Towards a System of Distributional National Accounts: Methods and Global Inequality Estimates from WID.world

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Abstract – This paper briefly presents the methodology of Distributional National Accounts (DINA), which distributes total national income and total wealth among all individual residents. With DINA, we can estimate inequality statistics and growth by income and wealth groups that are consistent with aggregate growth from National Accounts. This methodology has been recently applied to a number of countries, and the data produced are available from WID.world. The paper summarizes the initial empirical findings. We observe rising top income and wealth shares in nearly all countries in recent decades, but the magnitude of the increase varies substantially, thereby suggesting that different country-specific institutions and policies matter. We combine countries' statistics to estimate global inequality since 1980. Global inequality has increased since 1980 in spite of the catching up of large emerging countries like China and India. This has been driven by the income growth of top world earners.

JEL Classification: D31, D33
Keywords: inequality, distribution, income, wealth, national accounts

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Rising inequality has attracted considerable interest among academics, policy-makers and the general public in recent years. Yet we still face important limitations in our ability to measure the changing distribution of income and wealth, both within and between countries, and at the world level. In this paper, we discuss novel methods to develop a System of Distributional National Accounts, DINA (Alvaredo *et al*., 2016) and present new findings about global inequality dynamics that follow this general framework.

The development of economic statistics is a historical lengthy process that involves economic theory, the limits of available data, the construction of a body of conventions, and the agreement of the community of scholars. Macroeconomic aggregates (GDP, national income) from the System of National Accounts (SNA) are the most widely used measures of economic activity. In the beginning, national accountants were also experts in distributional issues, as the inter-linkages between the estimation of national income and its distribution were clearly recognised. However, the focus of the SNA has so far always been on the main sectors in the economy, only distinguishing results for the household sector as a whole, and not providing insights into disparities within the household sector. Partly as a result of these developments, the discrepancies between levels and growth rates displayed in national accounts and the ones displayed in micro statistics and underlying distributional data have been growing in all dimensions: income, consumption, wealth. Scholars have been aware of the discrepancies, and have provided a list of general reasons behind them, but systematic and coordinated action to put them in a consistent framework has just started.[1]

One reason why this work has only begun recently is clear: it is not a simple task. A renovated approach to the measurement of economic inequality should rebuild the bridges between distributional data available from micro sources and national accounts. This is the main goal of the World Inequality Database project (WID.world) pursued through DINA: to provide annual estimates of the distribution of income and wealth using concepts that are consistent with the macroeconomic national accounts. In this way, the analysis of growth and inequality can be carried over in a coherent framework.

The article is structured as follows. In section 1, we start by discussing the current limitations when measuring and understanding inequality, and by describing the reasons for the development of a System of Distributional National Accounts. In section 2, we summarize the concepts and methods used (and proposed) for the estimation of DINA series. In sections 3 through 5, we present selected findings on income inequality, private *vs.* public wealth to income ratios, and wealth inequality. In section 6, we discuss new estimates of global inequality (also presented in Alvaredo *et al*., 2018). To conclude, we identify pathways for further progress.

1. Towards a System of Distributional National Accounts

Renewed interest in the long-run evolution of the distribution of income and wealth has given rise to a flourishing literature over the past 20 years. By combining historical tax and national accounts data, a series of studies has constructed time-series of the top income share for a large number of countries (see Piketty 2001, 2003 for France, Piketty & Saez, 2003 for the United States, and the two multi-country volumes on top incomes edited by Atkinson & Piketty 2007, 2010; see also Atkinson *et al.*, 2011 and Alvaredo *et al.*, 2013 for surveys of this literature). To a large extent, this literature has followed the pioneering works and methods of Kuznets (1953) and Atkinson & Harrison (1978), extending it to more countries and years. As these projects generated a large volume of data, intended as a research resource for further analysis as well as a source to inform the public debate on inequality, the data have subsequently been made public through the World Top Incomes Database, WTID (Alvaredo *et al.*, 2011-2015), and now the World Inequality Database (WID.world) (see Box for a brief history of the WID.world project).

The progress made in the last two decades meant an enormous step forward in the field of applied inequality studies. However, despite the latest developments and endeavours, we still face important limitations when measuring, analysing, and understanding economic inequality. Addressing the following concerns is at the core of the DINA project. First and most important, there is a large gap between national accounts (NA) – which focus on macro totals and growth – and inequality studies – which focus on distributions using survey and tax data.

1. *Social accounts matrices are a related precedent.*

Box – **History of the WID.world project**

By combining historical tax and national accounts data, a series of studies has constructed time-series of the top income share for a large number of countries (see Piketty 2001, 2003 for France, Piketty & Saez, 2003 for the United States, and the two multi-country volumes on top incomes edited by Atkinson & Piketty, 2007, 2010. See also Atkinson, Piketty & Saez, 2011 and Alvaredo *et al.*, 2013 for surveys of this literature). These projects generated a large volume of data, intended as a research resource for further analysis, as well as a source to inform the public debate on income inequality. To a large extent, this literature has followed the pioneering work and methodologies of Kuznets (1953) and Atkinson & Harrison (1978) on the long-run distribution of income and wealth, extending it to many more countries and years.

The World Top Incomes Database-WTID (Alvaredo *et al.*, 2011-2015) was created in January 2011 to provide convenient and free access to all the existing time series generated by this stream of work. Thanks to the contributions of over a hundred researchers in a clear synergetic framework, the WTID expanded to include time-series on income concentration for more than 40 countries, spanning most of the 20th, the early 21st centuries and, in some cases, going back to the 19th century. The key innovation of this research was to exploit tax and national accounts data in a systematic manner. This permitted the estimation of longer and more reliable time-series on the top income shares than previous inequality databases (which generally rely on self-reported survey data, with usually large under-coverage and under-reporting problems at the top, and limited time span).

These new series had a large impact on the discussion of global inequality. In particular, by making it possible to compare the shares captured by top income groups (e.g. the top 1%) over long periods of time and across countries, they contributed to reveal new facts, and refocus the discussion on rising inequality. Although the top income share series have contributed to improve our understanding of inequality trends, they suffer from important limitations (Atkinson *et al.*, 2011). In particular, they cover only the top part of the distribution; they are based only on fiscal income, which can diverge from national income because of tax exempt income, tax avoidance and evasion; finally, they focus on pre-tax income inequality and are therefore silent on redistributive effects of public policies between and across countries.

In December 2015, the WTID was subsumed into the WID.world, the World Wealth and Income Database (relabelled the World Inequality Database in March 2017). In addition to the WTID top income shares series, the first version of WID.world included an updated historical database on the long-run evolution of aggregate wealth-income ratios and on the changing structure of national wealth and national income first developed in Piketty & Zucman, 2014 (see also Piketty, 2014 for a historical interpretation on the basis of this material, and of the top income shares time-series). The name of the database changed from WTID to WID.world in order to reflect the extension in scope of the database, and the new emphasis on both wealth and income. In January 2017, a new website was launched (www.wid.world), with better data visualisation tools and more extensive data coverage. The World Inequality Lab was also created then, with the mission of maintaining and expanding WID.world, coordinating the statistical operations of the network (now with over 120 researchers around the world, in universities, research centres, official statistics offices, and tax offices) and publishing the World Inequality Report-WIR every two years (the first volume WIR2018 (Alvaredo *et al.*, 2018) was released in December 2017).

The discrepancies can be seen both in the level of income, wealth, and consumption, as well as in the observed growth rates of the economic aggregates (see, for example: Bourguignon, 2015; Deaton, 2005; Nolan *et al.*, 2018; Ravallion, 2003); they can attain particularly high levels in developing countries. National income is larger and has been growing faster than the other income concepts traditionally used to study inequality. Such gaps make it hard to assess how macroeconomic growth is distributed across income groups, and to address questions such as: what fraction of economic growth accrues to the bottom 10%, the bottom 50%, the middle 40%, and the top 10% of the distribution? How much of the rise in income inequality owes to changes in the share of labour and capital in national income, and how much to changes in the dispersion of labour earnings, capital ownership, and returns to capital?

