Predistribution vs. Redistribution: Evidence from France and the U.S.

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Abstract. How much redistribution policies can account for long-run changes in inequality? To answer this question, we quantify the extent of redistribution over time by the percentage reduction from pretax to post-tax inequalities, and decompose the changes in post-tax inequalities into different redistributive policies and changes in pretax inequalities. To estimate these redistributive statistics, we construct homogenous annual series of post-tax national income for France over the 1900-2018 period, and compare them with those recently constructed for the U.S. We obtain three major findings. First, redistribution has increased in both countries over the period, earlier in the U.S., later in France, to reach similar levels today. Second, the substantial long-run decline in post-tax inequality in France over the 1900-2018 period is due mostly to the fall in pretax inequality (accounting for three quarters of the total decline), and to a lesser extent to the direct redistributive role of taxes, transfers and other public spending (about one quarter). Third, the reason why overall inequality is much smaller in France than in the U.S. is entirely due to differences in pretax inequality. These findings suggest that policy discussions on inequality should, in the future, pay more attention to policies affecting pretax inequality and should not focus exclusively on "redistribution".

Section 1. Introduction

The issue of how to select the most adequate policies to reduce inequalities has attracted considerable interest, both in academia and in the public debate, in particular in light of the significant increase in inequality documented over the last decades in many countries. However, despite numerous research efforts, comparable long-term estimates of redistributive policies remain deceptively scarce.

Public policies aiming to reduce inequalities can be classified into two categories. First, for a given level of pretax inequality, taxes, transfers and other public spending can reduce post-tax income inequality. This is what is usually called *redistribution* policies. The public economics literature has largely been influenced by an approach which treats pre-tax inequalities as given, and where the policy options for reducing inequalities largely rest on various combination of tax-and-transfers, with the constraints imposed by the behavioral responses to the tax and transfer system (e.g., this is the generic logic of optimal taxation literature).[1] However, public policies can also affect the pretax distribution of income (what we will call "*predistribution*"). For instance, the legal and social system contributes to determine the bargaining power of workers vis-à-vis firm owners and managers, via wage-setting rules, corporate laws, trade regimes or labor market regulations. Similarly, educational and health care policies impact the access to skills and jobs, and therefore the overall inequality of labor earnings. Trade and technological changes can also influence the relative earnings of different skills or occupation, as well as a range of market regulations. Finally, taxation and transfers can also affect pre-tax income either via changes in bargaining incentives or through different dynamics of capital accumulation. Although these channels are known to impact inequalities, the lack of adequate data series with sufficient historical and comparative breadth has limited the ability to evaluate and compare the long-term impact of various public policy options on inequality.

This paper asks two simple empirical questions. What is the impact of public policies on inequality? What are the relative magnitudes of "redistribution" and changes in

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[1] See Mirrlees (1976), Kaplow (2008) and Piketty and Saez (2013) for general surveys of this approach.

pretax income in accounting for the observed evolution of inequality over time and across countries?

We break new grounds on this issue at both methodological and substantive levels. Our first objective is related to the measurement of income inequality. From a methodological perspective, our key contribution is to construct micro-files of the distribution of post-tax, post-transfer national income in France since 1900. These micro data are obtained by combining national accounts, administrative tax data and household survey data in a comprehensive and consistent manner. The methodology consists in two steps. First, we follow Garbinti, Goupille-Lebret and Piketty (2018) to obtain pretax inequality series, using the same methodology and updating estimates to 2018. Second, we develop a microsimulation model and use explicit tax incidence assumptions to impute all taxes, transfers and collective expenditures. This is done by applying legislation over taxes and transfers and/or using information on tax liability and monetary transfer receipt that is often directly observed in administrative tax data or in household surveys.[2] As a result, our French post-tax income series are annual, fully consistent with macroeconomic aggregates and cover the entire income distribution, from bottom to top percentiles.

Our second objective is to better understand the differential impact of public policies on inequality over time and across countries, by measuring the impact of redistribution on inequality dynamics. To exploit cross-country differences in pre- and post-tax inequalities, we compare our French inequality series with those from Piketty, Saez and Zucman (2018) for the U.S.[3] We develop simple statistics to quantify the contribution of redistribution, as opposed to predistribution or any other external shocks, in explaining observed long-run trends in inequalities across times and countries.

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[2] The imputation of in-kind transfers and collective expenditures is the most difficult part of this exercise. We show how variants for imputing these public spending affect our results.

[3] Note that this comparison is made possible by the fact that both series are based on the very same methodology and are anchored to national accounts. See Alvaredo et al. (2020) for a complete presentation of the general methodology to construct pre-tax and post-tax distributional national accounts. See also Blanchet et al. (2019) for an attempt to present DINA estimates for European countries using machine learning and survey calibration.

Our analysis leads to three sets of results. First, by comparing the evolution of pretax and post-tax income inequality between France and the U.S. over the 1900-2018 period, we identify two stylized facts, that are worth noting: First, while pretax inequality has followed a U-shaped pattern in both countries–with a much steeper rise in inequality in the U.S. in recent decades–the trend in post-tax income inequality differs markedly between the two countries, being U-shaped in the U.S. and L-shaped in France. Second, in both countries, the gap between pretax and post-tax income is only significant for the top 10% and bottom 50% income groups, with the middle 40% group largely unaffected.

Our second set of results relate to our quantification of the impact of redistribution[4] on inequality dynamics. Our analysis relies on inequality indicators defined either as the ratio between average incomes of the top 10% and bottom 50% groups (ratio T10/B50) or as the ratio between average incomes of the top 10% and bottom 90% groups (ratio T10/B90). We use these indicators to assess the magnitude of inequality reduction implied by redistribution in France and the U.S. by sub-periods. This can be done easily by computing the relative variation in our inequality indicators (ratio T10/B50 or ratio T10/B90) when going from pretax to post-tax income.[5] Based on these measures, we document that the reduction of inequality implied by redistribution is significant in both countries and increasing throughout the entire 20th century, even though not at the same pace and in the same period. As a case in point, redistribution measured by the T10/B90 ratio was similar in France and in the U.S. just before WWI (reducing pretax inequality by less than 10% in both countries), then increased sensibly in the U.S. after WWII while France kept a similar level of redistribution (-23% vs -11% for 1945-1955). From the mid-1970s onwards, redistribution increased in France, which cached-up with the U.S., and then both countries experienced increasing redistribution. At the end of the period (2010-2018), both France and the U.S. reduce pretax income inequality by 27%, for the indicator T10/B90. Using the more precise indicator T10/B50, the level of redistribution is higher, but still remarkably close for both countries (around -44%).

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[4] Redistribution is defined as the mechanical operation of taxes, monetary transfers, in-kind transfers and collective expenditures affecting the gap between pretax and post-tax income inequality.
[5] Consider the following example for France over the 2010-2018 period. The ratio T10/B50 is equal to about 7.2 in terms of pretax income, i.e., on average top 10% income earners make 7.2 times more than bottom 50% income earners. In terms of post-tax income, this ratio is reduced to 4.1. This implies that redistribution reduces pretax inequality by 44% on average in France over the 2010-2018 period.

These indicators highlight that France and the U.S. carry out very similar level of redistribution in 2010-2018, despite very different policies and institutions. Consequently, the much lower level of post-tax inequality in France is not the result of higher redistribution, but almost entirely due to much higher level of pretax inequality.

With our third set of results, we investigate to what extent the different dynamics of redistribution between France and the U.S. can account for the long-run evolution of income inequality. This exercise relies on a simple formula that allows to decompose the long-term evolution of post-tax income inequality between the variation in pre-tax income inequality and the change in redistribution over time. We show that the long-run decline in inequality in France over the 1900-2018 period (-65%) is due mostly to the fall in pretax inequality (-47%), and to a lesser extent to direct redistribution (-17%). The pattern of U.S. inequality over the period from 1913 to 2018 is one of a significant decline in post-tax inequality (-37%) up to the 1980s, followed by a steep increase since then, to end slightly below the inequality level of 1913 (-14%). This evolution is the result of two opposing factors: rising pretax income inequality (+7%) and rising redistribution (-21%). These results show that if inequality has decreased much more in France than in the U.S. during the 1900-2018 period, this is not due to a relatively more important increase in redistribution by the French tax and transfer system. The major factor behind this differential trend comes from the differential evolution of pretax income inequality between the two countries. Pretax income inequality has decreased relatively more in France than in the U.S. over the 1900-1983 period and has increased relatively less since 1983. In other words, both changes in pretax inequality and redistribution have had a significant impact on the historical reduction of inequality, but the former is quantitatively about three times as large as the latter.

Related literature. Our paper builds upon a long tradition of research studying the historical evolution of income inequality. Following the pioneering work by Kuznets (1953) and Piketty (2001, 2003), a number of authors have used income tax data to construct long-run series of top income shares (see Atkinson and Piketty, 2007, 2010, for a global perspective on top incomes). Although these series have contributed to improve our understanding of inequality trends, they suffer from important limitations (Atkinson, Piketty and Saez, 2011). In particular, they cover only the top part of the distribution. They are based on fiscal income, which can diverge from national income

because of tax exempt income, tax avoidance and evasion. Finally, they focus on pretax income inequality and are therefore silent on redistributive effects of public policies between and across countries. To overcome these limitations, several recent papers have attempted to combine the various available sources in a systematic manner in order to construct long-term income series of "distributional national accounts" (DINA) (see in particular Piketty, Saez and Zucman, 2018 for pre-tax and post-tax DINA in the U.S.; Garbinti, Goupille-Lebret and Piketty, 2018 for pre-tax DINA in France). The present paper follows this work and provides a more thorough analysis of the role of redistribution in inequality dynamics. We should also emphasize that the present research is part of a broader multi-country project, namely the WID.world project, with the aim of providing long-term homogeneous series of income and wealth consistent with national accounts in as many countries as possible in the coming years.[6]

Apart from the literature on long-run income inequality trends, our study contributes to several other strands of the literature. First, this paper relates to the large literature, initiated by Okner and Pechman (1974), that studies the progressivity and the tax burden of tax and transfer systems (for work related to France, see Bourguignon, 1998; Accardo et al., 2009 ; Landais, Piketty and Saez, 2011; Chanchole and Lalanne, 2012; Eidelman, Langumier and Vicard, 2013; Bozio, Breda and Guillot, 2020).[7] Our key contribution to this literature is to construct long-term, annual series of pretax and post-tax income for France that provide a comprehensive view of how government redistribution affects inequality. Indeed, our French series cover the entire distribution,

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[6] See also Morgan (2017), Alvaredo, Assouad and Piketty (2019), Novokmet, Piketty and Zucman (2018) and Piketty, Yang and Zucman (2019) for recent work on pretax income inequality in Brazil, the Middle East, Russia and China, respectively. See Saez and Zucman (2016), Garbinti, Goupille-Lebret and Piketty (2020), Martinez-Toledano (2017) for work on wealth inequality in the U.S., France and Spain, respectively.

[7] Bourguignon (1998); Chanchole et Lalanne (2012), and Eidelman, Langumier et Vicard (2013) use microsimulation models and household surveys to estimate the progressivity of the tax and transfer system for one or two given years. Accardo, et al (2009) break down disposable income reported in the national accounts by income quintiles for the year 2003. Bozio, Breda and Guillot (2020) analyzes the impact of social security contributions on labor income inequality over the 1967-2015 period. The paper most directly related to ours is Landais, Piketty and Saez (2011), which combines tax data with national accounts to estimate tax rates by pretax income groups for a given year. See also Piketty and Saez (2007), Mirrlees and al. (2010), Sutherland and Figari (2013) with EUROMOD, Bengtsson, Holmlund and Waldenström (2016), and OECD work by Zwijnenburg et al. (2016) for cross-country comparison exercises.

are fully consistent with national accounts, and consider all forms of taxes and government expenditure.

Second, our study complements the macro literature that analyzes the role of taxes and transfers on inequality dynamics (Kaymak and Poschke, 2016; Hubmer, Krussel and Smith, 2017). The use of our detailed micro series of pretax and post-tax income could improve the ability of macroeconomic models to reproduce distributional dynamics over time (Ahn et al., 2018).

