

5 Conclusion and next steps

With the construction of our DINA series, we have demonstrated the importance of income components that are only covered to a limited extent (or not at all) in the surveys. Financial capital income is the most notable income component with coverage rates of around 10% to 30% in the surveys. Our preliminary DINA series covers the distribution of financial capital income as recorded in the National Accounts in all its forms (including undistributed profits). This additional source of income is mainly allocated at the top of the income distribution.

Obviously, distributing not only total financial capital income but all components included in the national accounts, affects the level and evolution of income inequality in Belgium. Our DINA series deviates from the one based on survey data both for pre-tax and post-tax incomes. Looking at pre-tax factor income (DINA1), we observe a kink in falling inequality around the financial crisis after which it increases. The tax- and benefit-system seems to have been able to neutralize the rising inequality in pre-tax factor income for some years. From 2014, this has also been reversed and since then we also find increasing inequality in post-tax disposable income (DINA3).

We showed that these findings are robust for the inequality measure used, at least as long as we stay with the scale-invariant ones or the 'popular' top10 income shares. In addition, we stressed that the role of equivalence scales and of how the reference population is defined should not be underestimated. This has a clear impact on the level, and certainly on the evolution, of inequality.

We close the discussion of these preliminary results by returning to one of the initial questions of this research project: how do we explain the possibly apparent paradox of Belgian inequality? The answer we give here is based on the sensitivity of the relative position of Belgian inequality and its evolution compared to the neighbouring countries. Since we want to illustrate the move from survey information to the more comprehensive National Accounts, we limit the comparison here to disposable income (or DINA3 in the DINA-approach). In Figure 18 we display two presentations of the relative position of Belgium as far as inequality is concerned as measured by the Gini.

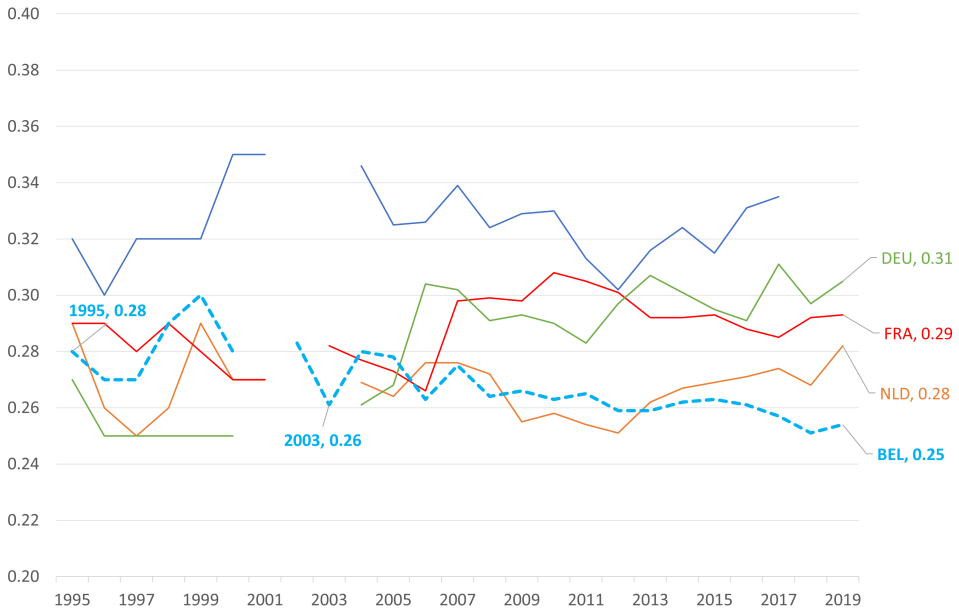
Panel A on top is the one which leads to statements that "*inequality in Belgium is low and stable*" (even slightly decreasing). It is based on household equivalized disposable income as directly obtained from surveys like EU-SILC, and predecessors ECHP and - for Belgium - SEP.[52] The blue line for Belgium is not only steadily declining, since 2013 it also leads to the lowest recorded inequality compared to the neighbouring countries.

In the lower panel of Figure 18 we make the same comparison of Belgium with the surrounding countries, but now based on the DINA methodology. We can in fact rely on two sources. First, since the start of our research project, WID has itself published a DINA series of disposable

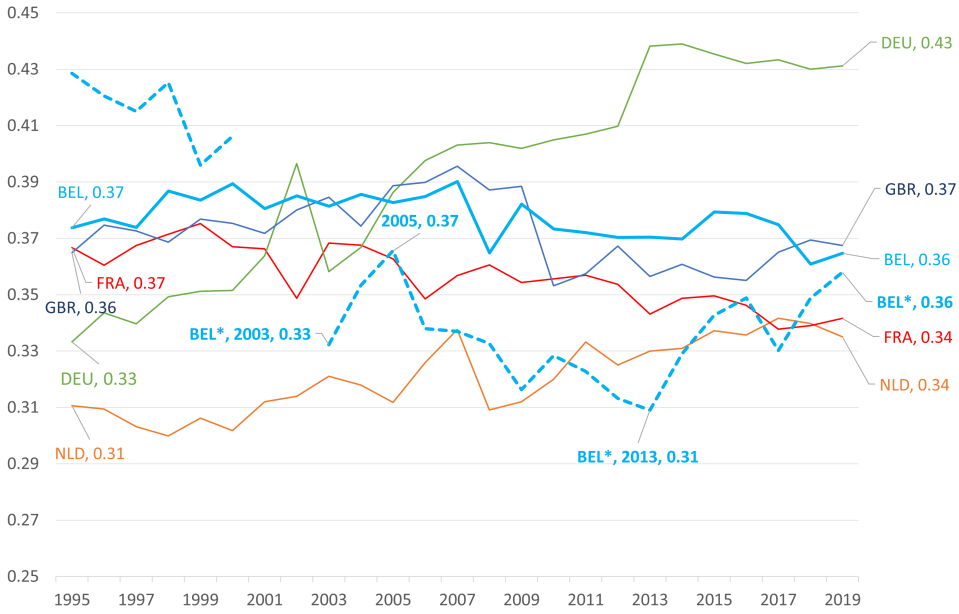
[52] see Assal et al. (2023) for an in-depth overview of the underlying survey data.