Second, a substantial fraction of national income (e.g. about a third in the USA and half in several European countries) is redistributed through taxes, transfers, and public spending on services such as education, police, and defense. Yet we do not have a comprehensive measure of how the distribution of pre-tax income differs from the distribution of post-tax income, making it hard to assess how government redistribution affects inequality.

Third, existing inequality statistics use the tax unit (when they mostly rely on tax data) or the household (when they are based on surveys) as the unit of observation. As a result, we do not have a clear view of how long-run trends in income concentration are shaped by the major changes in women's labour force participation – and, in general, gender inequality – that have occurred over the past century.

Fourth, it is not an easy task to predict whether the observed trend of rising concentration of wealth will continue. In the long run, steady-state wealth inequality depends on the inequality of saving rates across income and wealth groups, the inequality of labor incomes and rates of returns to wealth, and the progressivity of income and wealth taxes. How have these factors affected the process of wealth accumulation in the past, and what can they tell about potential future dynamics? Numerical simulations show that the response of steady-state wealth inequality to relatively small changes in these structural parameters can be rather large (Saez & Zucman, 2016; Garbinti *et al.*, 2016). In our view, this instability reinforces the need for increased data quality to allow the dynamics of income and wealth to be properly studied and understood.

Fifth, the move from national states considerations to the study of inequality at the regional and global level requires an acceptable level of homogeneity of statistics across countries. Distributional information published by national statistical offices cannot be aggregated in a simple way. These limitations also apply to provinces within a country.[2]

A renovated approach to the measurement of economic inequality consistent with NA should overcome the limits of the existing series, and re-build the bridges between distributional data available from micro sources and national accounts aggregates more systematically than done in the past. This is our main and overall objective: to produce a System of Distributional National Accounts – which includes the theoretical principles as well as the statistics for all countries in the world –, and to use the newly created series to make progress in the understanding of the inequality phenomena. We propose to combine national accounts, tax, and survey data to build DINA, that is, series on the distribution of total national income and national wealth for the longest possible period and, ideally, for all the countries in the world. The series should be homogeneous across countries and along time as in the internationally agreed SNA. In this way, the analysis of growth and inequality can be carried over in a coherent framework.

The DINA project involves extending the past developments into three main directions. First, the project aims to cover developing countries and not only developed countries (which were the majority in WTID); in recent years, tax information has been released in a number of emerging economies, including China, Brazil, India, Mexico, and South Africa. Second, WID.world intends to provide more and updated series on wealth-income ratios and the distribution of wealth, and not only on income. Third, we aim to cover the entire distribution of income and wealth, and not only of top groups (as was the case in the WTID). The overall long-run objective is to produce a set of Distributional National Accounts, which are the main focus of this paper.

A main methodological contribution is the production of synthetic micro-files: individual level data that are not necessarily the result of direct observation but rather estimations that reproduce the observed distribution of the underlying data. They include – whenever possible – the joint distribution of age, gender, marital status, numbers of dependent children, and provide information on income and wealth. This synthetic micro-files of pre-tax and post-tax income (and wealth) consistent with macro aggregates, ideally contain all the variables of the national accounts as well as synthetic adult individual observations that are obtained by statistically matching tax and survey data, and by making explicit the assumptions about the distribution of income (and wealth) categories for which there is no directly available source of information, and which are being imputed.[3] By construction, the totals in these micro-files add up to the national accounts totals, while the distributions are consistent with those in the underlying distributional information (tax data, surveys, etc.). The synthetic micro-files can be used to compute a wide array of distributional statistics (labour and capital income earned, taxes paid, transfers received, wealth owned, etc.). The long-run aim is to release income and wealth synthetic DINA micro-files for all countries on an annual basis. Such data could play a critical role in the public debate, and be used as a resource for further analysis by various actors in civil society and in the academic, business and political communities.

It is worth stressing that the WID.world and DINA have both a macro and a micro dimension. Homogenous time-series should cover both the macro-level structure of national income and wealth, as well as the micro-level distribution.

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2. Even in Europe, comparing national inequality trends and analyzing the dynamics of regional inequalities is far from straightforward; see Blanchet et al. *(2019), who discuss some of the difficulties arising in the production of DINA for thirty-eight European countries.*

3. Naturally, the assumptions will be, in many cases, specific to the countries and years under study, and dependent on the institutional arrangements as well as on the data available. See Piketty et al. *(2018) and Garbinti* et al. *(2018) for synthetic files for the USA and France respectively.*

By doing so, we hope to contribute to the reconciliation of inequality measurement and national accounting, i.e. the micro-level measurement of economic and social welfare and the macro-level measurement. In some cases, this may require revising central aspects of key national accounts concepts. By combining the macro and micro dimensions of economic measurement, we are following a very long tradition. In particular, it is worth recalling that Simon Kuznets was both one of the founders of US national accounts (and author of the first national income series), and also one of the first scholars to combine national income series and income tax data to estimate the evolution of the share of total income going to top fractiles in the USA over 1913-1948 (Kuznets, 1953).[4] This line of research continued with Atkinson & Harrison (1978), who combined historical inheritance tax data with capital income data to study the long-run evolution of the distribution of wealth in Britain over 1922-1972. We are simply pushing this effort further by trying to cover more countries and years.

Such an ambitious long-term objective – annual distributional national accounts for both income and wealth and for all countries in the world – will require a broad international and institutional partnership. The initial set of methodological principles and recommendations are being set by on-going work in the first version of the DINA Guidelines (Alvaredo *et al*., 2016). There are still many methodological decisions to be made and agreed upon. It took four decades from the 1910s to the 1950s before scholars (Kuznets, Kendrick, Dugé, Stone, Meade, Frankel) could hand over the estimation of national income to official statistics bodies. It also took a long time (from the 1950s to the 2000s) before official national accounts were able to include standardised wealth accounts. In fact, the first consistent guidelines for balance sheets – covering stocks of assets and liabilities – appear in the SNA manuals of 1995 and 2008 (in some key countries, such as Germany, the first official stock accounts were released only in 2010). Along the same lines, the development of a system of DINA could to take some time before consensus among scholars and the statistical community is reached.

We should stress at the outset that our methods and time-series are imperfect, fragile and subject to revision. The WID.world DINA project attempts to combine the different data sources that are available (in particular tax data, survey data, and national accounts) in a systematic way. We also try to provide a very detailed and explicit description of our methodology and sources, so that other users can contribute to improving them. But our time-series and methods should be viewed in the perspective of a long, cumulative, collective process of data construction and diffusion, rather than as a finished product.

2. Distributional National Accounts: Concepts and Methods

The concepts and methods used in the WTID series were initially presented in the two collective volumes edited by Atkinson & Piketty (2007, 2010), and in the corresponding country chapters and research articles. Despite our best efforts, the units of observation, the income concepts and the Pareto interpolation techniques were never made homogenous over time and across countries. Moreover, for the most part attention was restricted to the top income decile, rather than the entire distribution of income and wealth. In contrast, the DINA time-series aim to be homogenous across these dimensions (or at least to make much more explicit the remaining heterogeneity) and, most importantly, to provide more detailed and comprehensive measures of inequality. In the DINA series, inequality is always measured using homogenous observation units, and taxable income reported on fiscal returns is systematically corrected and upgraded in order to match national accounts totals separately for each income category (wages, business income, etc.) using various sources, imputation methods and techniques to align the micro and macro data. WID.world aims to provide series on wealth (and not only on income) and on the entire distribution (and not only on top shares).