Third, our paper contributes to the broad literature on the determinants of pretax income inequality. This literature has typically discussed the relative role of education policies (Katz and Murphy, 1992; Chetty et al., 2017), minimum wage (Autor, Manning and Smith, 2016), compensation bargaining (Piketty, Saez and Stantcheva, 2014), international trade and technological change (Autor et al., 2014, Acemoglu and Restrepo, 2020), as driving forces of increased inequality. Our results suggest that such "predistribution"–policies, rules and mechanisms impacting pretax income inequality–matters much more than direct redistribution in explaining differences in overall inequality between the U.S., France and possibly other European countries. Generally speaking, our findings contribute to the expending policy debate on the notion of "predistribution" and call for a better comprehension of these mechanisms.[8]

The rest of this paper is organized as follows. In section 2, we describe our data sources and methodology. In section 3, we present our main results regarding the overall magnitude of redistribution in France and the U.S. In section 4, we present detailed results on the anatomy of redistribution, the role of tax progressivity, monetary transfers and in-kind transfers. In section 5, we discuss our incidence assumptions and present variants to test the robustness of our results. In section 6, we offer concluding comments and discuss research perspectives.

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[8] The notion of "predistribution" has played an increasingly important role in policy debates since the 2000s, particularly in British policy debates. See e.g. O'Neill and Williamson (2012) and Thomas (2017).

Section 2. Concepts, data sources and methodology

In this section we describe the concepts, data sources and main steps of the methodology that we use in this paper in order to construct our income distribution series. Broadly speaking, we combine three main types of data: national accounts; fiscal data (income tax returns); and household surveys. We first present our income concepts. We then describe our data sources and methods to derive pretax and post-tax income series for France over the 1900-2018 period. Complete methodological details of our French specific data sources and computations are presented in the Online Data Appendix along with a wide set of tabulated series, data files and computer codes.[9]

2.1. Income concepts

Our income distribution series are constructed using income concepts that are based upon national accounts categories.[10] As such, four basic income concepts (with a number of variants) are of interest: pretax national income and pretax factor income, post-tax disposable income and post-tax national income. By construction, average income per adult is equal to average national income per adult for all concepts (except post-tax disposable income).[11]

Pretax income (or pretax national income) is our benchmark concept to study the distribution of income. Pretax income is equal to the sum of all income flows going to labor and capital, after taking into account the operation of the pension and unemployment insurance systems, but before taking into account other taxes and

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[9] We also refer the readers to our companion paper (Garbinti, Goupille-Lebret and Piketty, 2018), where we further describe the sources and methods used for the construction of pre-tax DINA series for France. A longer and more complete discussion of the general methodological issues involved in creating DINA estimates (not specific to France) is presented in Alvaredo et al. (2020).

[10] The reason for using national accounts concepts is that they are defined and estimated in the same manner in all countries and time periods, and aim to be independent from the fiscal legislation of the given country/year.

[11] National income is defined as GDP minus capital depreciation plus net foreign income, following standard national accounts guidelines (SNA 2008).

transfers. That is, we deduct pension and unemployment contributions, and add pension and unemployment distributions.[12]

Factor income (or pretax factor income) is equal to the sum of all income flows going to labor and capital, before considering the operation of the pension and unemployment system. That is, we do not deduct pension and unemployment contributions and exclude pension and unemployment distributions as they are not factor incomes. One problem is that retired individuals typically have very small factor income, so that inequality of factor income tends to rise mechanically with the fraction of old-age individuals in the population, which biases comparisons over time and across countries. This is why we use pretax national income as our benchmark concept of pretax income.[13]

Post-tax disposable income is defined as pretax income minus all forms of taxes plus all individualized monetary transfers.

Post-tax national income is equal to the sum of all income flows going to labor and capital, after considering the operation of the pension and unemployment system, and also after taking into account all forms of taxes and transfers (monetary transfers, in-kind transfers, and collective consumption expenditure). In other words, post-tax income is defined as post-tax disposable income plus in-kind transfers and collective consumption expenditure.

Note also that our income series refer to the distribution of income among equal-split adults (i.e. the income of married couples is divided into two).[14]

We compute national income and the various subcomponents of pretax and post-tax national income using the official national accounts established by the French national

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[12] This approach does not incorporate the redistribution carried out ex post by the pension and UI systems over the life-cycle (with redistributive properties and life-expectancy differentials).

[13] Note that looking at the distribution of factor incomes among the working-age population can yield additional insights: it allows to better measure the distribution of labor costs paid by employers (see our companion paper Garbinti, Goupille-Lebret and Piketty (2018) for a presentation of factor income series).

[14] Alternative series of pretax income at the tax-unit level (married couples and singles) as well as individualistic-adults series (i.e., labor income is allocated to each individual income earner within the couple) could be found in our companion paper Garbinti, Goupille-Lebret and Piketty (2018).

statistical institute (INSEE) for the 1949-2018 period.[15] All data files and complete methodological details are given in Online Appendix A.

In the present paper, we investigate the impact of the tax and transfer system on inequality. Therefore, we focus on the construction and the comparison of pretax national income, post-tax disposable income, and post-tax national income series.

2.2 Data sources and methods for the 1970-2018 periods

2.2.1 Data sources

We start with the micro-files of income tax returns that have been produced by the French Ministry of Finance since 1970. We have access to large annual micro-files since 1988. These files include about 400,000 tax units per year, with large oversampling at the top (they are exhaustive at the very top; since 2010 we also have access to exhaustive micro-files, including all tax units, i.e. approximately 37 million tax units in 2010-2012). Before 1988, micro-files are available for a limited number of years (1970, 1975, 1979, and 1984) and are of smaller size (about 40,000 tax units per year).

These micro-files allow us to estimate the distribution of fiscal income, i.e. income reported on income tax returns. In order to estimate the distribution of national income (pretax and post-tax), we need to combine income tax micro-files with other data sources, namely national accounts and household surveys, and to apply a number of imputation/simulation rules. We start by describing how we move from fiscal income to total pretax income, before describing how we deal with taxes and transfers to obtain post-tax income.

2.2.2 Construction of pretax national income series (1970-2018)

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[15] For the transfers, we also rely on CNAF and DREES files that report the number of beneficiaries and the aggregate amount of each transfer since 1946. For the 1900-1948 period, we use the historical series of national accounts reported in Piketty and Zucman (2014), which rely on the detailed series constructed by Villa (1994).

The gap between fiscal income and national income can be decomposed into three components: tax-exempt labor income, tax-exempt capital income, and production taxes. Before we take each of these three components in turn, note that income tax micro-files allow us to split fiscal labor income into three components (wages; pension and unemployment benefits; and labor component of mixed income, which we assume for simplicity to be equal to 70% of total mixed income) and fiscal capital income into four components (tenant-occupied rental income; dividend; interest; and capital component of mixed income, i.e., 30% of total mixed income).[16]

From fiscal labor income to pretax labor income

Tax-exempt labor income, which we define as the gap between national-accounts labor income and fiscal labor income, consists mainly of non-contributive social security contributions (SSCs) and, to a lesser extent, of non-taxable compensation items such as health benefits and a number of other in-kind benefits.[17] To capture total pretax labor income, we proceed as follows. We compute non-contributive SSCs (employer and employee) by simulating the complexity of the different SSC schemes in each year.[18] In the absence of specific information, we simply impute non-taxable compensation items in proportion to fiscal labor income.

From fiscal capital income to pretax capital income

Tax-exempt capital income raises more complicated issues. Fiscal capital income differs from national capital income for three main reasons. First, some capital income components are fully tax-exempt and therefore not reported in income tax returns. Tax-exempt capital income includes three main components: income going to tax-exempt

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[16] Fiscal capital income also includes realized capital gains, but we do not use this variable for imputation purposes in our benchmark series (because it is too lumpy). Income tax micro-files also allow us to split mixed income into different forms of self-employment activities (BIC, bénéfices industriels et commerciaux; BNC, bénéfices non commerciaux; BA, bénéfices agricoles), but we do not use this decomposition.

[17] Non-contributive SSCs refers to contributions funding either health care spending or child benefits. Note that we have also computed contributive SSCs (or unemployment and pension contributions), which are excluded by definition from pretax income but included in factor income (see Section 2.1).

[18] Our simulations take into account the different SSC schedules as well as reductions in employer SSCs and flat-rate income tax (CSG and CRDS). For more details, see online Appendix B and Stata code. See also Bozio, Breda and Guillot (2020) for a more complete description of SSC schemes in France.

life insurance assets[19]; owner-occupied rental income; other tax-exempt interest income paid to deposits and saving accounts. Second, some capital income components are included into the income tax returns but their aggregate may differ from those reported in national accounts due to tax avoidance or tax evasion. For example, a significant part of dividends is missing in the tax data.[20] Finally, corporate retained earnings and corporate taxes are not directly received or paid by individuals and are therefore excluded from income tax. One needs to make implicit incidence assumptions on how to attribute them. As a result, these elements are either missing or under-reported in the income tax returns and need to be imputed.

Regarding owner-occupied housing, life insurance assets, and deposits and saving accounts, we use available wealth and housing surveys in order to impute these assets on the basis of labor income, financial income and age. We then attribute the corresponding asset income flows on the basis of average rates of return observed in national accounts for this asset class (See our companion paper Garbinti, Goupille-Lebret and Piketty 2020 for a detailed description of the methodology).

For capital income components reported in the income tax micro-files[21], we conduct the following reconciliation exercise. We simply adjust proportionally each of these capital income components in order to match their counterpart in national accounts (reported in Online Appendix A, Table A8).[22] The assumption behind this simple adjustment is that tax evasion and tax avoidance behaviors do not vary along each income-specific distribution.[23]

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[19] More precisely, this category regroups income attributed to life insurance and pension funds. Before 1998, life insurance income was entirely exempt from income tax. Since 1998, only capital income withdrawn from the account are taxed (see Goupille-Lebret and Infante 2018 for more details). As a result, total life insurance income reported in the tax data corresponds to less than 5% of its counterpart in national accounts.

[20] Individuals can legally avoid dividend tax using complex tax optimization strategies. Such schemes imply that dividends have to be distributed to and kept in holding companies. Dividend tax will eventually occur when the holding company will distribute dividends to its shareholders.

[21] i.e. tenant-occupied rental income; dividends; interests from debt assets; and capital component of mixed income (i.e., 30% of total mixed income).

[22] That is, we multiply each individual capital income component reported in the micro-files by the corresponding national-income/fiscal-income ratio.

[23] Alstadsaeter, Johannesen and Zucman (2019) provide evidence that tax evasion rises sharply with wealth. Our assumption is therefore conservative and our results should be seen as a lower bound of the true level of income concentration.

Regarding corporate retained earnings and corporate taxes, we impute them in proportion to individual dividends, life insurance income, and interests, i.e., total financial income excluding tax-exempt interest income paid to deposits and saving accounts.[24] More precisely we impute to individuals the fraction that can be attributed to individuals, i.e., we subtract the fraction of domestic corporate capital that can be attributed to the government.

Incidence of production taxes

Finally, note that production taxes (in the SNA 2008 sense) include a number of indirect taxes, which in effect are paid by corporations before they can distribute labor and capital income flows, and are therefore excluded from fiscal income.

These productions taxes are split into four categories: i) consumption taxes, which include value added taxes and several taxes on energy products, tobacco, alcohol beverages, among others; ii) professional taxes; iii) household property taxes; iv) taxes on wages. We attribute to individuals these taxes using the following incidence assumptions and imputation rules. First, consumption taxes are borne by consumers only, proportionally to consumption (disposable income minus saving). Second, we assume that household property taxes only fall on housing assets and attribute them to individuals in proportion to their housing assets. Finally, we consider taxes on wages only fall on labor and impute them proportionally to social security contributions.

More generally, we should stress that our implicit tax incidence assumptions are relatively rudimentary and could be improved in future estimates. However, we have tested a number of alternative tax incidence assumptions, and found only second-order effects on the level and time pattern of our pretax income series.