FIGURE 18: COMPARISON OF GINI OF POST-TAX DISPOSABLE INCOME: 1995-2019

(A) EQUIVALISED DISPOSABLE INCOME IN SURVEYS (TOTAL POPULATION)



(B) POST-TAX PER CAPITA DISPOSABLE INCOME DINA3 (POPULATION 20+)



Note: Panel A is based on a download from EUROSTAT. In panel B the full lines show the Gini of post-tax disposable income for Germany, Great Britain, Belgium, France and the Netherlands, downloaded from the WID-website on August 29 2023. The dotted blue line with blue label BEL* shows the Gini for Belgium of the same DINA3-concept, calculated on our dataset.

income for Belgium. This is the solid blue line in Figure 18b. In addition, we have our own first DINA results of this paper, which we represent as a blue dotted line, and which replicate the results already presented in Figure 11.

Both curves for Belgium based on DINA show a thoroughly adjusted picture compared to the surveys. As discussed in detail above, this is not surprising, given the magnitude of both the rescaling and the addition of important income components in the DINA-approach. Both the WID results and our own results agree on the conclusion that, in terms of inequality of disposable income, Belgium is not necessarily the least unequal country (of the ones shown here). But as far as the evolution of inequality is concerned, the picture we paint is very different from what we find at WID. The WID results continue to confirm that inequality in Belgium, though higher than initially thought based on survey information alone, remains fairly stable, and is even decreasing slightly. Our results, on the contrary, show an outspoken V-shaped pattern with sharply rising inequality since 2013.

In the introduction to this paper, we clearly stated that we consider the empirical results of this paper to be very preliminary. The purpose of this paper was to explain in detail the DINA methodology, such that empirical applications for Belgium would be clearly documented. In this respect, the fact that in this paper we still only use ECHP and SILC microdata as source of distributional information does not reflect a methodological choice, but should be considered more as an intermediate step, which will be followed soon by extensions based on administrative tax data, additional survey information from the HFCS, and possibly information from the 'rich-list'.

It is possible that these extensions might bring our DINA-results more in line with the currently published WID-series for Belgium. As far as we can deduce from the methodological notes in the Appendix of Blanchet et al. (2022a), we see at least the following differences between the WID-approach and the one used in this paper. First, the microdata used to distribute the national account aggregates differ. We use ECHP and SILC microdata while they produce DINA series based on SEP and most of the available SILC datasets. In the Appendix of Blanchet et al. (2022a) it is documented (but not argued why) they do not use the SILC microdata for the years 2004, 2005 and 2006. This might explain why they do not observe a peak in inequality during this period.

Second, they extend the coverage of SEP and SILC in two ways. Starting from survey tabulations from a variety of sources (PovcalNet, UNU-WIDER ...), they 'recover' complete distributions using a generalized Pareto interpolation method developed by Blanchet et al. (2022c). In addition, they use a machine learning algorithm (XGBoost) to impute the distribution of missing 'target' concepts based on observed related 'source' concepts. The algorithm is trained (across country-years) on cases in which the income distribution is simultaneously observed for both the 'target' and the 'source' concept. This allows for the imputation of e.g. taxable income and/or tax concepts that are not included in SEP or SILC. In this paper, we did not impute

any missing concepts based on other datasets or tabulations. We only used the EUROMOD microsimulation model to simulate taxes and construct tax income concepts.

Third, WID uses tax data tabulations to correct the surveys for the 'missing rich'. Based on top 10 income shares from Decoster et al. (2017), they correct non-sampling errors using standard survey calibration techniques. Since neither gross nor net taxable income are included in SEP and SILC, they probably use an imputed income concept using XGBoost for the calibration of the top 10 share. Next, they correct for sampling errors by modelling the top 10% of the income distribution as a generalized Pareto distribution. This adjustment has no impact on the top 10 income share but only refines the distribution within the top 10%.

Fourth, our methodology to include imputed rents, undistributed profits or indirect taxes is not exactly the same as the one of WID.

This naturally brings us to the planned next steps to refine these first, provisional, Belgian DINA. First, we want to extend the analysis period further backwards, at least starting in 1985. This implies that we will, like WID, also use SEP (the income survey available for 1985), and possibly revise our reliance on ECHP for later years. Second, for earnings and benefits, administrative tax data are definitely more accurate, and we will follow Blanchet et al. (2022b) to combine surveys and tax data. This will allow us to tackle to some extent the issue of 'the missing rich' in the survey data. However, since Belgian tax data do not cover capital income due to a flat rate withholding tax, we plan an additional improvement based on HFCS. By statistically matching EU-SILC with the HFCS database, we will solve the limited level of detail and poor coverage of capital income in EU-SILC. This will allow us to produce more accurate DINAs for the four years where SILC and HFCS are simultaneously available. We might complement this step with an additional correction of the survey data, now common in the literature, by means of a Pareto-tail estimated on a rich list (Chakraborty et al. (2019); Waltl and Chakraborty (2022); Vermeulen (2018); Blanchet et al. (2022c)). Finally, we will extend the coverage of our analysis, by using the Household Budget Surveys to impute expenditures into our micro-data. This will not only allow to estimate VAT and excise taxes and to allocate them across the distribution, but also open up the possibility to investigate the distributional impact of inflation, based on household specific expenditure patterns.

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EU-SILC Acronyms

HY030G gross imputed rents

HY040G gross income from rental of a property or land

HY050G gross family/children-related allowances

HY060G gross social exclusion not elsewhere tagified

HY090G gross interests, dividends, profits from capital investment in unincorporated businesses

HY100G interests repayments on mortgage

PY010G gross cash or near cash employee income

PY020G gross non-cash employee income

PY050G cash benefits or losses from self-employment

PY090G gross unemployment benefits

PY100G gross old-age benefits

PY110G gross survivor benefits

PY120G gross sickness benefits

PY130G gross disability benefits

PY140G gross education-related allowances

A National Accounts: a brief introduction

The DINA framework is based on revised concepts from National Accounts which are a sequence of accounts giving a complete accounting view of a nation (or one of its regions) for a defined period of time. In the latest European accounting system, ESA2010, 5 institutional units, called sectors, form the national economy (S.1): non-financial corporations (S.11), financial corporations (S.12), general government (S.13), households (S.14) and non-profit institutions serving households (NPISH) (S.15). These resident institutional units have economic links with a sixth institutional sector, the "rest of the world" (S.2). National Accounts present the value creation of units and the transactions and interactions between them within a dual accounting system: transactions that increase economic value are recorded as "resources" and transactions that reduce the economic value of a unit are recorded as "uses". ESA2010 follows the principle of a sequence of accounts: current accounts (production of value added, distribution and redistribution of income), accumulation accounts (changes in the assets and liabilities of each unit), balance sheet accounts (accounting for stocks of assets and liabilities). By construction, to balance resources and uses or assets and liabilities, a balance item is defined in each account (in light grey in Table A.9). Each transactions is recorded with a name and a code. Codes who start with a "P" stands for transactions in products (goods and services)."D" stands for distributive transactions where the added value is distributed to labour, capital and government."B" stands for balancing items in each account.