The two main data sources used in the DINA continue to be income tax data and national accounts (just like in the WTID series), but we use these two core data sources in a more systematic and consistent manner, with harmonized definitions and methods, and together with other sources such as household income and wealth surveys, inheritance data, estate and wealth tax data, as well as the wealth rankings in "rich lists" compiled by the press. In most cases, the general trends in inequality depicted in the WTID series will not be very different in DINA series.[5]

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4. Kuznets (1953) was preceded by ten years by Frankel & Herzfeld (1943), who made estimates of the European income distribution in South Africa based on the income tax returns, making use of control totals from the census of population and from the national accounts.

5. Results of these comparisons are available for France (Garbinti et al.*, 2018) and the United States (Piketty* et al.*, 2018).*

The following elements are key in the construction of DINA:

- The unit of observation (adult individual with equal split of income among married couple, adult individual with own individual income).

- The income concepts (pre-tax national income, pre-tax factor income, post-tax disposable income, post-tax national income, and fiscal income) and the wealth concepts (personal wealth, private wealth, public wealth, and national wealth).

- The methods employed to reconcile income tax returns and household survey micro files with NA, as well as with wealth inequality sources.

- The methods employed to produce synthetic micro files.

- The methods that can be used in the case of countries and time periods with more limited data sources.

In this section, we briefly refer to the units of observation, the income and wealth concepts, and the case of countries and years with limited data.[6]

2.1. The Unit of Observation

One of the limitations of the WTID series was the lack of homogeneity in the micro-level observation unit. WTID series were constructed by using the 'tax unit' (as defined by the tax law of the country at any given point in time) as the observation unit. In joint-taxation countries like France or the United States, the tax unit has always been defined as the married couple or the single adult. This is problematic, since variations in the share of single people in the population, or in the extent of assortative mating in couples could potentially bias the evolution of income inequality in various and contradictory ways. In other countries, the tax system switched to individual taxation in the last decades (e.g., in 1990 in the United Kingdom), which creates other discontinuities in the WTID series (see Atkinson, 2005, 2007).

In order to correct for these biases, the DINA series try to use homogenous observation units. Generally speaking, the benchmark unit is the adult individual. Whenever possible, we also aim to estimate distributions that can be decomposed by age, gender and number of dependent children. One key question is how to split income and wealth between adults who belong to a couple (married or not) and/or to the same household. To the extent possible, we want to produce two sets of inequality series: equal-split-adults series and individualistic-adults series. In the equal-split series, we split income and wealth equally between adults who belong to the same couple. In the individualistic series, we attribute income and wealth to each individual income recipient and wealth owner (to the extent possible). Both series are equally valuable. They offer two complementary views on different dimensions of inequality. The equal-split perspective assumes that couples redistribute income and wealth equally between their members. This is arguably a very optimistic: bargaining power can be typically very unequal within couples. But the opposite perspective (zero sharing of resources) is not realistic either, and tends to underestimate the resources available to non-working spouses (and therefore to overestimate inequality in societies with low female participation in the labor market).

Regarding the equal-split series, an important question is whether we should split income and wealth within the couple (narrow equal-split) or within the household (broad equal-split). In countries with significant multi-generational cohabitation (e.g. grandparents living with their adult children), this can make a significant difference. In countries where nuclear families are prevalent, this makes relatively little difference.

Finally, when we look at the inequality of post-tax disposable income, we also introduce dependent children into the analysis, in order to be able to compute the child related cash and in-kind transfers to the parents.

The issues are more complicated for capital income flows. In joint-taxation countries, capital income is usually not reported separately for both spouses, and we generally do not have enough information about the marriage contract or property arrangements to split capital income and assets. So we simply assume in our benchmark series that each spouse owns 50% of the wealth of a married couple and receives 50% of the corresponding capital income flow. If and when adequate data sources become available, we might be able to offer a more sophisticated treatment of this important issue.

6. We invite the interested reader to consult the DINA Guidelines for the complete documentation, and a thorough (though on-going) investigation of details, problems, limitations and challenges.

2.2. The Income and Wealth Concepts

2.2.1. Income Concepts

Other major limitation of the WTID time-series was the lack of homogeneity of the income concept and its dependence on the tax laws of each country. In contrast, the concepts used in DINA series are defined in the same manner in all countries and time periods, and aim to be independent from the tax legislation. We use four basic pre- and post- tax income concepts to measure inequality: *i)* pre-tax national income; *ii)* pre-tax factor income; *iii)* post-tax disposable income; and *iv)* post-tax national income.[7] All of them are anchored on the notion of national income: GDP minus capital depreciation plus net income received from abroad, defined by using the same concepts as those proposed in the latest international guidelines on national accounts, as set forth by the 2008 UN SNA. However, in attributing income to the household sector we apply a broader definition, as we also distribute the income of the other sectors in the economy (i.e. corporations, general government and non-profit institutions), rather than focusing on the household sector as defined in SNA.

Despite the usual focus on GDP, national income is a more meaningful concept for two reasons. First, capital depreciation is not economic income: it does not allow one to consume or accumulate wealth. Allocating depreciation to individuals would artificially inflate the economic income of capital owners. Second, including foreign income is important, because foreign dividends and interest are sizable for top earners.

Importantly, we include corporate retained earnings – the fraction of after-tax corporate profits which is not distributed to shareholders – in our measures of income. They can be sizable and vary significantly over time or across countries, so their omission can lead to deficient estimates of the level and trend in income concentration. The key reason for adding undistributed profits (or at least a fraction of them) to personal income is because undistributed profits should be considered as income for the owners of corporations. Undistributed profits are an income flow in the Hicksian sense: they make the owners of corporations wealthier. Depending on the tax system, shareholders may prefer to accumulate profits in corporations rather than to receive dividends (e.g. because this may allow them to realize capital gains by selling shares at a later stage, and by doing so they might pay less taxes than what they would have paid on the corresponding dividends). We only include the fraction of corporate retained earnings that accrue to resident households, i.e., we subtract the retained earnings in domestic firms that are foreign-owned (and, symmetrically, add the retained earnings in foreign firms owned by domestic residents). This adjustment is particularly important for low-tax countries, which tend to have high profits (and in particular high retained earnings) in foreign-owned firms (Tørsløv *et al.*, 2018).

By construction, pre-tax national income and pre-tax factor income are both equal to national income at the aggregate level, but they are not the same at the individual level and in terms of distribution. The central difference is the treatment of pensions, which are counted on a contribution basis in pre-tax factor income, and on a distribution basis in pre-tax national income. We tend to favor the pre-tax national income concept for our benchmark series for pre-tax inequality, but pre-tax factor income inequality also provide complementary information. Both series should be produced. The key reason why we prefer the pre-tax national income inequality series is that it is less affected by the age structure of the population. We aim to define pre-tax national income so as to satisfy the following neutrality condition: in a hypothetical economy with 100% replacement rates for pensioners, the cross-sectional inequality of pre-tax national income should be the same whether it is measured within the entire population (including pensioners) or within the working-age population.

Post-tax disposable income is defined as pre-tax national income, minus all taxes on production, income and wealth, plus social assistance benefits in cash. In order to compute post-tax national income, we add social transfers in kind.

2.2.2. Wealth Concepts

In the same way as for the income concepts, our wealth concepts refer to the NA guidelines, based on which we define personal wealth, private wealth, public wealth, corporate wealth, and national wealth.[8]

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7. We also keep the fiscal income definition associated with the top income share series in Atkinson & Piketty (2007, 2010) and Alvaredo et al. *(2011-2015).*

8. Readers are referred to the DINA Guidelines Appendix, where we provide the formulas linking the DINA income and wealth definitions to the SNA 2008 classification codes.