2.2.3 Construction of post-tax national income series (1970-2018)

To move from pretax to post-tax income, we deduct all taxes and add back all transfers. We now present briefly the different elements of the French tax and transfer system

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[24] In France, tax-exempt saving accounts (like livret A) are financial products that are regulated by the State and used to finance social projects.

and how we simulate them. A more complete description of the methodology can be found in Online Appendix B.

The French tax and transfer system

The French tax system includes a large variety of taxes that we can regroup into five categories: indirect taxes, capital taxes, progressive income taxes, flat income taxes, and non-contributive social contributions.

Indirect taxes make up about 14% of national income today. It includes consumption taxes (80% of total indirect taxes), professional taxes, and residence taxes.

Capital taxes amount to about 4% of national income and consist of corporate taxes, wealth taxes, property taxes, and bequest and gift taxes.

From 1991, France is characterized by the coexistence of two taxes on income: a progressive income tax—which is the historical income tax created in 1914—and a flat income tax called general social contribution.[25] In addition to these two income taxes, capital income is also subject to several other types of social contributions with flat tax rates.[26] We regroup the general social contribution and the other types of social charges under the general term of "Flat-rate income taxes" (7% of national income) and refers to the historical income tax as progressive income taxes (4% of national income).

Finally, non-contributive social contributions include all SSCs that are not dedicated to the financing of the pension and unemployment systems as well as taxes on wages. Altogether, they make up to 11% of national income.

Government spending can be decomposed into three distinct categories: monetary transfers, in-kind transfers, and collective consumption expenditure.

Monetary transfers amount to about 4% of national income and include various types of housing benefits, family benefits, and social benefits.[27]

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[25] The historical income tax is called "Impôt sur le revenu" (IR) and the general social contribution is called "contribution sociale généralisée" (CSG).

[26] Note that since 2018, the two income taxes and the different social contributions have been merged into a unique 30% flat tax for capital income.

[27] The housing benefits regroup "Allocation de Logement Familiale" (ALF), "Allocation de Logement Personnalisée" (APL) and "Allocation de logement sociale" (ALS). The family benefits include "Allocation Familiale" (AF), "Complément Familial" (CF), "Allocation Pour Jeune Enfant" (APJE), "Prestation d'Accueil du Jeune Enfant" (PAJE), "Allocation de Rentrée Scolaire" (ARS) and "Allocation de Soutien

In-kind transfers are all transfers that are not monetary (or quasi-monetary) and can be individualized. They correspond to individual goods and services produced directly or reimbursed by government. In-kind transfers make up to 20% of national income (including 12.5% for health and 6.5% for education expenditure).

Collective consumption expenditure regroups all consumption services that benefit to the community in general and cannot be individualized (spending on defense, police, the justice system, public infrastructure, etc.). It amounts to 10% of national income.

Simulation and imputations

In order to simulate the French tax and transfer system, we proceed as follows.

First, we exploit the richness of the income tax micro-files to simulate very precisely all monetary transfers and taxes levied on income (progressive and flat income taxes, and social security contributions). In particular, we are able to consider all changes in tax schedules or specific tax deductions, exemptions and credits over time. We also use all socio-demographic variables reported in micro-files (number and age of dependents, marital status, disability status, etc.) in our simulation exercises.

Second, when the appropriate tax base is not directly observable in our micro-files, we use our estimated variables of wealth[28] and income as a proxy. Wealth taxes, property taxes, and residence taxes are computed using our estimated values of taxable wealth, housing assets, and rents paid, respectively. Although imperfect, this methodology still allows us to simulate the different tax schemes and the specific exemptions, discounts and tax cap for low-income earners, disabled, widows or elderly. We should also stress that we have made every attempt to collect and use additional information from official reports to check and improve our simulations. For example, our simulations of wealth taxes are fully consistent with wealth tax tabulations, which report the number of taxpayers as well as average taxable wealth and tax paid by tax bracket. The number

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Familial" (ASF). The social benefits regroup "Revenue de Solidarité Active" (RSA), "Prime d'Activité" (PPA), "Minimum Vieillesse" (MV) and "Allocation de Solidarité aux Personnes Agées" (ASPA).

[28] See Garbinti, Goupille-Lebret, Piketty (2020) for details about the construction of our wealth series.

of beneficiaries of each monetary transfer is also consistent with the statistics provided by official reports (CNAF and DREES files).

Third, we must impute the remaining taxes and transfers based on rules and tax incidence assumptions. As explained in the previous section, professional taxes, and sales and excise taxes are assumed to be borne by consumers only, proportionally to their consumption (disposable income minus saving). Corporate taxes are allocated proportionally to dividends, life insurance income, and interests.

We now present the choices we made to allocate in-kind transfers and collective expenditure. Few studies provide detailed measures of the redistributive impact of non-monetary transfers, and even fewer offer estimates of changes over time.[29] As we know relatively little about who benefits from this government spending, we need to make some assumptions about their distribution. We are well aware that these assumptions could be improved with studies that could bring a more precise light over their true distributive effects.[30]

Our baseline scenario (V1) assumes i) a lump-sum imputation of health care expenditure to individuals[31], and ii) a proportional imputation to post-tax disposable income for education spending and collective expenditures. A lump-sum imputation attributes the same average monetary value to each adult individual, and is therefore characteristics of a strong redistributive impact of these expenditures. A proportional imputation to post-tax disposable income is, on the contrary, neutral to the measurement of inequality.

In order to assess the sensitivity of our results to the imputation of in-kind transfers and collective expenditure, we also present two alternative variants. We impute all these public spending either on a lump-sum basis (scenario V2) – the most redistributive assumption – or proportionally to post-tax disposable income (scenario v3). This last

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[29] For France we rely on the few studies done on health expenditures (e.g., Jusot et al., 2016) or education expenditures (Allègre et al., 2012; Courtioux and Lignon, 2017).

[30] Nonetheless, including these public spending is a necessary step to compare countries with differential in-kind vs. monetary transfers: countries with higher level of in-kind transfers would appear artificially poorer if one used only a measure of disposable income.

[31] For France which is characterized by a single-payer system where almost all health spending is paid for by the government, healthcare spending is attributed as a fix lump sum to all adults. For the U.S., healthcare spending is assigned on a lump sum basis to the beneficiaries.

scenario has the advantage of being neutral and to be equal to disposable inequality measures, i.e., after tax and monetary transfers.

Finally, in order to ensure that aggregate pretax and post-tax national incomes match exactly with aggregate national income, we follow Piketty, Saez and Zucman (2018) and attribute 50% of government deficit (or surplus) in proportion to taxes and 50% in proportion to transfers and expenditures. This assumes that fiscal adjustment will be borne equally by taxes and spending. In practice, this makes very little difference (except in years with very large deficit or surplus).

2.3 Data sources and methods for the 1900-1969 periods

Unfortunately, no income tax micro file is available in France before 1970, so we have to use income tax tabulations. Detailed income tax tabulations have been produced by the French Finance Ministry since the creation of income tax in France in 1914 (first applied in 1915). These tabulations are available on an annual basis since 1915 (with no exception) and are based upon the universe of all tax units.[32] They report the number of taxpayers, total income and income taxes paid for a large number of income brackets.

These tabulations were first used in a systematic manner by Piketty (2001, 2003) to estimate top shares of fiscal income and then by Garbinti, Goupille-Lebret and Piketty (2018) to estimate the complete distribution of fiscal and pretax income.

In the present paper, we develop a very simple procedure to estimate the distributions of post-tax disposable and post-tax national income over the 1900-1969 period.

From the distribution of fiscal to disposable income (1900-1969)

Going from fiscal to disposable income requires to deduct bequest and income taxes from fiscal income and add back monetary transfers.[33]

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[32] We also rely on the estimates of the distribution of income for years 1900 and 1910 produced by the French Finance Ministry in the context of the parliamentary debates about the creation of an income tax (using data from various sources, including property taxes and inheritance taxes).

[33] Note that fiscal income is already net of production taxes, corporate taxes and social security contributions. In addition, the tax system was much less complex over the 1900-1969 period as flat income taxes and wealth taxes did not exist.

Conceptually, the distribution of post-tax disposable income can be recovered from the distribution of fiscal income using the following equation:

$$Disp_{pt} = a_{pt} \cdot Fisc_{pt} \cdot Disp_t/Fisc_t$$

Where $Fisc_{pt}$ and $Disp_{pt}$ are fiscal and disposable income accruing to percentile *p* at time *t*, $Disp_t/Fisc_t$ is the ratio between average disposable income and average fiscal income at time t, and a_{pt} are correction factors capturing the redistributive effects of monetary transfers, and bequest and income taxes by year and percentile.

Our objective is to estimate a_{pt} over the 1900-1969 period as $Fisc_{pt}$ is provided by Garbinti, Goupille-Lebret and Piketty (2018) and $Disp_t/Fisc_t$ can be computed using the National Accounts.

Before World War 1, we can assume that our correction factors a_{pt} are equal to 1. Indeed, income taxes and monetary transfers did not exist and the redistributive effects of bequest taxes were negligible as they represented less than 0.7% of national income and were based on small tax rates.

Over the 1915-1969 period, one simple approach (referred to as the "simple method") would be to assume that correction factors rise linearly from 1915 to 1970. While this approach is clearly an approximation, it has the merit to capture the trend in redistribution induced by the progressive development of monetary transfers, and bequest and income taxes over the 1915-1969 period. One drawback of this simple approach is that it does not capture non-linear changes in redistribution over time.

To overcome this limitation, we go one step further and develop a more sophisticated interpolation procedure (our baseline method). This procedure consists in splitting the correction factors a_{pt} into three tax-specific correction factors (income taxes/bequest taxes/ monetary transfers) and use all available information to estimate their changes over time. In particular, the correction factors for income taxes are constructed using income taxes paid each year by income group as reported in the tax tabulations. Correction factors for bequest taxes and monetary transfers take into account the yearly evolution of their macroeconomic aggregates as reported in the National Accounts.

In order to assess the robustness of our 1900-1969 series, Appendix Figure 1 reports the evolution of the bottom 50% (Panel A) and the top 10% (Panel B) shares for disposable income (simple or baseline method) as well as for pretax income over the 1900-2018 period. Appendix Figure 1 shows that disposable income shares derived from the simple and baseline methods are almost identical except during the 1919-1925 period where exceptional monetary transfers were implemented and could by definition not be taken into account by the linear interpolation implemented in the simple method. If we exclude the 1919-1925 period, the fact that the simple and baseline methods deliver consistent income shares reflects that the redistribution induced by taxes and monetary transfers is likely to follow a smooth and continuous trend over the 1900-1969 period.

Disposable and pretax income shares are very close over the 1900-1969 denoting a small impact of taxes and monetary transfers on inequality. Although our method should be seen as exploratory and incomplete, we argue that it should not under-estimate the level and evolution of disposable income inequality. Indeed, pretax and disposable income shares are also very similar over the 1970-1975 period where a microsimulation exercise is conducted on micro-files.

From the distribution of disposable income to post-tax income (1900-1969)

The last step consists in estimating the different variants of post-tax income (V1, V2, V3) by allocating the macroeconomic aggregates of in-kind transfers and collective expenditure reported in the National Accounts either on a lump-sum basis or proportional to disposable income.

Section 3. Quantifying Redistribution

We start by comparing the long-run evolution of pretax and post-tax income inequality between France and the U.S., before proposing a quantification of the extent of redistribution in these two countries.

Section 3.1. The long-run evolution of pretax and post-tax income inequality: France vs. United States.

We report on Figure 1 the evolution of pretax income inequality in France and the United States over the 1900-2018 period, as measured by the shares of total pretax income going to the top 10%, the middle 40%, and the bottom 50%.[34]

For France, we observe a large decline of the top 10% pretax income share (T10) from about 51% in 1900-1910 to 27% in 1983. This fall has been at the advantage of both the bottom 50% (B50), whose pretax income share increased from 13% to 24%, and the middle 40% (M40), whose pretax income share increased from 36% to 48%. Since 1983, this trend reversed, with a moderate increase in the top 10% income share (+5 percentage points, from 27% in 1983 to 32% in 2018) and a corresponding erosion of both the bottom 50% and the middle 40% income shares. So far, this turnaround has been quantitatively much smaller than the decline that occurred between the 1910s and the early 1980s, but it is nevertheless a significant change in direction.