The **production account** (I) concerns production carried out on national territory. Production ($P.1$) is recorded in resources and intermediate consumption ($P.2$) in uses. Value added is the main balancing item: it is calculated before or after the consumption of fixed capital ($B.1g$ is gross and $B.1n$ is net value). At the level of the total economy, gross domestic product is calculated at market price, and must therefore take into account taxes like VAT ($D.21$), less subsidies on products ($D.31$).For household sector (S.14), production is composed of two important components: production done by self-employed persons and housing services produced by households (with real gross rents or imputed for owner-occupied persons). Intermediate consumption has also two components for costs endured by self-employed persons and housing services.

The **distribution and use of income accounts** are a sequence of four stages: primary distribution (account II.1), secondary distribution (account II.2), redistribution in kind (account II.3) and use of income (account II.4). The primary income distribution account (account II.1) includes income from the production process and distributes it among the factors of production (capital and labour) and general government (through taxes less subsidies). There are two tables inside account II.1.

The first table is the **generation of income account** (II.1.1) which focuses on each institutional sector as producer. In the resources column, we put the added value produced by each sector. The uses column shows how added value covers the uses of inputs for production

purpose: compensation of persons employed by each sector ($D.1$), taxes ($D.2$) and subsidies ($D.3$) of each sector. A first important note is only a part of taxes and subsidies is affected to each institutional sector ($D.29$ and $D.39$). Taxes and subsidies on products ($D.21$ and $D.31$) are only available at the national economy level (S1). The balancing items are the remuneration of capital with the operating surplus ($B.2_g$, available for each institutional sector), and the mixed income ($B.3_g$, only for household sector). $B.2_g$ is surplus or deficit on production activities before to pay or receive interest, rents or charges on financial assets or natural resources. Within the household sector, the balancing items can be tricky to understand. The mixed income reflect incomes to all unincorporated business where it is difficult to separate remuneration from labour and from capital. The gross operating surplus comprises, on the one hand, depreciation of household capital (mainly residential property and business capital) and, on the other hand, net rents real or imputed (i.e. not the rents of public limited companies or public social housing corporations). As DINA rely on net concepts, we need to shift from gross balancing items to net ones. In the publicly available National Accounts, for the household sector, there is no breakdown of the consumption of fixed capital ($P51_{c,S14}$) between that attributable to the operating surplus ($B2g_{R,S14}$) and that attributable to the mixed income ($B3g_{R,S14}$). Equation 13 presents the assumption made to breakdown the depreciation in order to compute the net aggregates.

$$\begin{aligned} P51_{c1,S14} &= \frac{B2g_{R,S14}}{B3g_{R,S14} + B2g_{R,S14}} P51_{c,S14} \\ P51_{c2,S14} &= \frac{B3g_{R,S14}}{B3g_{R,S14} + B2g_{R,S14}} P51_{c,S14} \end{aligned} \tag{13}$$

The second table is the **allocation of primary income account** (II.1.2) which, unlike the previous one, focuses on the institutional units as beneficiary from primary income. The resources column shows the income of each institutional sector because of their participation to the production process or because they provide financial asset or natural resources to another institutional sector. For financial and non-financial sector (S.11 and S.12), resources are only the operating surplus ($B.2_{g/n}$) and incomes from property ($D.4$). For household sector (S.14), there are the mixed income ($B.3_{g/n}$) and the compensation of employees ($D.1$). Finally, for government sector (S.13), there is a small amount from operating surplus ($B.2_{g/n}$) but mainly incomes from taxes minus subsidies and property income.

The difference from perspective between II.1.1 and II.1.2 table can be explained through compensation of employees. Wages paid to workers in private sector institutions are recorded in S.11/S.12 units within II.1.1 (because firms are the production places and they use labour as an input) but in S.14 unit within account II.1.2 (because households are the beneficiaries and wages are their resources). But, it is important to note that $D.1_{S1}$ in II.1.1 are not the same amount than $D.1_{S1}$ in II.1.2. The first one describes the amount that the national economy spends on compensations to employees as the national production counterpart: it is paid to residents

and non-residents. The second one describes the amount that the national economy receives for compensations to employees that are resident (but might be part of a foreign production process). The second one can be deducted from the first one by removing compensations of employees received by S2 (item in resources), and by adding compensations of employees paid by S2 (item in uses). In the uses column of II.1.2, we find for each sector the amount they pay for using assets from others institutional sectors ($D.4$). The balancing item in II.1.2 is the gross/net national income ($B.5_{g/n}$) (which is also called gross/net balance of primary income).

While Table A.9 includes the concepts needed to establish DINA1, Table A.10 introduces the various levels of redistribution needed to establish the concepts of DINA 2 to 4. The **secondary distribution of income account** (II.2) shows how contributions paid by each sector (taxes $D.5$ and social contributions $D.61$) or social benefits ($D.62$) affect primary income. The balancing item is disposable income ($B.6g$). The last account emmployed is the **Use of disposable income account** (II.4.1) which shows how disposable income is affected to expenditures for the households, the government and the non-profit sector. The balancing item is the gross saving ($B8g$).