We should make clear at the outset that our choice of using NA income and wealth concepts for distributional analysis certainly does not mean that we believe that these concepts are perfectly satisfactory or appropriate. Quite the contrary: our view is that NA statistics are insufficient and need to be improved. In particular, one of the central limitations of official GDP accounting is that it does not provide any information about the extent to which the different social groups benefit from GDP growth. The other reason for using NA concepts is simply that they represent the only existing systematic attempt to define notions such as income and wealth in a common way, which (at least in principle) can be applied to all countries independently from specific legislation.

2.2.3. Countries and Years with Limited Income and Wealth Data: Simplified DINA

The construction of DINA series is very demanding in terms of data and other information. Countries do not usually have all the sources required, the limitations being very pronounced in many countries/years. This problem was also at the center of the development of NA: designing the SNA meant accepting that the standards could not be set at the level of the best; their implementation had to be feasible in less well-advanced countries. Methods (labeled here as "Simplified DINA") need to be developed in the case of countries and time periods with more limited sources, typically on the basis of income tax tabulations rather than income tax micro-files, and/or with income tax data covering only a subset of the population, and/or inadequacy of income tax data (e.g. due to exemptions on capital incomes).

Some of the methods that can be applied in such circumstances can be found in recent work on DINA for China (Piketty *et al.*, 2017) and France (a country with detailed tax data but where only income tax tables are available prior to 1970; see Garbinti *et al.*, 2018).[9] Piketty *et al.* (2019) further develop, for the USA, a simplified methodology that starts from the fiscal income top income share series and makes very basic assumptions on how each income component from national income that is not included in fiscal income is distributed.

3. Income Inequality Dynamics: Countries and Regions

The methods proposed in the DINA project have already been applied to several countries: the United States in North America; France in Europe; China, India and Malaysia in Asia; Brazil in South America; Russia; and the Middle East. The new series combine national accounts, survey, and fiscal data in a systematic manner in order to estimate the distribution of pre-tax national income (including tax exempt capital income and undistributed profits).[10]

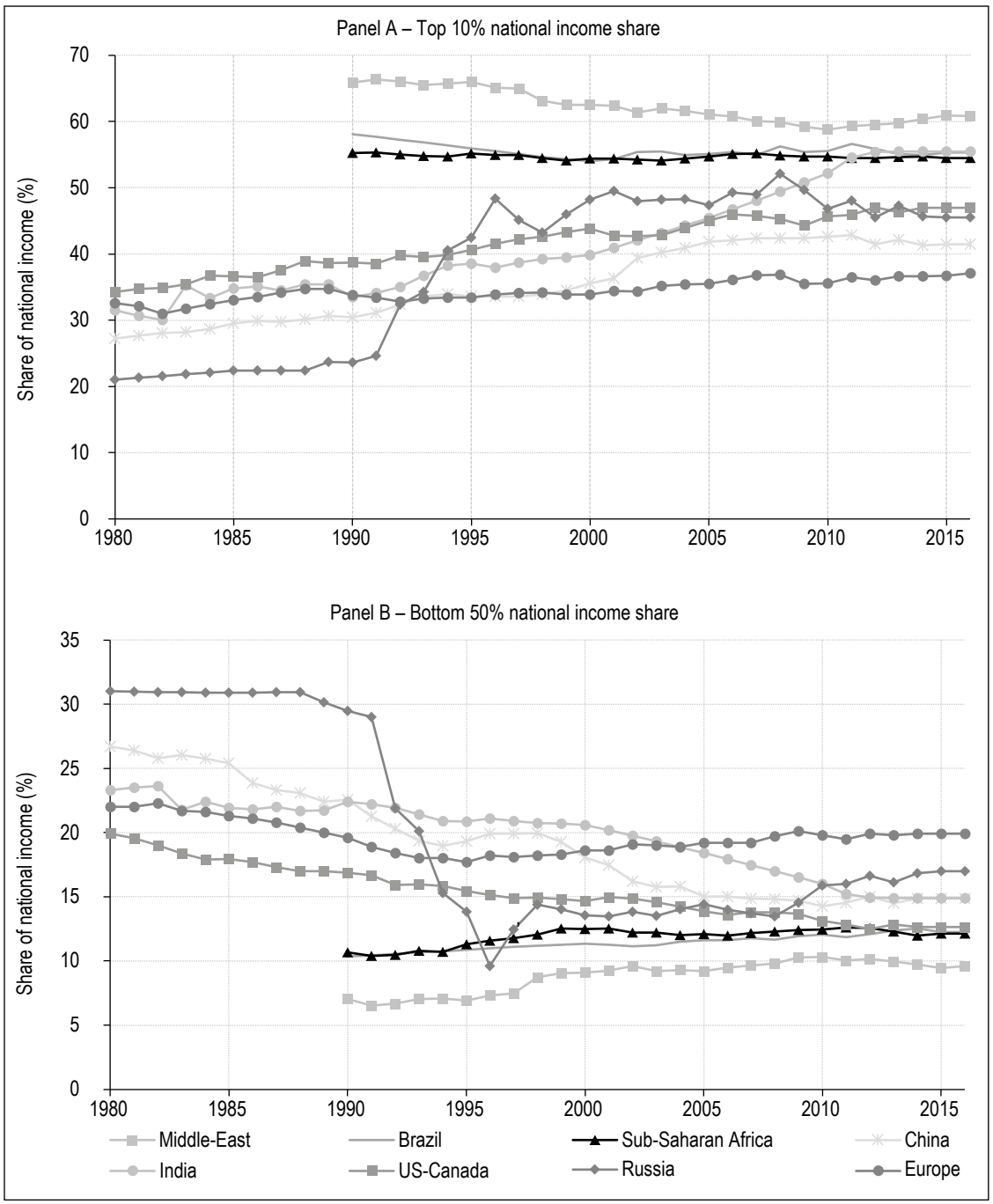
Figure I displays the evolution of inequality in various countries and regions based on the new estimates. As shown in panel A, the top 10% income share has increased almost everywhere since 1980, but with large variations in magnitude. In Europe, the rise was moderate. It was much more marked in North America, India, China, and Russia. By 2016, the top 10% income share stands at about 41% in China, 46% in Russia, 47% in North-America, and 56% in India. The rise in inequality correlates with policy changes in each country: the Reagan revolution in the United States, the transition away from communism in China and Russia, the shift to a deregulated economy in India. Policies and institutions matter: rising inequality cannot be viewed as a mechanical, deterministic consequence of globalization or technological change, as most economic models assume.

There are exceptions to the general pattern of increasing inequality. In the Middle East, Brazil, and sub-Saharan Africa, income inequality has remained relatively stable at extremely high levels since 1990, the first year for which we can construct estimates for these regions. In effect, for various historical reasons and in contrast to the other countries shown in Figure I, these regions, despite local developments, never went through the post-war egalitarian regime and have always been at the world's high-inequality frontier.

As shown in the panel B of Figure I, the share of income accruing to the bottom 50% looks like the mirror image of the top 10% income share. The bottom 50% income share is lowest in places where the top 10% share is highest (Middle East, Brazil, Sub-Sahara Africa) and vice-versa (Europe). The bottom 50% share has also fallen most in countries where the top 10% has increased the most (Russia, China, India,

9. See Blanchet et al. *(2017) and http://WID.world/gpinter for technical details on Pareto curves and the corresponding interpolation techniques.*
10. We refer the reader to the country-specific articles; they can be found in the Library section of WID.world: for the Middle East, see Alvaredo, Assouad & Piketty (2019); for Brazil, Morgan (2017); for India, Chancel & Piketty (2017); for Russia, Novokmet et al. *(2018). For details on the methods to go from country inequality to regional inequality, see Alvaredo* et al., *2018.*

Figure I – **Distribution of income**



Notes: Share of total national income earned by the top 10% and bottom 50% of adults in various countries and regions from 1980 to 2016. Income is before taxes and transfers but after the operation of public and private retirement and unemployment insurance systems. For married couples, income is split equally across spouses.
Sources: WID.world.

and the United States). It has remained stable in places where the top 10% income has also been stable.