While the pattern of both the French and the U.S. top 10% income shares over the century is U-shaped, some important differences need to be emphasized.

First, while both countries experienced a dramatic drop in the top 10% pretax income share during WWII and then a stabilization in the following two decades, French top 10% income share continued to decline during the 1968-1983 period. In contrast, the decline of the U.S. top 10% income share is concentrated over the 1940-1945 period. As a result, the decrease in the top 10% income share in France is significantly larger than the one experienced by the U.S. during the 1913-1980 period (-43% vs. -23%).

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[34] U.S. pretax income series are provided by Piketty et al. (2018). The decomposition of the bottom 90% income share between the bottom 50% and the middle 40% shares is available for the U.S. only since 1962.

Second, while we observe a rise in pretax income inequality in both countries since the early 1980s, top 10% income shares have increased twice as much in the U.S. (+35%) as in France (+16%) over the 1980-2018 period.

Overall, the French top 10% income shares have decreased dramatically since 1900 (-36%). In contrast, U.S. pretax income inequality has now returned to its pre-1940 level, the highest in the period of study, and is very close to the level observed in France at the beginning of the 20th century.

Figure 2 compares the evolution of pretax and post-tax income inequality in France (Panel A) and in the U.S. (Panel B) over the 1900-2018 period. Post-tax income is defined as pretax income minus all taxes plus all monetary transfers, in-kind transfers, and collective expenditures.[35] Two stylized facts are worth highlighting from these series.[36]

First, the evolution of pretax and post-tax income inequality has been far from steady and differs strongly between the two countries. While pretax inequality has followed a U-shaped pattern in both countries, post-tax inequality is L-shaped in France and U-shaped in the U.S. The increasing progressivity of the French tax and transfer system has been able to counteract the gradual rise in pretax income inequality, leading to a relatively constant level of post-tax income inequality since the early 1980s. This contrast strongly with the U.S. case, where rising redistribution has not matched the dramatic increase in pre-tax inequality.

Second, the difference between pretax and post-tax affects mostly the top 10% and bottom 50% income shares in both countries, leaving almost unchanged the middle 40% share. The difference in income shares of the middle group M40 is at most 2-3 p.p. in France, while it is around 1 p.p. in the U.S. By contrast T10 income share is reduced significantly by redistribution, for instance in 2018 from 32% to 25% in France and from 45% to 38% in the U.S., while B50 income share rises from 22% to 31% in France, respectively from 14% to 20% in the U.S.

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[35] Our benchmark scenario assumes a lump-sum imputation of health care expenditure to individuals, and a proportional imputation to post-tax disposable income for education spending and collective expenditures. We present in section 5.1 variants of imputation assumptions for non-monetary transfers.
[36] Note that our stylized facts are robust to the use of alternative concepts of post-tax income (variants 2 and 3). See Online Appendix Figures 2 and 3.

Section 3.2. Measuring the extent of redistribution

Table 1 presents some key statistics on the extent of redistribution in France and the U.S. in the recent period (2010-2018), measured as the difference between post-tax and pretax income shares. Thus defined, redistribution reduces the top 10% income shares by 21% in France against 17% in the U.S., while it increases the bottom 50% income share by 40%, compared to 46% in the U.S. In both countries the middle 40% share is only very modestly affected–even if it is noticeable that redistribution marginally benefits the middle 40% in the U.S., while it is negative in France.

One simple inequality indicator which can be used to assess the extent of redistribution is the ratio between the average income of the top 10% income group and the average income of the bottom 50% income group (T10/B50). In terms of pretax income, this ratio is equal to 7.2 in France, i.e., on average top 10% income earners make 7.2 times more than bottom 50% income earners, compared to a ratio of 15.8 in the U.S. In terms of post-tax income, this ratio is reduced to 4.1 in France, i.e., a reduction of 44%, compared to 9.0 in the U.S., i.e., a reduction of 43%. In that sense, one can say that redistribution reduced pretax inequality by 44% in France against 43% in the U.S. over the 2010-2018 period.

In Online Appendix Table 1, we have also computed other inequality indexes–such as Gini and Theil indexes and Palma and P75/P25 ratios–to measure the change in inequalities over time and find similar results.[37] We prefer to highlight income ratios as inequality indicator for several reasons. First, they are intuitive and transparent statistics whose interpretation is straightforward. Second, they are not data-demanding and can therefore be used over historical data, which are usually not available at a very disaggregated level. Finally, they allow for a clearer decomposition of the role played by redistribution on inequality in the upper and lower segments of the distribution (while synthetic indexes like Gini and Theil tend to blur these distinctions). For instance, one can see that the 44% reduction in inequality in France comes primarily from the decline from bottom-end inequality. That is, top-end inequality (as measured by the ratio T10/M40) is reduced by 18% on average over the 2010-2018

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[37] All the inequality indicators depict an increase in redistribution for France and the U.S. over the 1970-2018 period. Redistribution was relatively higher in the U.S. over the 1970-1979 period. Since 2010, both countries carry out similar level of redistribution whatever the inequality indicator used. If anything, the level of redistribution in France over the 2010-2018 period appears slightly higher than in the U.S. when using the Gini index and slightly lower when using the Theil index.

period, while bottom-end inequality (as measured by the ratio M40/B50) is reduced by 31%. Very similar numbers are found for the U.S. Top-end inequality (ratio T10/M40) is reduced by 19%, while bottom-end inequality (M40/B50) is reduced by 30%.

These indicators highlight that France and the U.S. carry out very similar level of redistribution in 2010-2018, despite very different policies and institutions. Consequently, the much lower level of post-tax inequality in France is not the result of higher redistribution, but almost entirely due to much higher level of pretax inequality.

Section 3.3. How much does redistribution reduce inequality over time?

We now turn to an analysis of long-term changes in redistribution between France and the U.S. Figure 3 presents the evolution of inequality ratios for pretax and post-tax income over the 1900-2018 period for the two countries. Panel A presents the evolution of the ratio T10/B50, which is available only from 1962 onwards for the U.S.
In terms of pretax income, French top 10% income earners used to earn about 18 times more than bottom 50% income earners in 1900. The ratio T10/B50 has decreased almost continuously from 18 in 1900 to 5.6 in 1983, and increased since then to 7.3 in 2018.
The post-tax income ratio decreased dramatically during WWI, from 17 in 1910 to 9.4 in 1919, and then stabilizes around 10.5 over the 1920-1929 period. After 1929, post-tax income followed closely the pretax income ratio up to the mid-1970s, then decreased more rapidly than the pretax ratio over the 1974-1984 period, before stabilizing around 4. In the 1960s, inequality indicators were similar in the U.S. and in France, with ratios around 9 for pretax income and 7 for post-tax income, decreasing in both countries. From 1980 onwards, U.S. inequality indicators start increasing sensibly, along with measures of redistribution. France's path diverges here with a much less pronounced increase in pre-tax inequality, but with a similar increase in redistribution. At the end of the period, both countries reduce pretax inequalities by 43%-44%, albeit with considerable difference in the level of pretax and post-tax inequalities.

To adopt a long-term perspective, panel B of Figure 3 presents the ratio T10/B90 which is available for both countries over the entire period of study.[38] During the 1925-1935 period, both France and the U.S. had T10/B90 post-tax ratios around 7, with similar redistribution levels (around 12% reduction). After WWII, both countries experienced a very steep drop in inequality, which was partly reversed in the U.S. despite increasing redistribution.

Figure 4 presents the annual evolution of our redistribution indicator, i.e., the percentage reduction from pretax to post-tax inequalities for T10/B50 (panel A) and T10/B90 (panel B). The T10/B50 indicator highlights the massive shock that WWI represents for France. During the war, and the following years, the very large health care spending and monetary transfers to veterans and widows, funded by debt and increased taxation have all contributed to that temporary spike in redistribution. From 1928 onwards, the extent of redistribution has been almost continuously increasing in France, most notably since 1973. The U.S. presents a similar picture of increasing redistribution, starting from very similar levels in both countries in the 1960s (around 25% reduction of pretax inequality), and reaching 45% of reduction at the end of the period in both countries. If one looks at the T10/B90 indicator (panel B), the shock represented by wars is evident in both countries – WWI for France and WWII for the U.S.– but contrary to France, the U.S. maintained after the war a high level of redistribution through the 1950s, 1960s and 1970s. With that indicator, the U.S. was the most redistributive country post WWII until the early 1980s, as France increased its level of redistribution steadily from 1973 onwards. Overall, the impact of redistribution on inequality has increased dramatically over time. Over the 1900-1914 period, redistribution played a modest role by reducing inequality between the top 10% and the bottom 90% income groups by 7% in France and in the U.S. In contrast, it reduced the same inequality indicator by 28% over the 2010-2018 period, in both countries. Interestingly, redistribution has increased first in the U.S. where higher level of redistribution is noticeable as soon as 1945, whereas in France redistribution increased mostly from the mid-1970s.

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[38] Note that the use of this alternative indicator is unlikely to affect our long-term trends and interpretations as the evolution of T10/B50 and T10/B90 are highly correlated. Using the average income of the bottom 90% group over the bottom 50% group will mechanically decrease the level and the changes in redistribution and inequality (see Table 2).

Panel C of Fig. 4 presents the same index of redistribution with the ratio T10/B90 comparing the benchmark estimate of post-tax income (V1) with the V3 variant where health care spending is allocating proportionally to disposable income. That latter measure is equivalent to disposable income, after tax and monetary transfers. One can see with this figure that redistribution has been mostly in the form of tax and transfers in the U.S. up to the 1970s, at a time this form of monetary redistribution was still limited in France. Since the 1970s, both countries have experienced a form of convergence with a strong increase in monetary transfers in France and an increase in health care spending in the U.S. Comparing estimates of post-tax income with disposable income highlights the importance of including non-monetary transfers in cross-country analysis of redistribution, and not focusing exclusively on the tax and benefit system.

Panel D of Figure 4 presents another alternative assumption for collective expenditures (scenario V2, assuming lump-sum gains of all collective expenditures). The general pattern is very similar except that the level of redistribution is much higher in both countries.

This long-term analysis has highlighted that the reduction of inequality implied by redistribution is significant in both countries and increasing throughout the entire 20th century, even though not at the same pace and in the same period. We now turn to an attempt to decompose changes in post-tax inequality to uncover what have been the main drivers of inequality over the last century.

Section 3.4. Long-term decomposition of changes in inequality indicators

In order to quantify the respective role of falling pretax income inequality and rising redistribution in the long-term decline of post-tax inequality in France, we rely on the following formula:

$$\frac{Ineq_{t2}^{Post}}{Ineq_{t1}^{Post}} = \frac{Ineq_{t2}^{Pre}}{Ineq_{t1}^{Pre}} \times \frac{\frac{Ineq_{t2}^{Dis}}{Ineq_{t2}^{Pre}}}{\frac{Ineq_{t1}^{Dis}}{Ineq_{t1}^{Pre}}} \times \frac{\frac{Ineq_{t2}^{Post}}{Ineq_{t2}^{Dis}}}{\frac{Ineq_{t1}^{Post}}{Ineq_{t1}^{Dis}}} \quad (1)$$

Where $Ineq^{Pre}, Ineq^{Post}$ and $Ineq^{Post}$ are the inequality indicators (e.g., ratio T10/B50) computed using either the concept of pretax (*Pre*), disposable (*Dis*) or Post-tax (*Post*) income, and t_1 and t_2 are the beginning and the end of the period considered. Equation

(1) formalizes the decomposition of post-tax inequality into three terms: i) changes in pretax inequality, ii) changes in redistribution due to taxes and cash transfers, and finally iii) changes in in-kind and collective expenditures.