Table A.9: national accounts - production, income and allocation of primary accounts

Uses								Resources							
Code	Account	S1	S11	S12	S13	S14	S15	Code	Account	S1	S11	S12	S13	S14	S15
Production account (I)															
P.2	Intermediate consumption	•	•	•	•	•	•	P.1	Output	•	•	•	•	•	•
								D.21	Taxes on products	•					
								D.31	Subsidies on products	•					
B.1g	Gross added value - GDP	•	•	•	•	•	•								
P.51c	Fixed capital consumption	•	•	•	•	•	•								
B.1n	Net added value	•	•	•	•	•	•								
Generation of income account (II.1.1)															
D.1	Compensation of employees	•	•	•	•	•	•	B.1g	Gross added value - GDP	•	•	•	•	•	•
D.2	Taxes on production and importation	•	•	•	•	•	•								
D.3	Subvention on production	•	•	•	•	•	•								
B.2g	Gross operating surplus	•	•	•	•	•	•								
B.3g	Gross mixed income	•				•									
P.51c1	Fixed capital consumption (GOS part)	•	•	•	•	•	•								
P.51c2	Fixed capital consumption (Mixed inc. part)	•				•									
B.2n	Net operating surplus	•	•	•	•	•	•								
B.3n	Net mixed income	•				•									
Allocation of primary income account (II.1.2)															
D.4	Property income	•	•	•	•	•	•	B.2g/n	Gross/net operating surplus	•	•	•	•	•	•
								B.3g/n	Gross/net mixed income	•				•	
								D.1	Compensation of employees	•				•	
								D.2	Taxes on production and importation	•			•		
								D.3	Subsidies	•			•		
								D.4	Property income	•	•	•	•	•	•
B.5g	Gross national income	•	•	•	•	•	•								
B.5n	Net national income	•	•	•	•	•	•								

Black dots (•) refers to existing National Accounts concepts.

Table A.10: national accounts - secondary distribution and use of income accounts

Uses								Resources							
Code	Account	S1	S11	S12	S13	S14	S15	Code	Account	S1	S11	S12	S13	S14	S15
Secondary distribution of income account (II.2)															
D.5	Current taxes on income, wealth, etc	•	•	•	•	•	•	B.5g	Gross national income	•	•	•	•	•	•
D.6	Social contributions and benefits	•				•		D.5	Current taxes on income, wealth, etc	•			•		
D.7	Other current transfers	•	•	•	•	•	•	D.61	Net social contributions	•	•	•	•	•	•
								D.62	Social benefits other than in kind	•				•	
								D.7	Other current transfers	•	•	•	•	•	•
B.6g	Gross disposable income	•	•	•	•	•	•								
Use of disposable income account															
P.31	Individual consumption expenditure	•			•	•	•	B.6g	Gross disposable income	•	•	•	•	•	•
P.32	Collective consumption expenditure	•			•			D.8	Adjustment for pension entitlements	•				•	
D.8	Adjustment for pension entitlements	•		•	•										
B.8g	Gross saving	•	•	•	•	•	•								

Black dots (•) refers to existing National Accounts concepts.

B Correspondence between NA-aggregates and micro-counterparts

In Table B.11 to Table B.14 below, we describe in detail which survey-variables, if any, have been used to distribute the National Accounts aggregates. We do this separately for the four DINA-concepts. The aggregation of the survey counterparts in the right column of Table B.11 forms the survey equivalent of pre-tax factor income (DINA1). To give a feeling of the quantitative relevance of an aggregate in the National Accounts, we give the value in €bn for the year 2019. When presenting results we often summarize the income structure in five broad components. Income y_h for observational unit h is decomposed into five 'income sources':

$$y_h = \sum_{k=1}^{5} y_{h,k} \tag{14}$$

where subscript k takes the following values:

1. labour income;
2. mixed income (or self-employment income);
3. imputed and actual rents;
4. capital income from financial assets;
5. undistributed profits.

In Appendix C we discuss in detail how this decomposition in income sources can also be translated into a decomposition of inequality.

Table B.11: Pre-tax factor income* (dina1): decomposition into NA concepts and related micro-concepts

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
A. Pre-tax personal factor labor income					
+	Wages and salaries	$D11_{R,S14}$	181406	Gross cash or near cash employee income	PY010G
				Gross non-cash employee income	PY020G
+	Employers social contributions	$D12_{R,S14}$	60702	Micro-simulated variable in Euromod	Euromod
+	Labor share of gross mixed income	$B3g_{R,S14}$	22800	Cash benefits or losses from self-employment	PY050G***
−	Labor share of consumption of fixed capital (mixed income part)	$P51c_{2,S14}$	1847		
B. Pre-tax personal factor capital income					
+	Capital share of gross mixed income	$B3g_{R,S14}$	9772	Cash benefits or losses from self-employment	PY050G
−	Capital share of consumption of fixed capital (mixed income part)	$P51c_{2,S14}$	791		
+	Gross operating surplus	$B2g_{R,S14}$	27213	Gross imputed rents	HY030G
−	Consumption of fixed capital (GOS part)	$P51c_{1,S14}$	17366	Gross income from rental of a property or land	HY040G
−	Interests paid by household sector	$D41_{U,S14}$	1477	Interests repayments on mortgage	HY100G
+	Interests received by household sector	$D41_{R,S14}$	1307	Gross interests, dividends, profits from capital	HY090G
+	Distributed income from corporations received	$D42_{R,S14}$	17038	investment in unincorporated businesses	
+	Reinvested earnings on foreign direct invest	$D43_{R,S14}$	0	NA (zero value in National Accounts)	
+	Investment income attributable to insurance policy holders	$D441_{R,S14}$	5124	*Gross cash or near cash employee income*	PY010G
				Gross non-cash employee income	PY020G
+	Incomes from pension entitlements	$D442_{R,S14}$	2126	*Gross cash or near cash employee income*	PY010G
				Gross non-cash employee income	PY020G

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Table B.11 – continued from previous page

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
+	Investment income attributable to collective investment fund shareholders	$D443_{R,S14}$	2823	*Gross interests, dividends, profits from capital investment in unincorporated businesses*	*HY090G*
+	Primary income of corporate sector	$B5g_{U,S11+S12}$	102156	*Gross interests, dividends, profits from capital investment in unincorporated businesses*	*HY090G*
−	Depreciation of corporate sector	$P51c_{S11+S12}$	58780		
+	Rents (land) received	$D45_{R,S14}$	696	*Neutral***	
−	Rents (land) paid	$D45_{U,S14}$	340		
C. Pre-tax government income					
+	Gross operating surplus	$B2g_{R,S13}$	10641	*Neutral***	
−	Consumption of fixed capital	$P51c_{S13}$	10569		
+	Taxes on production	$D2_{R,S13}$	64275		
−	Subsidies on production	$D3_{R,S13}$	17930		
+	Property income received by gov sector	$D4_{R,S13}$	4254		
−	Property income paid by gov sector	$D4_{U,S13}$	9758		
D. Pre-tax non-profit income					
+	Gross operating surplus	$B2g_{R,S15}$	303	*Neutral***	
−	Consumption of fixed capital	$P51c_{S15}$	303		
+	Property income received by NPSIH sector	$D4_{R,S15}$	157		
−	Property income paid by NPSIH sector	$D4_{U,S15}$	12		
= DINA 1 - Pre-tax factor income (NNI)			393620		

Notes.