The combination of tax and survey data leads to markedly revise upwards the official inequality estimates of China. We find a corrected top 1% income share of around 13% of total income in 2015, *vs.* 6.5% in survey data. We stress that our estimates should likely be viewed as lower bounds, due to tax evasion and other limitations of tax data and national accounts in China. But they are already more realistic and plausible than survey-based estimates, and illustrate the need for more systematic use of administrative records, even in countries where the tax

administration is far less than perfect. Figure I shows that China had very low inequality levels in the late 1970s, but it is now approaching North America. In particular, we observe a collapse of the bottom 50% income share in the US-Canada between 1980 and 2016, from 20% to 12% of total income, while the top 1% income share rose from 11% to 20%. In contrast, and in spite of a similar qualitative trend, the bottom 50% share remains higher than the top 1% share in 2015 in China, and even more so in France.[11]

In light of the massive fall of the bottom 50% pre-tax incomes in US-Canada, our findings also suggest that policy discussions about rising global inequality should focus on how to equalize the distribution of primary assets, including human capital, financial capital, and bargaining power, rather than merely discussing the ex-post redistribution through taxes and transfers. Policies that could raise the bottom 50% pre-tax incomes include improved education and access to skills, which may require major changes in the system of education finance and admission; reforms of labor market institutions, including minimum wage, corporate governance, and workers' bargaining power through unions and representation in the board of directors; and steeply progressive taxation, which can affect pay determination and pre-tax distribution, particularly at the top end (see, for example: Piketty *et al.*, 2014; Piketty, 2014).

The comparison given above illustrates how the *DINA* series can be used to analyze the distribution of growth across income classes. The Table below decomposes income growth within China, Europe, India, Russia, and North America, by income group. Real average national income per adult grew at very different rates in the five regions from 1980 to 2016: an impressive 831% in China and 223% in India, a moderate 40% in Europe, 34% in Russia, and 63% in US-Canada. In all these countries, income growth is systematically higher for upper income groups. In China, the bottom 50% grew 417% while the top 0.001% grew more than 3,750%. The gap between the bottom 50% and the top 0.001% is even more important in India. In Russia, the top of the distribution had extreme growth rates too while bottom 50% incomes fell; this reflects the shift from a regime in which top incomes were constrained by the communist system towards a market economy with few regulations limiting top incomes. In line with Figure I, Europe stands as the region with the lowest growth gap between the bottom 50%, the full population, and the top 0.001%. In China, top groups have enjoyed very high growth, but aggregate growth was also so large that even the bottom 50% average income grew markedly. This is likely to make rising inequality much more acceptable. In contrast, in the US-Canada, there was very little growth left for the bottom 50% (+5%).

4. Private *vs.* Public Wealth-Income Ratios

Next, we present findings on the evolution of aggregate wealth on Figure II. We observe a general rise of the ratio between net private wealth and national income in nearly all countries in recent decades. It is striking to see that this long-run finding was largely unaffected by the 2008 financial crisis. It is also worth stressing the unusually large rise of the ratio

11. These series refer to pre-tax, pre-transfer inequality. Post-tax, post-transfer series (not discussed here) reinforce these conclusions, at least regarding the USA-France comparison; see Bozio et al.*, 2018.*

Table – **Real income growth and inequality, 1980-2015, in %**

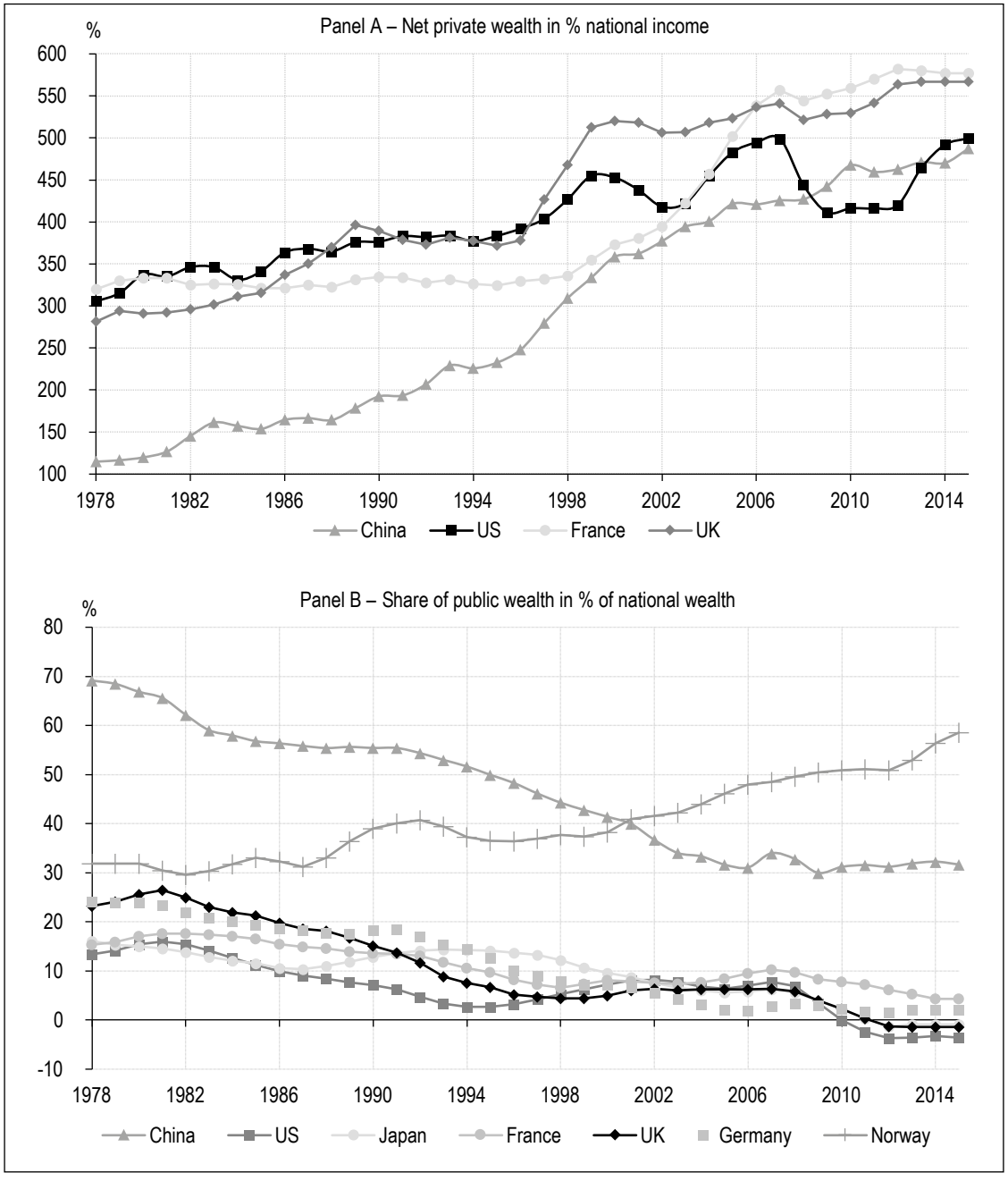
Income group (distribution of per-adult pretax national income)	China	Europe	India	Russia	USA-Canada	World
Full population	831	40	223	34	63	60
Bottom 50%	417	26	107	-26	5	94
Middle 40%	785	34	112	5	44	43
Top 10%	1,316	58	469	190	123	70
including Top 1%	1,920	72	857	686	206	101
including Top 0.1%	2,421	76	1,295	2,562	320	133
including Top 0.01%	3,112	87	2,078	8,239	452	185
including Top 0.001%	3,752	120	3,083	25,269	629	235

Notes: Distribution of pre-tax national income (before taxes and transfers, but including pensions and unemployment insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split-adult series (income of married couples divided by two).
Sources: WID.world.

for China (panel A). According to our estimates, net private wealth was a little above 100% of national income in 1978, while it is above 450% in 2015. The private wealth-income ratio in China is now approaching the levels observed in the USA (500%) and in the UK and France (550-600%).