Table 2 presents this decomposition for the T10/B50 indicator (panel A) and for the T10/B90 indicator (panel B) for both France and the U.S.

For France, the overall decline in post-tax T10/B50 inequality over the 1900-2018 period (-75%) can be ascribed mostly to a decline in pre-tax inequality (-50%), and somewhat to tax and monetary transfers (-21%). Reduction of inequality from in-kind transfers or collective expenditures is comparatively very small (in our baseline scenario -5%).

The evidence is qualitatively similar using the indicator T10/B90 with respectively an overall decline in inequality of -65%, explained mostly by pretax inequality changes (-7%) and taxes and monetary transfers (-13%). For the U.S., the overall reduction in post-tax T10/B90 inequality over the 1913-2018 period (-14%) is the result of an increase in pretax inequality (+7%) corrected by an increasing redistribution from taxes and monetary transfers (-13%) and in-kind transfers and collective expenditures (-8%). However, this long-term analysis masks two very different underlying dynamics. The decline in post-tax income inequality happens during the 1900-1983 period. It is mostly due to the fall in pretax income inequality (89% of the total decline for France, and 77% for the U.S.) and, to a lesser extent, to the rise in redistribution. In contrast, the 1983-2018 period is characterized by a moderate increase in post-tax income inequality in France (+7% in T10/B90). This stability is the result of two opposing forces: rising pretax income inequality (+24% in T10/B90) compensated largely by rising redistribution (-17%). For the same period, the contrast with the U.S. is startling. The overall increase in post-tax inequality (+37%) can be decomposed into an even higher increase in pretax inequality (+51%) only partially reduced by an increase in redistribution (-14%), even if that latter increase is of the same magnitude as the one observed in France. Note that the results are similar when using the indicator T10/B50. As a sensitivity analysis, Appendix Table 2 depicts the same findings using the two other variants of post-tax income (V2 or V3). This is explained by the fact that the contribution of in-kind transfers and collective expenditures to the evolution of post-tax inequality remains small whatever the concept of post-tax income used.

To sum up, these results show that if inequality has decreased much more in France than in the U.S. during the 1900-2018 period, this is not due to a relatively more important increase in redistribution by the French tax and transfer system. The major factor behind the differential trend in post-tax income inequality comes from the differential evolution of pretax income inequality between the two countries.

Over the recent period, the rise in redistribution was similar in both countries. However, it was able to annihilate the slight rise in pretax inequality in France, but not in the U.S. where the increase in pretax income inequality has been much steeper.

Section 3.5 Comparison of pretax and post-tax real income between France and the U.S. 1962-2018

Because pretax and post-tax DINA series are fully consistent with national income, they can be used to consistently compare income levels across countries.

Figure 5 sets the macroeconomic comparison of income levels between France and the U.S. It presents the ratio of French national income per capita relative to the U.S. level from 1962 to 2018. This ratio rose from 60% in the early 1960s to 85% in 1982, then decreased to 70% at the end of the period. To understand this relative income performance, it has been usual to relate it to both productivity catch-up in the first half period, and to a relative decline in hours of work in France relative to the U.S. which has been well documented.[39]

What has not been yet documented is how the average national income trend can be split into distributional analysis. Figure 6 presents such decomposition between B50, M40 and T10 income groups, comparing relative level of pretax and post-tax income (in constant 2018 euros PPP) by income group between France and the U.S. This period is of particular interest as the level of inequality is similar between the two countries in the early 1960s and diverge dramatically since then. Table 3 provides absolute numbers for 1962 and 2018.[40]

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[39] See for instance Blundell et al. (2011, 2013) for an in-depth comparison of the UK, the US and France.
[40] The annual evolution of pretax and post-tax income between France and the U.S. over the 1962-2018 period is provided in Appendix Figure 4 (Panel A to C).

In 1962, both countries depict the same level of pretax and post-tax income inequality. However, there are important cross-country differences due to the large gap in average national income between the two countries (15,000 euros vs. 24,000 euros). As a result, all French income groups earn approximately 60% of their U.S. counterpart in 1962. The recent period contrasts dramatically with the early 1960s. Post-tax income of the French bottom 50% group is now 10% higher than its U.S. counterpart (24,000 vs. 22,000 euros), reflecting a dramatic increase of the bottom 50% FR/U.S. ratio from 61% to 108% over the 1962-2018 period. In contrast, the middle 40% ratio increases only slightly to 73% (42,000 vs. 59,000 euros) and the top 10% ratio decreases to 46% (96,000 vs. 208,000 euros).

Two significant results emerge from this analysis. First, post-tax income of the French bottom 50% group was 60% lower than its U.S. counterpart in 1960, it is now 10% higher. Second, the ratios France/U.S. of pretax and post-tax income has remained very similar during the entire period, highlighting that redistribution has not been the main driver of these changes.

If pretax inequality has been the main driver of the changes in inequality over time in both countries, redistribution has also played an important role. In the next section, we look at the tools of redistribution used in the U.S. and France.

Section 4. Anatomy of Redistribution in France vs the United States.

In this section, we delve into more details of the structure of redistribution, looking at the respective role of taxation and public spending.

Section 4.1 From the structure of taxation to tax progressivity

Figure 7 presents the evolution of the structure of taxes for France (Panel A) and the U.S. (Panel B) over the 1900-2018 period. Taxes represented less than 10% of national income in the early 20th century and increased up to 25% in the early 1950s in both countries. Since the early 1950s, the total tax burden, excluding contributive Social Security contributions, has remained relatively constant in the U.S., hovering around 25%, while it continued to increase in France, reaching 40% in the mid-1990s.[41]

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[41] These figures exclude from the total tax burden contributive Social Security contributions (notably pension contributions) in line with the definition of pretax income. The total tax burden including these

Changes in the structure of taxation. From the start of our series, the structure of taxation appears markedly different in France and the U.S. In the early 20th century, indirect taxes represented in France 92% of total taxes, and capital taxes only 8%. By contrast, in the U.S., capital taxes represented 60% of the total, indirect taxes 26% and income taxes 12%. Over the 20th century, the French tax structure has been dramatically altered, with a decline of the share of indirect taxes in total taxes from 92% to 36% today. Capital taxes and progressive income taxes have significantly risen over this period, but the most striking increase has occurred for Social Security contributions (SSCs). Both contributive (pensions and UI) and non-contributive SSCs have been expanded after WWII but focusing on the non-contributive SSCs–the most similar to other form of taxation–, they reached 40% of the total taxes by the 1990s. This striking change reflects the rise of the French welfare state after 1945, largely influenced by a Bismarckian model whereby SSCs on earnings fund social benefits. From the 1990s onwards, non-contributive SSCs on labor earnings have been reduced, and replaced by flat-rate income taxes – taxing both labor and capital income as the same rate.

In the U.S., the change in the tax structure has affected mostly capital taxes. These have declined from around 60% of total revenues to less than 20%. Indirect taxes have remained at approximately the same level throughout the century, and the most striking evolution has been the development of income taxation, which increased from a low level of 1% of national income in the 1910s to 11% today.

To sump-up, although both countries have experienced significant changes in the structure of taxation over the 20th century, the differences between the two countries remain large. In France, indirect taxation and non-contributive SSCs represent together 60% of total taxes (75% over the 1900-1995 period), while in the U.S. progressive income tax and capital taxes together make the bulk of taxation, with 70% of the total taxes.

Tax progressivity. The structure of taxation provides some clues about the progressivity of the tax system, but comparisons are hazardous without detailed micro data and tax simulations. We can carry out robust analysis of the tax burden by income groups since the 1970s when we have access in both countries to administrative micro data.

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mandatory contributions is represented with a dotted line. France has also experienced an increase in these contributive SSCs post WWII, with a total tax burden reaching 55%, while the difference is more modest for the U.S. with total tax burden around 30%.

Figure 8 presents the evolution of taxes paid by different income groups, the top 10%, middle 40% and bottom 50% in France and the U.S. over the 1970-2018 period. At the start of the period, tax progressivity appears very limited in France, with average tax rates around 31-33% for all groups, while in the U.S. tax progressivity is clearly apparent: the top 10% group faces average tax rates of 32%, like in France, compared to 22% for the middle 40% and 19% for the bottom 50%. During the 1970-1995 period, the overall increase in the tax burden in France affects all income groups, only marginally increasing tax progressivity: average tax rate for the top 10% group increases to 40%, to 39% for the middle 40% and 37% for the bottom 50%. From 1995 onwards, tax progressivity increases sensibly in France in the context of constant overall tax burden: the tax rate of top 10% reaches 48%, while the bottom 50% experiences a decrease of average tax rates to 31%. In contrast, the U.S. has experienced a relative stability in tax progressivity, despite fluctuations of the average tax rate of the top 10% group.[42]

Figure 9 provides a more detailed picture of the evolution of tax progressivity in France and the U.S. by depicting the distribution of tax rates along the income distribution in 1970 and 2018. In France, the move towards more tax progressivity is clearly visible: in 1970, taxes rates increase slightly from 27% to 33% when we move from P10-P20 to P40-50, then remain stable until P99.5, before reaching 39% for P99.9-100. By 2018, the average tax rates have shifted upward for the top 50% of the income distribution, with an almost linear increase from 27% for P10-P20 to 50% for P99-99.9. At the very top of the income distribution (P99.9-100), the increase is less pronounced, from 39% in 1970 to 49% in 2018, leading to a small regressivity in French tax rates. On the other hand, the tax increase is highest for the first half of the top 1% (P99-99.5), whose average tax burden jumped from 32% to 50%.

In the U.S., tax progressivity is much more important than in France in 1970. Average tax rates increased from 15% for P10-P20 to 54% for P99.9-100. By 2016, the U.S. tax burden has shifted downwards, but not equally for all income groups. Two parts of the income distribution have experienced the most decline in tax rates: first, the middle of the income distribution, from P20 to P70, has seen a reduction of average tax rates of 3-4 percentage points[43]; second, the top 5 percent of the income distribution has seen

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[42] Average tax rates of the bottom 50% and top 10% groups have declined slightly over the 1970-2018.
[43] Note that we have classified EITC as a monetary transfer (see next section). Tax rates are therefore computed gross of EITC.

its tax burden reduced by at least 3 percentage points, with the highest decline for the top 0.1%, where tax rates have declined from 54% in 1970 to 38% in 2018. [44]

Interestingly, French and U.S. tax rates at the very top have followed opposite trends. The tax rate faced by the French top 0.1% increased dramatically over the 1970-2018 period and is now equal to the level faced by the U.S. top 0.1% in 1970. In contrast, the tax rate faced by the U.S. top 0.1% has declined dramatically and converges toward the level faced by the French top 0.1% in 1970.

Explaining the change in tax progressivity. Figures 10 and 11 present the decomposition of tax structure in France and the U.S. along the income distribution for selected years from 1970 to 2018 (additional years are available in Appendix[45] [46]). From 1970 to 1996, indirect taxes and non-contributive SSCs have driven the overall tax increase in France. This has affected most of the income groups, except individuals in the top 0.1%, who have seen a small decline in their tax burden from reduction in the progressive income tax. From 1996 to 2016, the progressivity of the French tax system was dramatically increased by two subsequent policy changes: first, a reduction in non-contributive SSCs for the bottom of the income distribution[47], and second a significant increase in progressive income taxes and capital taxes for the top 30%. The recent years (2016-2018) have seen a removal of the wealth tax on financial assets and the introduction of a flat-rate income tax on capital incomes, which has reduced the tax burden for the very top of the income distribution (P99.5-P100).

In the U.S., most of the change in tax progressivity can be accounted for by the reduction in capital taxes at the top of the distribution (mainly due to the shrinking of corporate taxes), and by a reduction in progressive income taxes for the middle group from P20 to P70.

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[44] As shown by Saez and Zucman (2019), the profile of taxation is regressive at the very top once we disentangle the top 0.1% between P99.9-99.99 and P99.99-100 in 2018. See also Saez and Zucman (2019) for a detailed analysis of the long-run changes in tax progressivity in the U.S. and the distributional effects of the recent reforms of the U.S. tax system.