*The *Pre-tax factor income* is decomposed into 4 main concepts: the *Pre-tax personal factor labour income*, the *Pre-tax personal factor capital income*, the *Pre-tax government income* and the *Pre-tax non-profit income*

**The neutral assumption implies that the distribution of the macro-aggregate distributed neutrally do not change the distribution of the pre-tax factor income. The macro-aggregate acts only as a level-shifter.

***This micro-concept in SILC is allowed to be negative (self-employment losses). As NA account total is here positive, we enforced negative micro-values to zero.

Table B.12: Pre-tax post-replacement income* (dina2): decomposition into NA concepts and related micro-concepts

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
Pre-tax factor income (DINA1)			393620		
−	Pension and other social contributions	$D61_{U,S14}$	89086	Micro-simulated variable in Euromod Micro-simulated variable in Euromod	Euromod Euromod
−	Investment income payable to pension entitlements	$D442_{R,S14}$	2126	Table B.11	
+	Social security benefits in cash	$D621_{R,S14}$	56047		
	Payments for sickness and invalidity	$[D62\_1]^{**}$	9350	Gross sickness benefits Gross disability benefits	PY120G PY130G
	Unemployment	$[D62\_2]$	4752	Gross unemployment benefits	PY090G
	Unemployment benefits with employer top-up ('early retirements' before 2012)	$[D62\_3]$	891	Gross unemployment benefits	PY090G
	Career break and time-credit	$[D62\_4]$	739	Gross unemployment benefits	PY090G
	Retirement pension and survival pension (private sector)	$[D62\_5]$	32091	Gross old-age benefits	PY100G
	Widow's and orphan's fund	$[D62\_6\_1]$	1178	Gross survivor benefits	PY110G
	Retirement pension and survival pension (public sector)	$[D62\_6\_2\,to\,6\_8]$	5724	Gross old-age benefits	PY100G
	Child allowance (Public Service for Social Security from provincial and local government)	$[D62\_8\_1]$	0	Gross education-related allowances Gross family/children-related allowances	PY140G HY050G
	Industrial accidents	$[D62\_9]$	278	Gross sickness benefits Gross disability benefits	PY120G PY130G
	Occupational diseases	$[D62\_10]$	245	Gross sickness benefits Gross disability benefits	PY120G PY130G

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Table B.12 – continued from previous page

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
	Fund for the Closing of Corporations	$[D62\_15]$	167	Gross unemployment benefits	PY090G
	Health and social care insurance in cash	$[D62\_16\_1]$	453	Gross sickness benefits Gross disability benefits	PY120G PY130G
	Social security benefits received by the households from other sector than S13	$D621_{R,S14} - \sum[]$	180	*Following the distribution of* $D621_{R,S14}$	
+	Other social insurance benefits	$D622_{R,S14}$	21812		
	Employers' social insurance schemes: retirement pension and survival pension	$[D62\_6\_9]$	10218	Gross old-age benefits Gross survivor benefits	PY100G PY110G
	Early retirements pension (military and teaching profession)	$[D62\_6\_10]$	66	Gross old-age benefits	PY100G
	Child allowance (Public Service - Employers' social insurance schemes)	$[D62\_8\_2]$	0	Gross education-related allowances Gross family/children-related allowances	PY140G HY050G
	Social benefits in cash, other	⅔ of $[D62\_17]$	1242	*Following the distribution of* $D622_{R,S14}$	
	Other social insurance benefits received by S14 from other sector than S13	$D622_{R,S14} - \sum[]$	10286	*Following the distribution of* $D622_{R,S14}$	
+ Pension and other social insurance surplus/deficit					
+	Pension and other social contributions	$D61_{U,S14}$			
+	Investment income payable to pension entitlements	$D442_{R,S14}$	13354	*Follow the distribution of Pre-tax personal post-replacement income*	
−	Social security benefits in cash	$D621_{R,S14}$			
−	Other social insurance benefits	$D622_{R,S14}$			
= DINA 2 - Pre-tax post-replacement income (NNI)			393620		

Notes.

*The *Pre-tax post-replacement income* is decomposed into 4 main concepts: the *Pre-tax personal post-replacement income*, the *Pension and other social insurance surplus/deficit*, the *Pre-tax government income* and the *Pre-tax non-profit income*

**Following codes into brackets refer no longer to ESA2010 terminology but to NA concepts available in the "Breakdown of paid social benefits" table on NBB.stat.

Table B.13: Post-tax disposable income: decomposition into NA concepts and related micro-concepts

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
Pre-tax post-replacement income (DINA 2)			393620		
−	Taxes on production and importation	$D2_{R,S13}$	64275	*Neutral*	
+	Subsidies on production and importation	$D3_{R,S13}$	-17930		
−	Taxes on income	$D51_{R,S13}{}^{*}$			
	Advance tax payment on movable property	[$D51\_A\_1$]	3700	Micro-simulated variable in Euromod	Euromod
	Business' advance tax payment	[$D51\_A\_2$]	47635	Micro-simulated variable in Euromod	Euromod
	Advance payments	[$D51\_A\_3$]	1586	Micro-simulated variable in Euromod	Euromod
	Assessments	[$D51\_A\_4$]	-391	Micro-simulated variable in Euromod	Euromod
	Annual tax on profit sharing	[$D51\_A\_5$]	18	Micro-simulated variable in Euromod	Euromod
	Special social contributions	[$D51\_A\_6$]	1267	Micro-simulated variable in Euromod	Euromod
	Contribution large incomes	[$D51\_A\_7$]	0	Micro-simulated variable in Euromod	Euromod
	Tax on the worker's participation in the benefit of the capital of the company	[$D51\_A\_8$]	9	Micro-simulated variable in Euromod	Euromod
	Other income taxes	[$D51\_A\_9$]	33	Micro-simulated variable in Euromod	Euromod
	Corporate income taxes	[$D51\_B$]	17730	*Gross interests, dividends, profits from capital investment in unincorporated businesses*	*HY090G*
	Other income taxes	[$D51\_E$]	1186	Micro-simulated variable in Euromod	Euromod
−	Other current taxes	$D59_{R,S13}$			
	Current taxes on immovable capital	[$D59\_A$]	861	Micro-simulated variable in Euromod	Euromod
	Poll taxes	[$D59\_B$]	0	*Micro-simulated variable in Euromod*	*Euromod*