The structural rise of private wealth-income ratios in recent decades is due to a combination of factors, which can be decomposed into volume factors (high saving rates, which can themselves be due to ageing and/or rising inequality, with differing relative importance across countries, combined with growth slowdown), and relative asset prices and institutional factors, including the increase of real estate prices (which can be due to housing portfolio bias, the gradual lift of rent controls, and the lower technical progress in construction and transportation technologies as compared to other sectors) and stock prices (which can reflect higher power of shareholders

Figure II – **Private *vs.* public wealth-income ratios**



Notes: Net private wealth is personal plus non-profit wealth. Net public wealth is public assets minus public debt.
Sources: WID.world.

leading to the observed rising Tobin's Q ratios between market and book value of corporations).

Another key institutional factor to understand the rise of private wealth-income ratios is the gradual transfer from public wealth to private wealth. This is particularly spectacular in the case of China, where the share of public wealth in national wealth dropped from about 70% in 1978 to 35% by 2015 (panel B). The corresponding rise of private property has important consequences for the levels and dynamics of inequality of income and wealth. In rich countries, net public wealth (public assets minus public debts) has become negative in the USA, Japan and the UK, and is only slightly positive in Germany and France. This arguably limits government ability to redistribute income and mitigate rising inequality. The only exceptions to the general decline in public property are oil-rich countries with large public sovereign funds, such as Norway.

5. Wealth Inequality Dynamics

In this section we present findings on wealth inequality on Figure III. We stress that currently available statistical information on the distribution of wealth and cross-border assets are highly imperfect in today's global economy. More transparency and better access to administrative and banking data sources are sorely needed if we want to gain knowledge of the underlying evolutions. In WID.world, we combine different sources and methods in a very transparent way in order to reach robust conclusions: the income capitalization method (using income tax returns), the estate multiplier method (using inheritance and estate tax returns), wealth surveys, national accounts, rich lists and generalized Pareto curves. Nevertheless, our series should still be viewed as imperfect, provisional, and subject to revision. We provide access to our data files and computer codes so that everybody can use them and contribute to improve the data collection.[12]

We observe a large rise of top wealth shares in the USA and China in recent decades, and a more moderate rise in France and the UK. A combination of factors explains these different dynamics. First, higher income inequality and severe bottom income stagnation can naturally explain higher wealth inequality in the USA. Next, the very unequal process of privatization and access by Chinese households to quoted and unquoted equity probably played an important role in the very fast rise of wealth concentration in China, particularly at the very top end. The potentially large mitigating impact of high real estate prices should also be taken into account. This middle class effect is likely to have been particularly strong in France and the UK, where housing prices have increased significantly relative to stock prices.

Given all these factors, it is not an easy task to predict whether the observed trend of rising concentration of wealth will continue. In the long run, steady-state wealth inequality depends on the inequality of saving rates across income and wealth groups, the inequality of labor incomes and rates of returns to wealth, and the progressivity of income and wealth taxes. Numerical simulations show that the response of steady-state wealth inequality to relatively small changes in these structural parameters can be rather large (see Saez & Zucman, 2016; Garbinti *et al.*, 2016). In our view, this instability reinforces the need of increasing transparency about the dynamics of income and wealth.

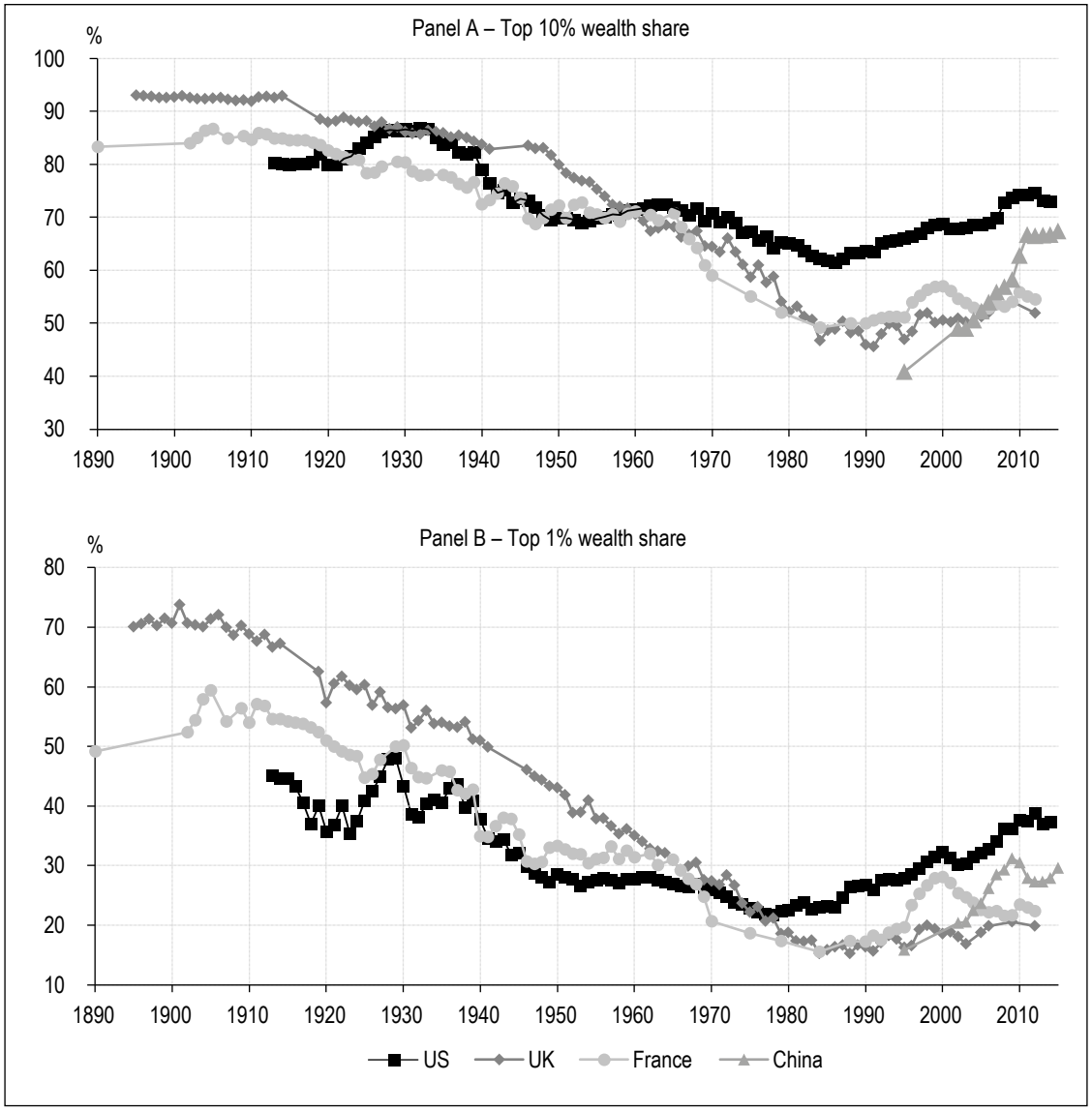
6. Global Income Inequality Dynamics

The dynamics of global inequality has also attracted growing attention in recent years. This, in part, should not be surprising, as it reflects the recognition that the distribution of income and wealth are not only determined at the national state level, but also (and necessarily) at the world level. As we have discussed in previous sections, inequality has been increasing in many countries, but large emerging countries (India, China) are catching up, with the effect of driving global inequality down. Recent studies, based on adjusted household survey data, provide valuable estimates (Lakner & Milanovic, 2015; Anand & Segal, 2008, 2017; Liberati, 2015; Ortiz & Cummins, 2011). Surveys, however, are not uniform across countries; they do not capture high incomes well, and are not consistent with macroeconomic totals. Such limitations remind again of the need of developing DINA series.