[45] See Appendix Figure 5 (Panel A and B) for additional years.

[46] Note that there are several other ways of looking at the progressivity of the tax system (See Appendix Figures 6 Panel A to C). One alternative way to proceed would be to look at the distribution of factor income among working age adults, and to consider all taxes, including "contributive taxes". Another way to look at progressivity is to rank individuals by wealth percentile rather than by income percentile, or by using some combination of income and wealth, for instance some form of "augmented income" concept, define as the sum of income and wealth divided by life expectancy. We think all these approaches are meaningful and complementary to one another.

[47] See also Bozio, Breda and Guillot (2020) for a detailed analysis of the impact of these reforms to payroll taxation in France on labor market inequality, and their interactions with minimum wage changes.

Overall these data highlight the large impact of changes in the overall structure of taxation. The relative weight of indirect taxation and non-contributive SSCs versus capital taxes and progressive income taxes affect structurally tax progressivity in the two countries under study.

Section 4.2 The role of monetary transfers for redistribution

We now look at the spending side of redistribution, by analyzing the role of transfers, in the evolution of redistribution in France and the U.S. We first look at the long-run change in the composition of transfers, distinguishing between monetary transfers, in-kind transfers (in particular education and health) and collective consumption goods (including police, public infrastructures, etc.).

Evolution of public spending over the 20th century. Figures 12a and 12c present the evolution and composition of public spending–outside contributive social insurance–respectively in France and the U.S. In both countries, public spending has increased dramatically from the beginning of the 20th century to the mid-century.

In France, public spending increased from 7% of national income in 1910 to approximately 34% in 2018.[48] Most of the increase is concentrated in the decade following WWII, with the creation of the French welfare state (public health care insurance, universal child benefits, etc.). Another expansion appears during the 1974-1984 period, notably with healthcare expenditures. Monetary transfers (including child benefits, means-tested benefits, or housing benefits) represent a small part of total spending, i.e., around 4% of national income.

In the U.S., public transfers increased from 8% of national income in 1913 to 26% today. Most of the change happened in the aftermath of the Great Depression that led to the creation of the American welfare state, though the share of public spending continued to increase after WWII and during the 1960s. In comparison to France, monetary transfers and health care expenditure represent a much smaller part, despite a continuous increasing trend from the 1980s onwards–in part at the expense of collective expenditures (down from 14% of national income in the early 1980s to 11.5% in the late 2010s).

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[48] In line with the previous analysis of taxes, we exclude here spending on contributory pensions and unemployment insurance benefit.

The contribution of monetary transfers to redistribution. Taking advantage of our administrative micro data, we now focus on the role played by monetary transfers since the 1970s. While they are a small part of total public transfers both in France and in the U.S., they have a strong impact on individuals' disposable income and are a crucial tool of any welfare state. In Figure 13, we present the average monetary transfers received by the different income groups previously defined, for France (panel A) and the U.S. (panel B).

For France, the long-term evolution has been a reduction of universal (non means-tested) child benefits and related family transfers (e.g., benefits for non-working mothers) and a strong increase in means-tested benefits like income support and housing benefits (see Fig. 12b).[49] This compositional change has impacted the distribution of monetary transfers (see Fig. 13a), with a reduction of transfers received by the top 10% and the middle 40% and an increase for the bottom 50% - i.e., average transfers received by B50 increased from 2.7% to 6% of national income over the period 1970-2018.[50]

Figure 13.b presents similar estimation for the U.S. In the 1970s and 1980s, monetary transfers received by the top 10% and the middle 40% declined substantially to the benefit of the bottom 50%. In 2007-2010, in the aftermath of the Great Repression, monetary transfers increased markedly for the bottom 50% and middle 40%. After 2008, extraordinary government programs were implemented. Besides tax credits for low- and middle-income families, it consisted in an increase in funding and access to food assistance programs for low-income families, extension of unemployment benefits, and increases in amount of EITC (see Almedia 2020 for a detail of changes in redistribution).

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[49] Housing benefits have played a significant role in this increase in redistribution. Until the late 1970s, subsidized housing consisted mainly of government funded construction. But this policy did not target the poorest households (since many households managed to stay in the subsidized units after their income had become too high to allow them to stay). At the end of the 1970s, the government decided to change its housing policy towards housing benefits, instead of public housing projects. See Fack (2006) for a detailed discussion about changes in housing policies. Regarding means-tested benefits, disabled adults allowance increased in the 1970s, while the late 1980s saw the creation of a minimum income benefit (the *Revenu minimum d'insertion*, RMI) dedicated to the poorest households as an income support of last resort. This benefit was replaced in 2009 by the *Revenu de solidarité active* (RSA).

[50] In 1998, the top 10% income group in France experienced a significant drop in transfers received, corresponding to the introduction of means-testing in child benefits, a reform which was repealed the following year, but re-introduced in 2015.

Overall redistribution through monetary transfers has increased in both countries, but the size of these transfers, notably towards the bottom 50%, has been much more pronounced in France, compared to the U.S.

Section 6. Discussion: from redistribution to predistribution?

To summarize our main results, pretax income inequality appears to be the main factor to account for differential level and trend in inequality between France and the U.S. over the 20th century. Redistribution plays an important role today in reducing post-tax inequalities in both the U.S. and France, by 43-44% using our benchmark measure of the ratio T10/B50. But this reduction of inequalities by direct redistribution has only contributed for a quarter of the total change in inequalities over the period.

An inadequate take-away would be that the non-monetary transfers (e.g., education spending, public goods) have only a very small impact on the evolution of inequality within country or on the differences in inequality across countries. We believe, on the contrary, that our analyses highlight that a large set of policies can have an impact on pre-tax inequality (within country and over time) that would not be captured with the usual concept of redistribution because this analytical tool can only capture direct redistribution from a given pre-tax income inequality. In capturing redistribution, it misses "predistribution".

Generally speaking, one can define predistribution as the set of policies that can affect the distribution of pretax income. This includes potentially a large set of policies and institutions, including the education system (particularly the inequality in education spending across social groups), labor market regulations (e.g., the level of the minimum wage and the various legal rules affecting the role of unions and the bargaining power of workers), and other policies affecting the distribution of primary assets and capabilities (including the health care system, the inequality of wealth and inheritance, etc.). The tax system has also an influence on pre-tax income: first, because taxes are needed to pay for publicly funded education and other public policies, second because taxation can lead to behavioral responses affecting labor and capital income, and third because progressive taxation of income and wealth can also affect the formation of top end compensation packages and wealth inequality (see e.g., Piketty, Saez and Stantcheva 2014; Piketty 2014; Piketty, Postel-Vinay and Rosenthal 2018).

Needless to say, we are unable in the context of the present paper to identify the exact role played by predistribution to account for differential level and trend in pretax inequality between France and the U.S. However, our findings clearly show that differences in post-tax income inequality between the two countries are explained by differences in pretax inequality rather than differences in redistribution. This implies that research and policy discussions should, in the future, focus on predistribution as much as on redistribution. In particular, a greater attention should be devoted to the study of the various policies and rules that can account for the fact that pretax inequality is so much larger in the U.S. than in France.

Section 6. Conclusion

In this paper, we have presented post-tax Distributional National Accounts (DINA) for France. That is, we have combined national accounts, tax and survey in a comprehensive and consistent manner to build homogenous annual series on the post-tax, post-transfer distribution of national income by percentiles over the 1900-2018 period, with detailed breakdown by age, tax and transfer categories over the 1970-2018 period.

Our main conclusion is that changes in pretax inequality levels seem to play the central role in explaining the long-term evolution of the distribution of post-tax income in France. The same conclusion also applies if one attempts to account for the difference in inequality levels between France and the United States. These findings suggest that policy discussions on inequality should in the future pay more attention to policies affecting pretax inequality and should not focus exclusively on "redistribution" (i.e., redistributive taxes and transfers, for a given level of pretax inequality).

We should stress again that our methods and results should be viewed not as a final product, but rather as part of an on-going attempt to provide more and more complete and transparent inequality statistics. As better sources and methods become available, we will revise and improve our series accordingly.

Finally, we emphasize that many of the important policy issues touched upon in this work – e.g., regarding the respective role of predistribution and redistribution – can only be analyzed more fully when we have more countries with consistent pretax and posttax DINA series. It is the purpose of the WID.world project to encourage and

standardize the collection of such inequality series, so as to allow for a better-informed public discussion on these important issues.

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Table 1. How much does redistribution reduce inequality, France vs. US, 2010-2018 ?

	France			United States		
	Pretax	Post-tax	Post-tax /Pretax-1	Pretax	Post-tax	Post-tax /Pretax-1
Income shares (averages 2010-2018)						
Top 10%	32%	25%	-21%	44%	37%	-17%
Middle 40%	46%	44%	-4%	42%	43%	2%
Bottom 50%	22%	31%	40%	14%	21%	46%
Inequality indicators (ratios between average incomes)						
Total inequality (T10/B50)	7.2	4.1	-44%	15.8	9.0	-43%
Upper inequality (T10/M40)	2.7	2.3	-18%	4.3	3.5	-19%
Lower inequality (M40/B50)	2.6	1.8	-31%	3.7	2.6	-30%
Simplified Total inequality (T10/B90)	4.2	3.0	-28%	7.2	5.3	-27%

Notes: Total inequality, as measured by the ratio between the average incomes of the top 10% and the bottom 50%, drops from 7.2 to 4.1 in France on average over the 2010-2018 period, i.e. by 44%, when we look at the distribution of post-tax income (after all taxes and public spending) rather than at the distribution of pretax income.

Table 2. Decomposition of the evolution of post-tax income inequality: France vs. U.S.

	France			United States		
	1900-2018	1900-1983	1983-2018	1913-2018	1913-1983	1983-2018
Panel A: T10/B50 inequality indicator						
Changes in post-tax income inequality	-75%	-76%	1%			48%
Due to changes in pretax inequality	-50%	-64%	26%			67%
Due to changes in redistribution due to taxes and cash transfers	-21%	-9%	-21%			-9%
Due to changes in in kind and collective expenditures (relative to disposable income)	-5%	-2.5%	-4%			-10%
Panel B: T10/B90 inequality indicator						
Changes in post-tax income inequality	-65%	-67%	7%	-14%	-37%	37%
Due to changes in pretax inequality	-47%	-59%	24%	7%	-29%	51%
Due to changes in redistribution due to taxes and cash transfers	-13%	-5%	-13%	-13%	-6%	-7%
Due to changes in in kind and collective expenditures (relative to disposable income)	-4%	-2%	-3%	-8%	-2%	-7%

Notes: Post-tax inequality relies on the benchmark scenario (scenario V1) which allocates health-care expenditures on a lump-sum basis, and education spending and collective expenditures proportionally to post-tax disposable income.

Table 3. Average real income by income group, France vs. U.S., 1962-2018

	1962			2018		
	Pretax	Post-tax	Ratio Post/Pre	Pretax	Post-tax	Ratio Post/Pre
Panel A: France						
Full Population	14 730 €			38 548 €		
Bottom 50%	5 705 €	6 833 €	120%	16 957 €	23 864 €	141%
Middle 40%	16 711 €	16 387 €	98%	44 257 €	42 474 €	96%
Top 10%	51 932 €	47 590 €	92%	123 666 €	96 266 €	78%
Panel B: U.S						
Full Population	24 150 €			55 248 €		
Bottom 50%	9 757 €	11 260 €	115%	15 592	22 129	142%
Middle 40%	26 862 €	27 814 €	104%	56 608	58 550	103%
Top 10%	85 238 €	73 951 €	87%	248 087	207 566	84%
Panel C: Ratio France/US						
Full Population	61%			70%		
Bottom 50%	58%	61%		109%	108%	
Middle 40%	62%	59%		78%	73%	to
Top 10%	61%	64%		50%	46%	

Notes: The unit is the adult individual (20-year-old and over; income of married couples is splitted into two). Income corresponds to national income. Fractiles are defined relative to the total number of adult individuals in the population.