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Table B.13 – continued from previous page

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
	Household payments for receiving licences	$[D59\_D]$	1270	*Micro-simulated variable in Euromod*	*Euromod*
	Other current taxes	$[D59\_F]$	23	*Micro-simulated variable in Euromod*	*Euromod*
+	Social assistance benefits in cash	$D623_{R,S14}$			
	Child allowance (private sector)	$[D62\_7]$ **	6888	Gross family/children-related allowances	HY050G
	Integration income	$[D62\_11]$	1445	Gross social exclusion not elsewhere tagified	HY060G
	Guaranteed income for the elderly	$[D62\_12]$	598	Gross old-age benefits Gross survivor benefits	PY100G PY110G
	Compensations for the handicapped	$[D62\_13]$	2304	Gross disability benefits	PY130G
	War pensions	$[D62\_14]$	47	Gross old-age benefits Gross survivor benefits	PY100G PY110G
	Corona unemployment benefits	$[D62\_18]$	0	Gross unemployment benefits	PY090G
	Bankruptcy / Replacement income self-employed	$[D62\_19]$	5	Equally for all self-employed	
	Social transfers (tax credit refundable) Social benefits in cash, other Other benefits in cash received by S14 from other sector than S13	$[D62\_16]$ ⅓ of $[D62\_17]$ $D623_{R,S14} - \sum[]$	769 621 765	Following the distribution of the rest of $D623_{R,S14}$	
= DINA 3 - Post-tax disposable income			285788		

Notes.

*Following codes into brackets refer no longer to ESA2010 terminology but to NA concepts available in the "Received taxes and actual social contributions by kind" table on NBB.stat

**Following codes into brackets refer no longer to ESA2010 terminology but to NA concepts available in the "Breakdown of paid social benefits" table on NBB.stat.

Table B.14: Post-tax national income: decomposition into NA concepts and related micro-concepts

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
Post-tax disposable income (DINA3)			285788		
+	Individual consumption expenditure (gov)	$P31_{U,S13}{}^{*}$			
	Health	$[F07]$	33071	*Equally among population*	
	Recreation, culture and religion	$[F08]$	1957	*Neutral: Follow the distribution of total of what precedes*	
	Education	$[F09]$	27126		
	Sickness and disability	$[F10.1]$	4399		
	Old age	$[F10.2]$	735		
	Survivors	$[F10.3]$	24		
	Family and children	$[F10.4]$	2068		
	Unemployment	$[F10.5]$	494		
	Housing	$[F10.6]$	227		
	Social exclusion	$[F10.7]$	1892		
+	Individual consumption expenditure (non-profit)	$P31_{U,S15}$	5049	*Neutral: Follow the distribution of total of what precedes*	
+	Collective consumption expenditure	$P32_{U,S13}$			
	General public service	$[F01]$	11118	Neutral: Follow the distribution of total of what precedes	
	Defence	$[F02]$	3535		
	Public order and safety	$[F03]$	7471		
	Economic affairs	$[F04]$	11272		
	Environment protection	$[F05]$	2027		
	Housing	$[F06]$	478		
	Health	$[F07]$	476		
	Recreation, culture and religion	$[F08]$	1040		
	Education	$[F09]$	385		
	R&D social protection	$[F10.8]$	0		
	Social protection n.e.c.	$[F10.9]$	418		

Table B.14 – continued from previous page

	National Accounts concepts			Direct link with microdata or *assumptions (in italic)*	
Role	Description	Code	2019 (m€)	Description	Code (SILC)
+	Government surplus/deficit				
	+ Net taxes	$D2_{R,S13} - D3_{R,S13}$	46345		
	+ Taxes on income of wealth	$D5_{R,S13}$	74927		
	− Social assistance benefits in cash	$D623_{R,S14}$	13441	*Neutral: Follow the distribution of total of what precedes*	
	− Individual consumption (gov)	$P31_{U,S13}$	71820		
	− Individual consumption (non-profit)	$P31_{U,S15}$	5049		
	− Collective consumption expenditure	$P32_{U,S13}$	38393		
= DINA 4 - Post-tax national income			393620		

Notes.

*Following codes into brackets refer no longer to ESA2010 terminology but no NA concepts available in the "Government spending by functions and transactions" table on NBB.stat

C Decomposition by income source

Here we show an additional table with, only for DINA1, the shares, the Gini's of the income sources and the contribution to inequality.

Table C.15: Income shares, Gini's and contributions to inequality by income source

	share of income source in total income				Gini of income source				Contribution income source to Gini			
year	(1) labour inc.	(2) fin. cap.	(3) oth. cap.	(4) mixed inc.	(1) labour inc.	(2) fin. cap.	(3) oth. cap.	(4) mixed inc.	(1) labour inc.	(2) fin. cap.	(3) oth. cap.	(4) mixed inc.
1995	0.618	0.266	0.022	0.094	0.581	0.901	0.684	0.955	0.522	0.365	0.009	0.105
1996	0.628	0.253	0.023	0.096	0.583	0.885	0.686	0.944	0.536	0.349	0.009	0.106
1997	0.630	0.250	0.023	0.097	0.575	0.892	0.680	0.947	0.533	0.347	0.008	0.112
1998	0.632	0.250	0.021	0.096	0.577	0.885	0.669	0.964	0.540	0.338	0.006	0.117
1999	0.648	0.232	0.022	0.097	0.576	0.886	0.664	0.973	0.559	0.309	0.007	0.125
2000	0.641	0.246	0.018	0.095	0.571	0.897	0.649	0.964	0.543	0.337	0.004	0.116
2001	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2002	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2003	0.680	0.210	0.021	0.089	0.575	0.773	0.630	0.948	0.650	0.241	0.003	0.107
2004	0.671	0.222	0.019	0.088	0.598	0.817	0.707	0.946	0.635	0.268	0.003	0.094
2005	0.668	0.224	0.020	0.087	0.578	0.851	0.657	0.936	0.617	0.295	0.002	0.085
2006	0.670	0.225	0.017	0.088	0.575	0.782	0.668	0.937	0.635	0.269	0.002	0.094
2007	0.667	0.236	0.011	0.086	0.569	0.771	0.652	0.946	0.630	0.275	0.001	0.093
2008	0.684	0.226	0.006	0.085	0.565	0.782	0.638	0.937	0.648	0.267	0.000	0.085
2009	0.711	0.193	0.009	0.086	0.569	0.747	0.684	0.938	0.690	0.218	0.000	0.092
2010	0.697	0.206	0.011	0.086	0.569	0.740	0.655	0.949	0.675	0.228	0.001	0.097
2011	0.718	0.181	0.015	0.085	0.572	0.771	0.666	0.945	0.694	0.211	0.001	0.094
2012	0.708	0.189	0.019	0.084	0.565	0.787	0.667	0.938	0.675	0.234	0.003	0.088
2013	0.709	0.185	0.022	0.084	0.573	0.806	0.650	0.936	0.677	0.233	0.004	0.087
2014	0.699	0.195	0.021	0.085	0.580	0.829	0.634	0.935	0.657	0.253	0.004	0.087
2015	0.686	0.204	0.023	0.086	0.584	0.868	0.622	0.932	0.634	0.278	0.003	0.085
2016	0.684	0.206	0.024	0.086	0.586	0.881	0.625	0.930	0.625	0.287	0.004	0.084
2017	0.688	0.201	0.025	0.086	0.571	0.863	0.620	0.931	0.634	0.278	0.005	0.084
2018	0.691	0.199	0.025	0.086	0.580	0.886	0.589	0.922	0.638	0.281	0.003	0.077
2019	0.687	0.205	0.024	0.085	0.578	0.898	0.595	0.920	0.626	0.295	0.003	0.076