Using simple assumptions, we estimate the evolution of incomes in the rest of the world (that is, in the countries and regions not covered yet by the DINA estimates discussed in section 4) so as to distribute 100% of global income. We start with aggregate national income and adult population in all countries and assume that countries with missing inequality information have the same level of inequality as other

12. We refer to the country-specific papers for detailed discussions; see Saez & Zucman, 2016; Alvaredo, Atkinson & Morelli, 2016, 2018; Garbinti et al.*, 2016; Piketty* et al.*, 2017.*

Figure III – **Top 10% and Top 1% wealth share in China, USA, France and UK, 1890-2015**



Notes: Distribution of net personal wealth among adults. Corrected estimates (combining survey, fiscal, wealth and national accounts data). For China, USA and France, equal-split-adult series (wealth of married couples divided by two); for UK, adult series.
Sources: USA: Saez & Zucman (2016); UK: Alvaredo, Atkinson & Morelli (2017, 2018); France: Garbinti *et al.* (2016); China: Piketty *et al.* (2017).

countries in their region. This is obviously an over simplification and our estimates will be refined as better data become available for more countries. Robustness tests and novel results using more detailed distributional information for missing countries suggest that our findings appear to be robust to these simplifications.[13] We stress that this exercise on income aggregation at the world level is possible mainly thanks to the fact that the DINA income concept is homogeneous across countries.

A powerful way to visualize the evolution of global income inequality dynamics is to plot the rate of growth at each percentile following Lakner & Milanovic (2015). We do this in Figure IV. The top percentile of the global income distribution earns over 20% of total global income today, and has captured 27% of total income growth from 1980 to 2016 (these growth rates are obtained once all the individuals of the different regions are pooled together using purchasing power parity exchange rates). To reflect its outsized importance, we further split it into 28 smaller groups: P99-99.1,…, P99.8-99.9, P99.9-99.91,..., P99.98-99.99,

13. The methodological details and robustness checks are presented in Chancel & Gethin (2017); all data and programs are available from WID.world. Estimates for Europe are discussed in Blanchet et al. *(2019).*

P99.99-99.991,…, P99.999-100. Growth rates are low at the very bottom due to low growth in the poorest countries (mostly in sub-Saharan Africa). Growth rates are quite high in percentiles 20 to 60 due to the high growth in large emerging countries (China and India). They are low in percentile 70 to 90 due to the modest growth of the incomes of the poor and middle classes in advanced economies. Finally, they are extremely high among top earners due to the explosion of top incomes in many countries. Therefore, this curve has the shape of an elephant (Lakner & Milanovic, 2015), with a long trunk.

Table shown earlier presents in an alternative way the growth rates of different groups for the world as a whole (as in Figure IV, we use purchasing power parity exchange rates to pool incomes together). Average global growth is relatively low (60%) compared to emerging countries' growth rates. At the world level (and contrary to what is observed in most countries), growth rates do not rise monotonically with income. Instead, we observe high growth for the bottom 50% (94%), low growth in the middle 40% (43%), and high growth for the global top 1% (101%), and especially the top 0.001% (235%).

Figure V shows the evolution of the global top 1% and bottom 50% income shares between 1980 and 2016. The global top 1% income share rose from about 16% in 1980 to more than 22% in 2007. It was then slightly reduced to 20.4% in 2016. The bottom 50% income share oscillated around 9% with a very slight increase between 1985 and 2016. Throughout the period, the top 1% earns in total about twice as much income as the bottom 50%, a group by definition 50 times more numerous. Hence, incomes of the global top 1% income are on average 100 times those of the global bottom 50%. Another notable finding is that neither high growth in emerging countries since 2000 nor the global financial crisis of 2008 stopped the rise in global income inequality.

Whether future growth in emerging countries will be enough to revert this trend is a key question that we now discuss. The right side of Figure V displays different possible global income inequality scenarios until 2050. The number of variables that we consider in our analysis is limited. This makes our projections straightforward and simple to understand, but it obviously limits their predictive power. Our projections are based on combining the demographic projections of the United Nations (UNDESA, 2017) with the OECD growth forecasts (OECD, 2017) and simple assumptions on how growth will be distributed within each country.[14] We consider three scenarios on growth distribution within countries. All three scenarios have the same between-country inequality evolutions (i.e., a given country has the same average income growth rate in all three scenarios).

Our first scenario represents an evolution based on "business as usual", that is, we assume that economic growth in each country will be distributed across percentiles in the same way as it has been distributed since 1980. For instance, the bottom 50% income earners in China captured 13% of total growth over the 1980-2016 period. We thus assume that the bottom 50% earners in China will capture 13% of growth up to 2050. The second scenario illustrates a high within-country inequality setting; it assumes that all countries will follow the same inequality trajectory as the United States did over the 1980-2016 period. The third scenario considers a low inequality trend; it assumes that all countries will follow the same inequality trajectory as the European Union did over the 1980-2016 period.

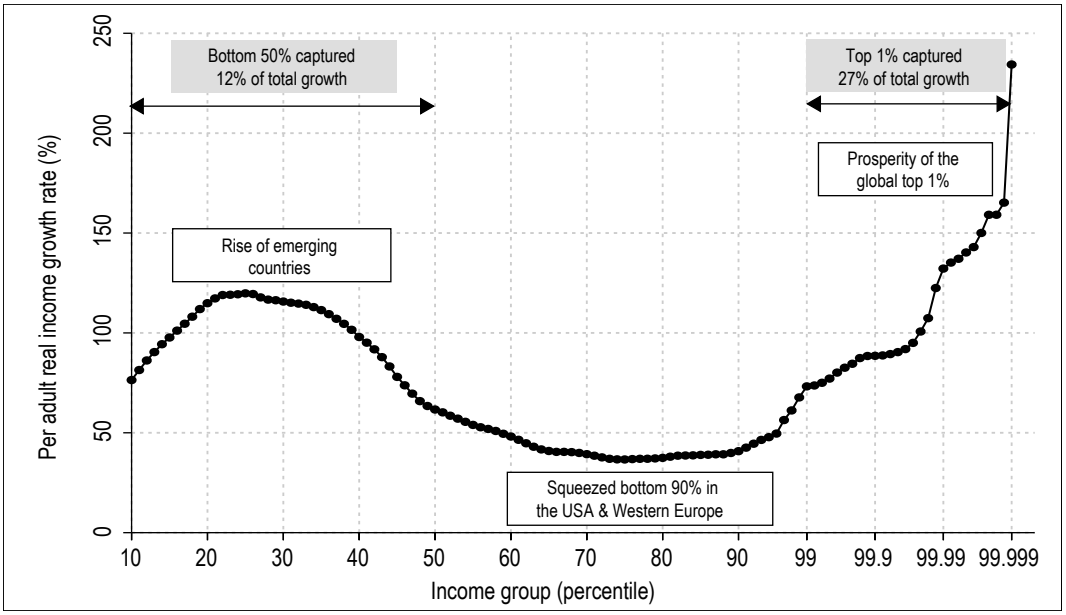
Under the business-as-usual scenario, the income share of the bottom 50% of the world population slightly decreases from approximately 10% today to less than 9% in 2050. The top 1% share rises from less than 21% today to more than 24% of world income. Global inequality thus rises steeply in this scenario, despite strong growth in emerging countries. The progressive catching-up of low-income countries would not be sufficient to counterbalance the worsening of within-country inequality at the current rates.