Figure 1. Pretax income inequality: France vs. U.S., 1900-2018

Legend:
- Top 10% France
- Middle 40% France
- Bottom 50% France
- Top 10% US
- Middle 40% US
- Bottom 50% US
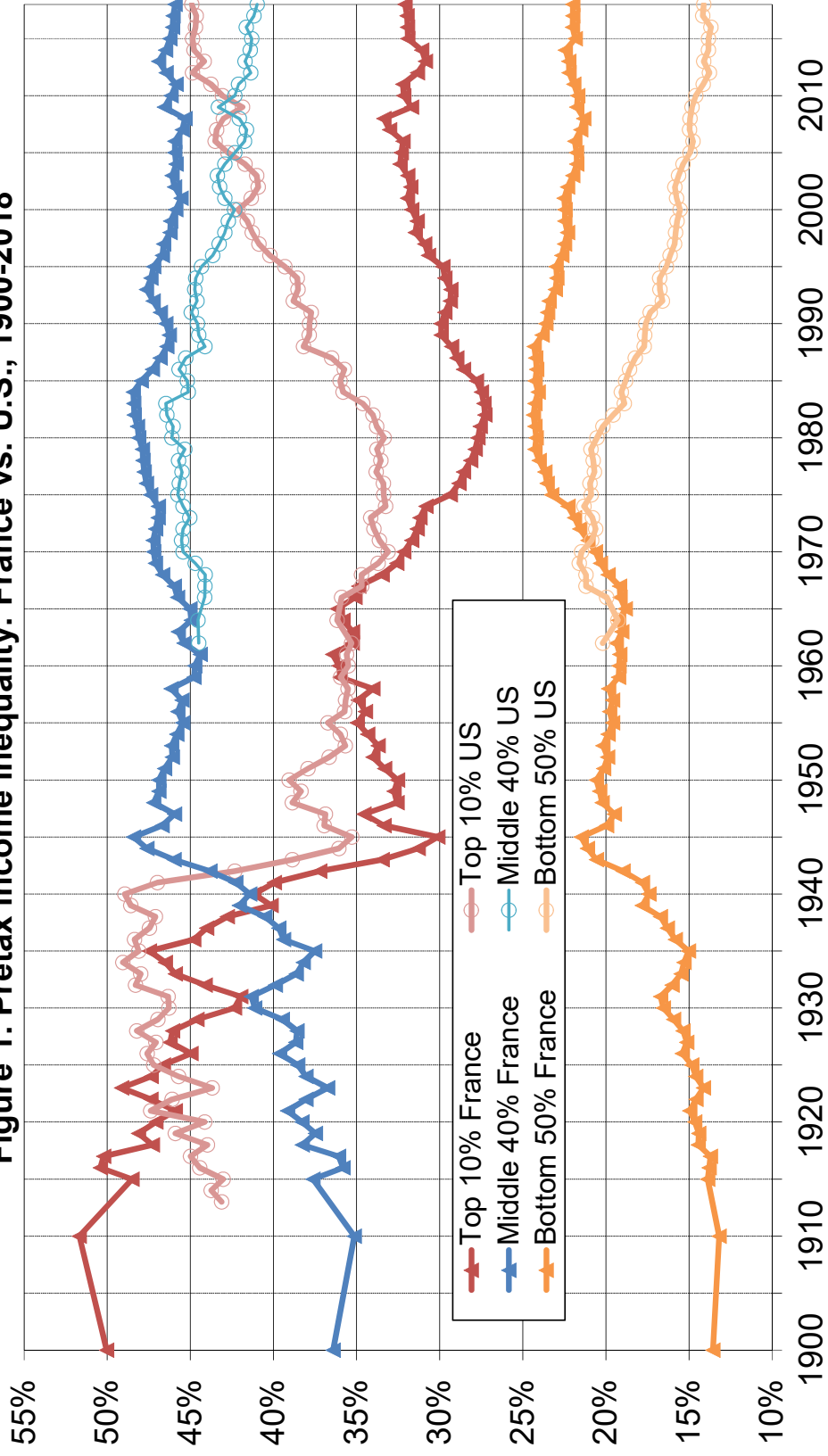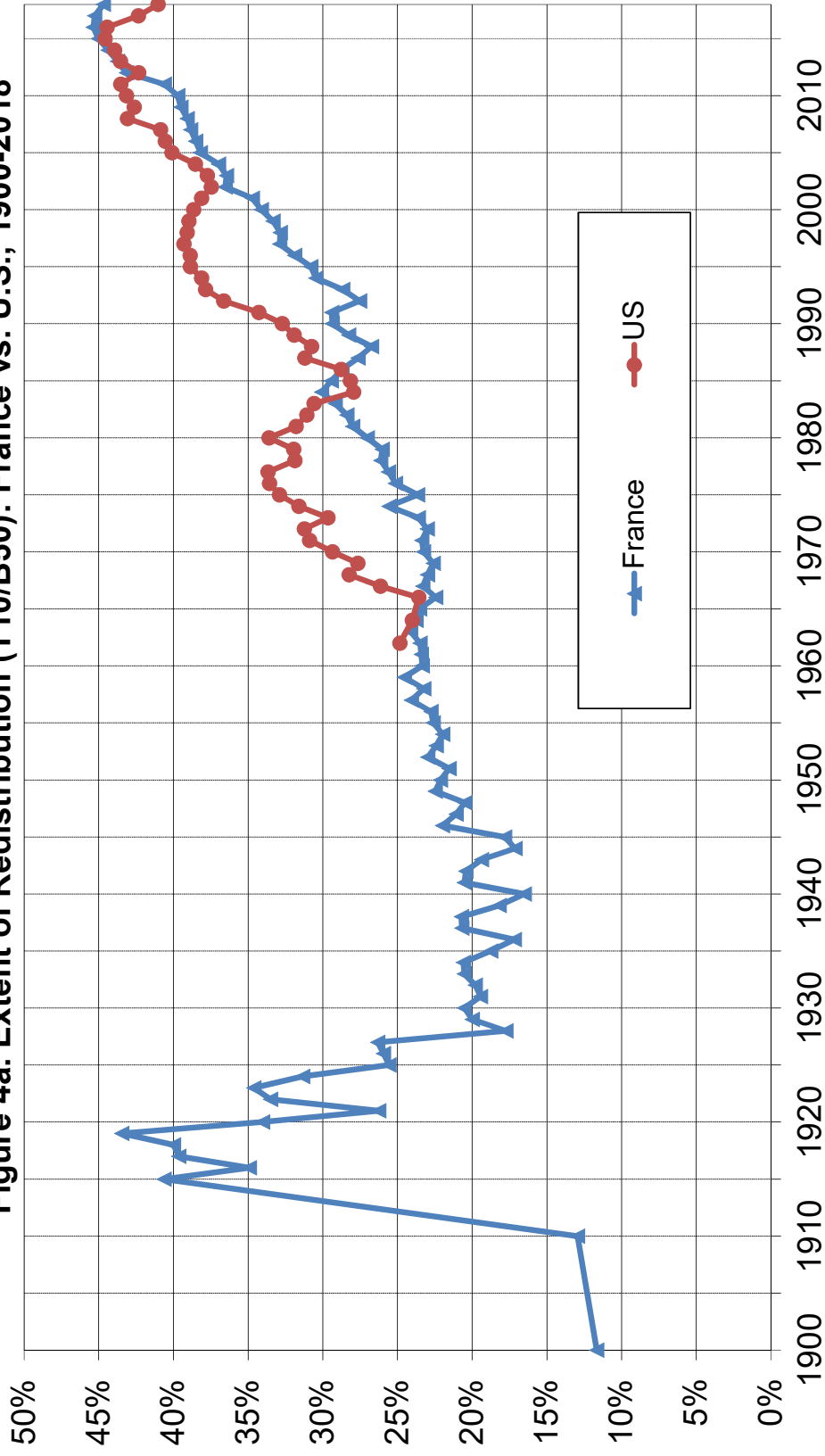
Distributions of pretax national income among equal-split adults (income of married couples divided by two).
Estimates for the U.S are from Piketty, Saez and Zucman (2018).

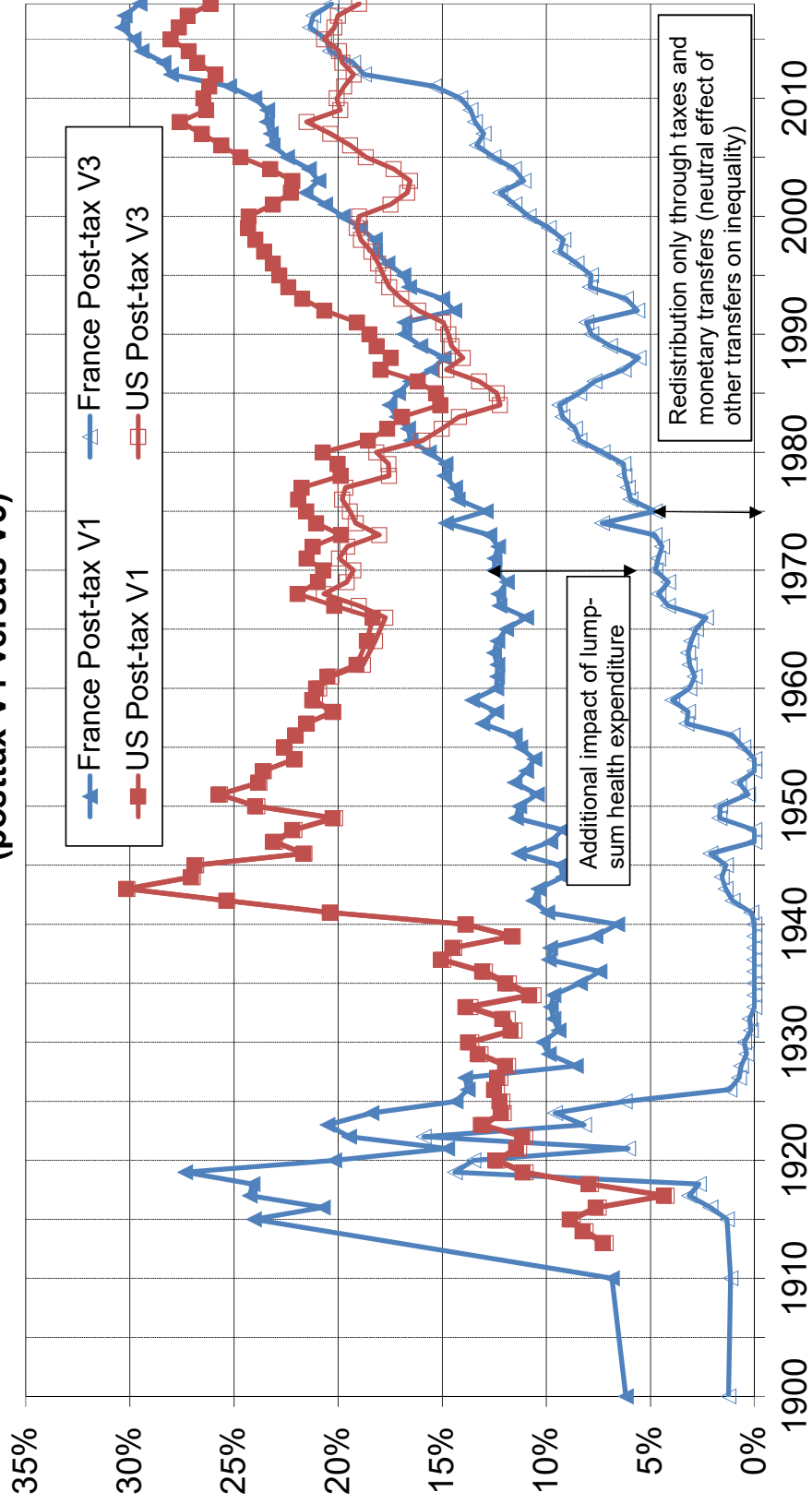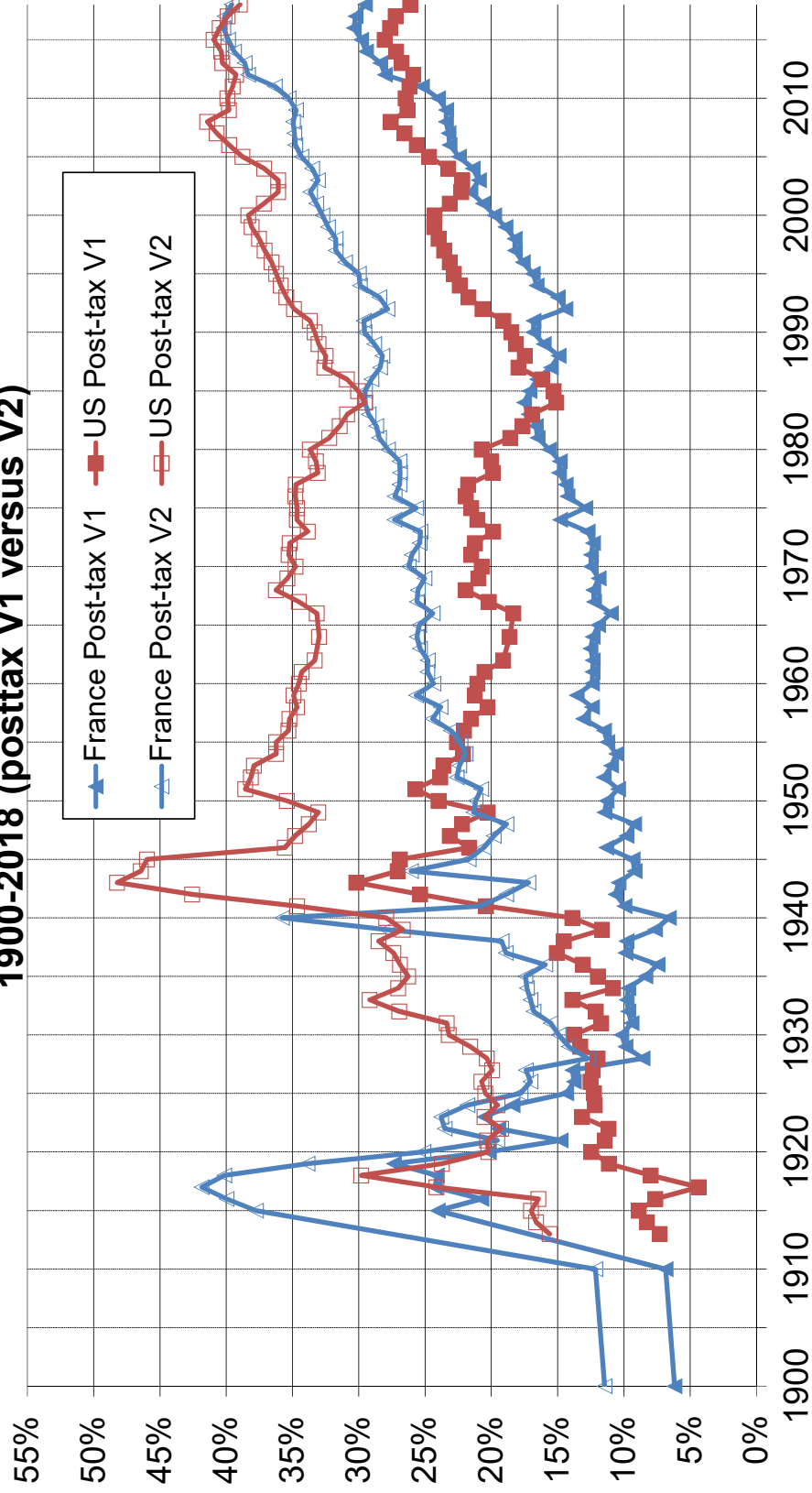Figure 2a. Pretax vs. Post-Tax Income Inequality in France, 1900-2018