Note: Own calculations based on the DINA-series.

D Coverage rates 1995-2019

In Table D.17 we show coverage rates, defined as the survey total divided by the corresponding total in the National Accounts, for some important income components.

TABLE D.17: COVERAGE RATES (SURVEY/NATIONAL ACCOUNT) 1995-2019

year year	wages and salaries	employer SSC's	net mixed income	net imput. and real rents	intrests paid by hh's	intrest and divid. income	NNI coverage	NNI gap in bn€
1995	0.99	0.71	0.97	2.07	0.18	0.27	0.75	44.8
1996	1.01	0.72	0.92	2.16	0.21	0.21	0.75	46.3
1997	1.01	0.70	0.81	2.14	0.23	0.27	0.73	51.4
1998	1.03	0.71	1.21	2.06	0.19	0.25	0.78	44.6
1999	1.00	0.70	1.61	2.09	0.25	0.29	0.80	40.8
2000	1.01	0.73	1.27	2.01	0.19	0.28	0.77	50.2
2001	n.a.	n.a	n.a	n.a	n.a	n.a	n.a	n.a
2002	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
2003	1.01	0.79	0.39	1.30	1.27	0.13	0.67	79.4
2004	0.99	0.80	0.68	1.59	1.67	0.14	0.67	81.8
2005	1.00	0.81	0.57	1.33	1.20	0.36	0.68	82.8
2006	0.97	0.77	0.46	1.33	0.93	0.21	0.64	96.6
2007	0.96	0.74	0.68	1.32	0.64	0.15	0.64	102.5
2008	0.97	0.77	0.55	1.48	0.63	0.13	0.66	100.8
2009	0.98	0.77	0.53	1.52	1.00	0.18	0.68	91.7
2010	0.99	0.78	0.55	1.60	1.13	0.17	0.67	97.9
2011	0.99	0.80	0.46	1.44	1.21	0.10	0.68	98.2
2012	1.01	0.82	0.46	1.46	1.82	0.16	0.68	101.0
2013	1.01	0.81	0.46	1.51	2.20	0.15	0.68	102.8
2014	0.99	0.80	0.49	1.65	2.20	0.17	0.67	109.1
2015	0.99	0.78	0.48	1.55	2.40	0.16	0.66	117.4
2016	0.98	0.74	0.55	1.65	2.99	0.16	0.65	124.6
2017	0.99	0.75	0.61	1.71	2.29	0.11	0.66	125.1
2018	1.01	0.74	0.67	1.60	2.41	0.09	0.67	124.9
2019	1.01	0.75	0.61	1.62	2.52	0.15	0.67	131.3

Note: Own calculations based on download of the National Accounts from Nbb.Stat on Febr 28th 2023. Survey info from ECHP for 1995-2000 and from SILC for 2003-2019. 'Wages and salaries' include social security contributions of the employee. 'Mixed income' and 'imputed and real rents' are net of depreciation. In the surveys, we have no information on depreciation. We applied the depreciation rate of the NA's for $B.3g_{S14}$ and $B.2g_{S14}$ on the survey info (see footnote c in Table 3 how we determined depreciation for these two income elements in the NA's).

E Adjustments to the microdata

The ECHP and SILC microdata are used to distribute the national account aggregates. We implemented three important adjustments to these surveys where necessary distributional information was missing. First, since ECHP only include income sources net of taxes and social contributes, we estimated gross incomes for the period 1995-2000. Second, we included imputed rents for owner-occupied houses. This variable is only included in the SILC from 2006 onwards but is missing in the years before and in ECHP. Third, we adjust the reported interests paid by household.

E.1 Estimate of gross incomes in ECHP

No gross incomes are available in the ECHP microdata. The survey only contains 'net' household income and its different components (net employment income, net pension benefits, net self-employment income ...). The adjective 'net' refers to an income concept after employee social contributions and personal income taxes have been subtracted. We assume that respondents implictly use the withholding tax as a proxy for the income tax they have to pay. To convert these net components to gross components, we developed a 'net-to-gross' trajectory for five different income components.

For **employee incomes**, we estimated gross incomes based on a net-to-gross trajectory which was available in the socio-economic panel (SEP). The SEP data contain net incomes and their gross counterparts had been simulated using the microsimulation model MISIM. The net-to-gross trajectory for ECHP then consists of four steps:

1. First, withholding taxes are estimated on the SEP data (1997) using an OLS regression with the logarithm of gross employment income as dependent variable and the logarithm of net employment income as independent variable, together with other categorical variables as the family composition or a dummy for having a partner (with positive income).

2. Second, the estimated coefficients of this regression are used to predict withholding taxes in ECHP.

3. Third, social insurance contributions are calculated based on the sum of net employment income and the estimated withholding taxes.