In the US-style inequality scenario, the global top 1% would earn 28% of global income by 2050, while the bottom 50% would earn 6%, less than in 1980 (before large emerging countries started to catch up with the industrialized world). In this scenario, the increase in the top 1% income share is largely, but not entirely, made at the expense of the bottom 50%.

The last scenario shows that global inequality can be reduced if all countries align on the

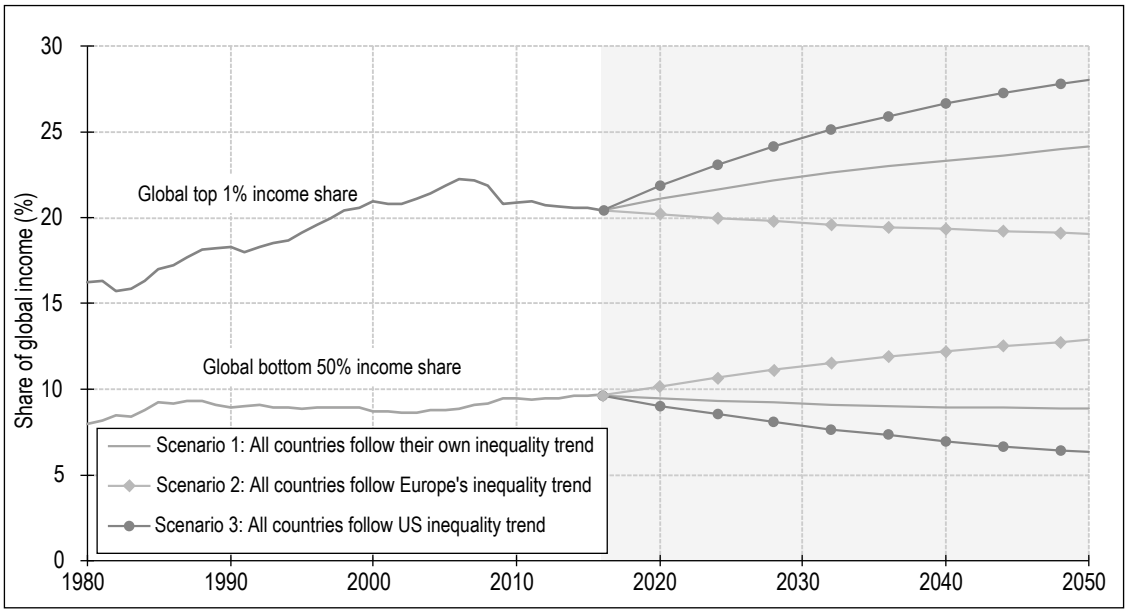
14. The growth rates we use are more optimistic than the rates assumed by the OECD to compute their total global income in 2050 for Africa, Latin America, and Asia. Assuming higher growth rates increases the force of convergence between countries, and hence tends to reduce global inequality. Therefore, we take a conservative approach to the rise of global inequality in the coming decades (for details see Alvaredo et al.*, 2018, and Chancel & Gethin, 2017).*

Figure IV – **Total income growth by percentile across all world regions, 1980-2016**



Notes: The vertical axis shows the total real income growth between 1980 and 2016 for each percentile of the global distribution of income per adult. The bottom 10 percentiles are excluded as their income levels are close to zero. The top 1% is divided into smaller groups (up to the top 0.001%) so as to better account for its share in total global growth captured.
Sources: WID.world.

Figure V – **Top 1% *vs.* bottom 50% shares of global income, 1980–2050**



Notes: This figure displays the global top 1% and bottom 50% income shares with data from 1980 to 2016, and projections from 2016 to 2050 under three scenarios for inequality: 1. Business as usual, 2. European scenario, 3. USA scenario; e.g. if all countries follow the inequality trajectory of the USA between 1980 and 2016 from 2017 to 2050, the income share of the global top 1% will reach 28% by 2050.
Sources: WID.world.

European inequality trajectory – or more equitable ones. The bottom 50% income share would rise from 10% to 13% in 2050, whereas the top 1% would decrease from 21% to 19% of total income. Even more equitable growth trajectories would be needed for the global bottom 50% share to catch up with the top 1% income share by mid 21st century.

We should stress again that there is much to be improved in the data underlying such projections. As DINA become available for more

countries and more years, we will be able to refine our understanding of global income inequality dynamics. What these scenarios suggest, however, is that global inequalities are likely to remain substantial in the coming decades.

* *
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We stress that global inequality dynamics involve strong and contradictory forces. We observe rising top income and wealth shares in nearly all countries in recent decades. But the magnitude of the increase varies substantially, thereby suggesting that different country-specific policies and institutions matter. High growth rates in emerging countries reduce between-country inequality, but this in itself does not guarantee acceptable within-country inequality levels, and does not ensure the social sustainability of globalization. Access to more and better data is critical to monitor global inequality dynamics, as this is a key building block both to properly understand the present as well as the forces that will dominate in the future, and to design potential policy responses.

There are a number of limitations in the data sources we are using to create DINA statistics that we would like to explicitly mention.

First, the scope of individual fiscal income (i.e. income as reported through tax-based sources) has deteriorated over time as many countries have chosen to exclude large components of capital income from the individual income tax. Countries such as Sweden and Germany have moved to a dual income tax system where capital income is taxed separately at a flat rate. Other countries have carved out large exemptions, such as tax-preferred life insurance accounts in France. As a result, the quality of the (necessary) imputation of capital income deteriorates. However, in most cases, the government still receives – or could collect at very low cost – information on exempted capital income on an individual basis. Countries such as Denmark for example do tax dividends and capital gains separately from other income, but it is still possible to merge both data sources at the individual level. Additionally, administrative wealth data are much sparser than income tax data because progressive wealth taxation is much less prevalent than progressive income taxation. Yet it would be possible to gather and collect wealth data at very low cost. Such data would be invaluable to measure wealth inequality but would also help with the administration of the progressive income tax. Once again, Denmark provides a good illustrative example: even if the country abolished its wealth tax in 1997, data on balances of individual financial accounts are still collected for the administration of the individual income tax on capital income.

Second, survey data could be greatly improved if they were systematically linked to administrative data.[15] Linkage with administrative data is useful both for sampling and for data quality. The US Survey of Consumer Finances is one of the most successful examples of the value of using administrative tax data to oversample the top of the wealth distribution and to capitalize investment incomes for the improvement of both the sampling framework and the accuracy of the estimates.[16] In this sense, survey data and administrative data should become complements instead of being viewed as competitors.[17]

Third, administrative data can be very defective in situations where large parts of the economy are informal. This is the still the situation in many emerging countries today. In such cases, surveys remain necessary to cover the full population.

As we stressed at the beginning of the paper, the production of distributional national accounts can only be sustained over time with the collaboration between national accountants, tax departments, statisticians and academic researchers within and across countries. □

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15. Blanchet et al. *(2018) provide a method to reweight surveys using tax data where both sources are not yet linked.*

16. The Enquête Patrimoine *in France also applies oversampling strategies based on administrative data; this could be further improved by taking additional external information from the capitalization of investment incomes, and by using administrative data on assets.*

17. Meyer et al. *(2015) document a noticeable and worrying rise in unit non-response, item non-response, and measurement error in a number of USA household surveys. Those threats to survey quality seem to be a widespread phenomenon across countries.*

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