4. Fourth, gross employment income is constructed by adding withholding taxes and social insurance contributions to net employment income.

The net-to-gross conversion for **pensions**, **self-employment incomes**, **sickness and disability benefits** and **unemployment benefits** are done similarly as for the employment incomes. For the **sickness and disability benefits** the withholding tax rates depend on the

type of the benefit. We therefore randomly assign the sickness and disability benefits to one of the following types (based on the SEP data): (1) sickness- and invalidity benefits (72,15%), (2) occupational accidents (9,56%), (3) occupational disease compensation (7,32%) and (4) disability allowances (10,96%). For **unemployment benefits**, the third step is not applied since no social contributions are levied on unemployment benefits.

E.2 Imputed rents correction

We distribute the net operating surplus (B.2n) of the household sector as recorded in the National Accounts on the basis of actual and imputed rents received by home-owners in the microdata. As of 2006, the Belgian Statistical office Statbel estimates imputed rents for SILC based on characteristics of the household and their dwelling available in the microdata, but they are missing in the microdata for the earlier SILC periods (2003-2005) and for ECHP (1995-2000).

We therefore predict imputed rents for home-owners using a hedonic regression approach as described by (Frick et al., 2010) and similar to the method used by Statbel to estimate imputed rents in SILC from 2006 onwards. We run a regression model with actual rents paid by tenants in private, non-subsidized markets as dependent variable and characteristics of the household and the dwelling as explanatory variables. We use the estimated coefficients of this regression to predict the imputed rents for home-owners. To account for possible selection bias between the groups of tenants and owners, we apply a Heckman selection correction as described by (Hulliger and Wiegand, 2012) by first estimating a probit regression to estimate the probability of being a tenant, and then incorporating the Mills-ratio in the linear regression model which explains the rents of tenants.

Table E.19: Description of explanatory variables to explain rent paid by tenants in ECHP (1995-2000)

Variable	Description	Code in ECHP data
Adults	Number of 16+ persons in household	Hd002
Age	Age of the reference person in household	Pd003
Married	Dummy – reference person is married	Pd005
Dispincome	Disposable household income (in euros)	Hi100
Apartment	Dummy – living in apartment or not	Ha005
Garden	Dummy – place to sit outside	Ha013
Rooms	Number of rooms (1-10+)	Ha007
Bath_shower	Dummy - Bath or shower available	Ha009
Heating	Dummy - heating available	Ha012
FL	Dummy – region Flanders	Hg015
WAL	Dummy – region Wallonia	Hg015
crime	Dummy – crime or vandalism in the area	Ha022

Table E.19 shows the explanatory variables used to explain rents paid by tenants in the ECHP microdata (1995-2000). The variables can be split into two groups: characteristics of persons living in the building (e.g. number of adults in the household) and dwelling related variables (e.g. number of rooms in the building). Similar to (Hulliger and Wiegand, 2012), we use both groups of variables for the probit model and only the variables directly related to the dwelling for the linear model. The model is estimated on the pooled ECHP waves (1995-2000) with reported rents of tenants scaled to one reference year using the rental index ('huurindex'). Table E.20 shows the estimated coefficients.

Table E.20: Heckman regression model (probit and linear model), ECHP (1995-2000)

	Probit Model	Linear Model
adults	-0.247***	
	(-0.0245)	
age	-0.0214***	
	(-0.0009)	
married	-0.128***	
	(-0.0344)	
dispincome	-0.00428***	
	(-0.0011)	
apartment	0.987***	34.43***
	(-0.0417)	(-8.846)
garden	-0.545***	21.61**
	(-0.0473)	(-7.253)
rooms	-0.179***	28.92***
	(-0.0114)	(-2.519)
bath_shower	-0.0475	84.54***
	(-0.0864)	(-13.16)
heating	-0.481***	101.7***
	(-0.0378)	(-6.841)
FL	-0.168***	-80.44***
	(-0.0493)	(-7.587)
WAL	0.109*	-59.69***
	(-0.0492)	(-7.566)
crime	-0.0347	-19.50**
	(-0.0387)	(-6.494)
_cons	2.503***	75.14***
	(-0.126)	(-15.87)
/mills lambda		16.9
		(-9.96)
N	11622	11622

A similar model is estimated on SILC-data for 2003-2005 and used to predict imputed rents

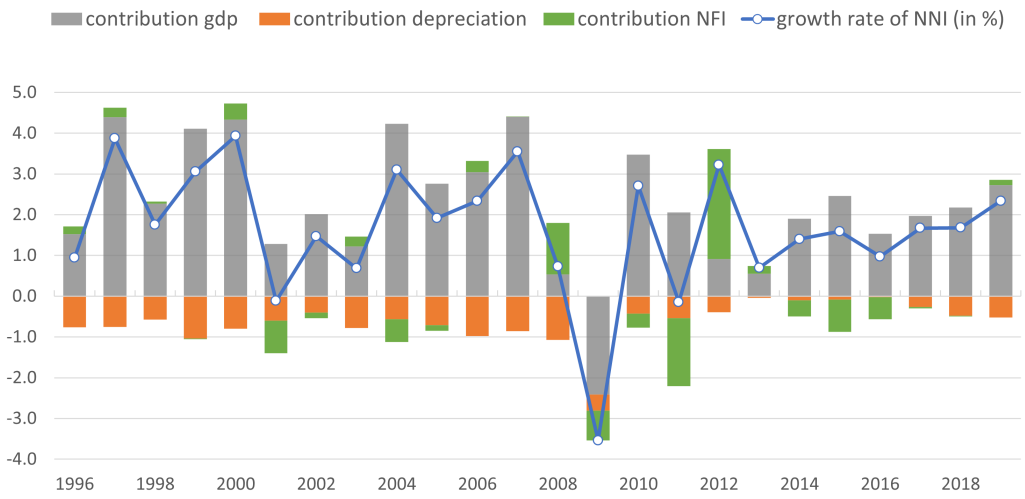
for these SILC-years.

E.3 Paid interests correction

The SILC-variable HY100G includes interests repayments on mortgage. It occurs that this variable takes very high (and unrealstic values). We therefore impose the mild condition that the level of interests repayments on mortgage cannot exceed the imputed rents of the house.

F Additional results

Figure F.19: Decomposition of growth of NNI into growth of GDP, depreciation and net foreign income between 1996 and 2019



Notes: all variables in real terms by deflating with GDP-deflator