Distributions of pretax national income and disposable income among equal-split adults (income of married couples divided by two).

Legend:
- Top 10% (pretax income)
- Middle 40% (pretax income)
- Bottom 50% (pretax income)
- Top 10% (post-tax income)
- Middle 40% (post-tax income)
- Bottom 50% (post-tax income)
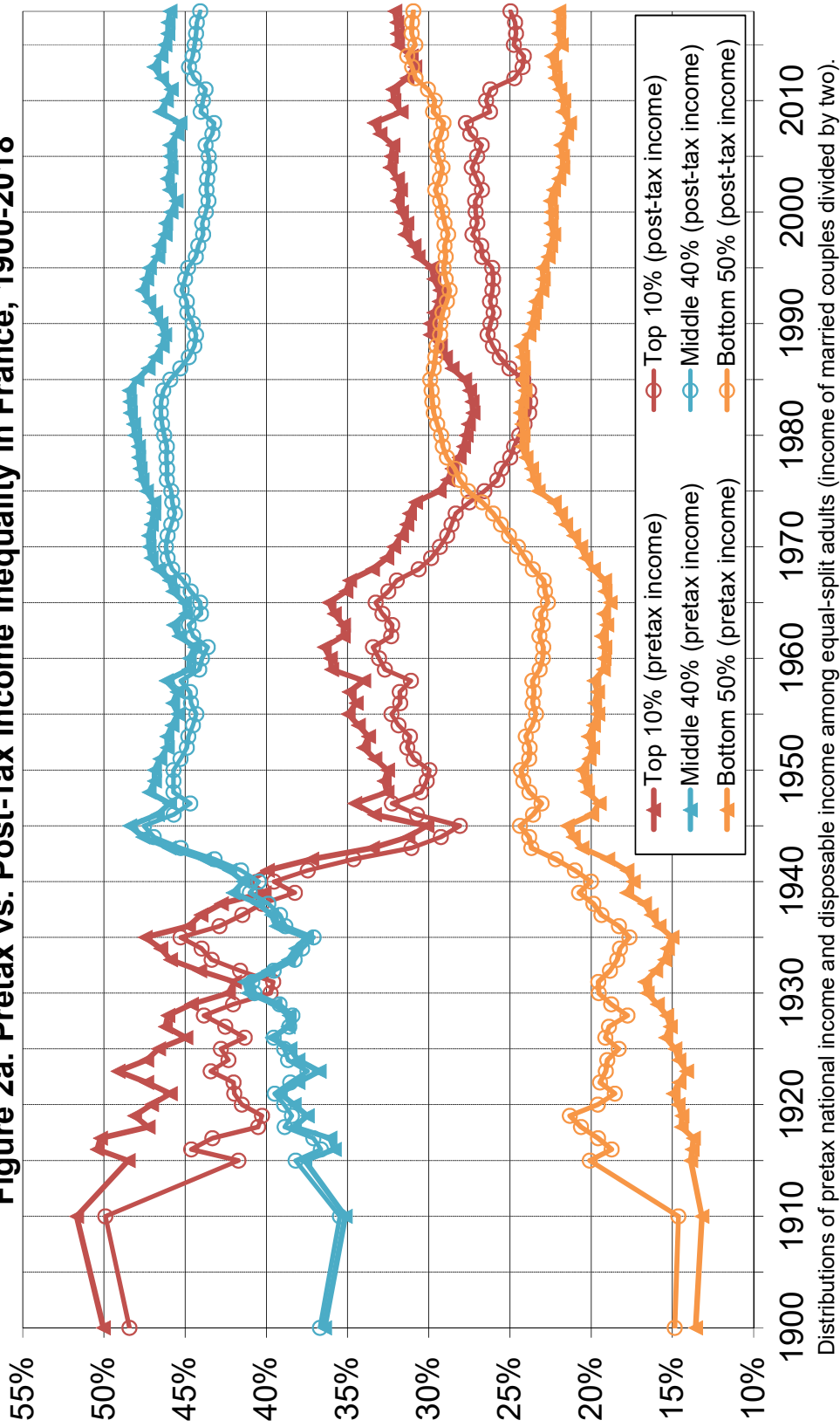
Figure 2b. Pretax vs. Post-Tax Income Inequality in the U.S., 1913-2018
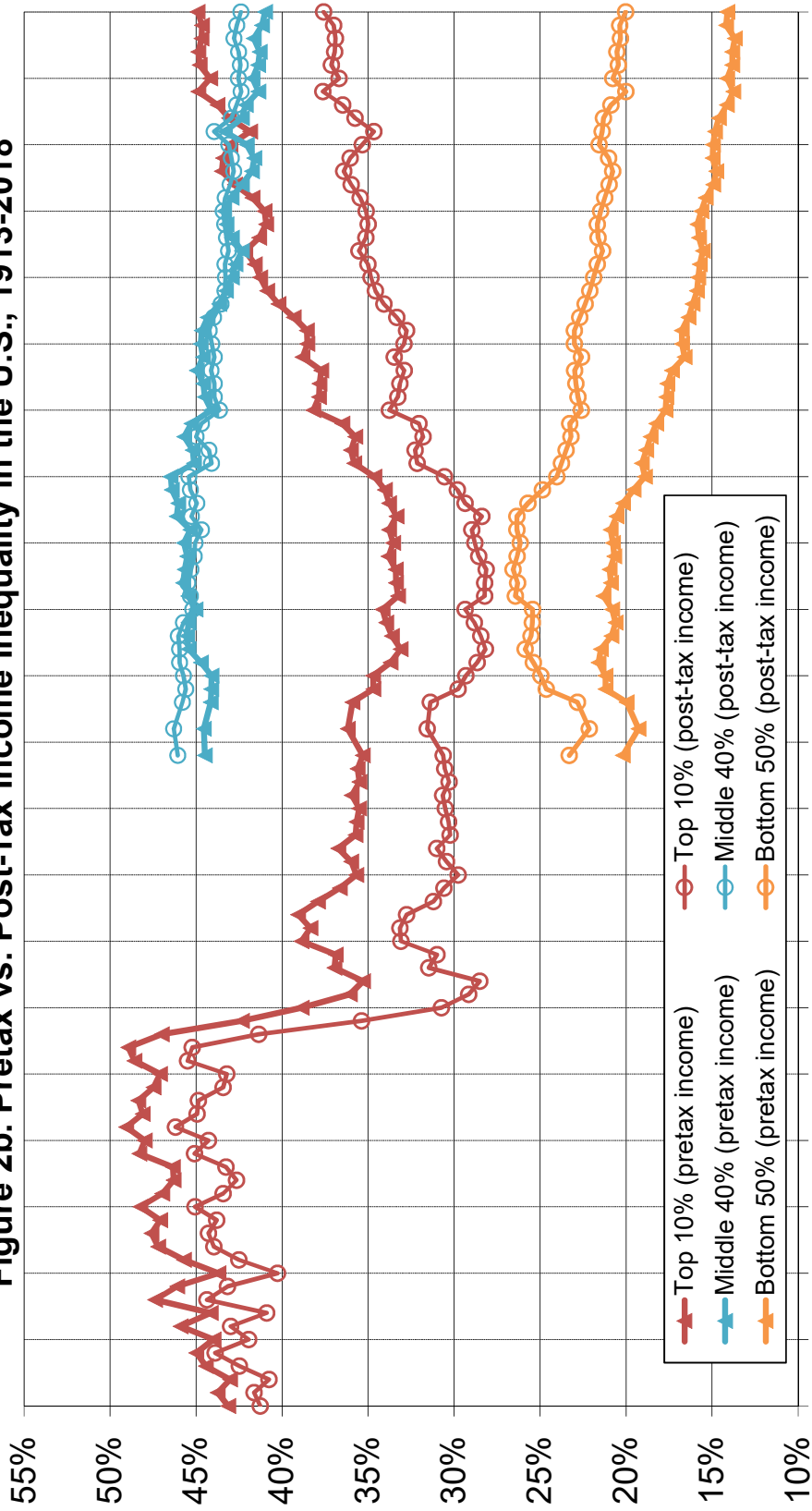
Legend:
- Top 10% (pretax income)
- Middle 40% (pretax income)
- Bottom 50% (pretax income)
- Top 10% (post-tax income)
- Middle 40% (post-tax income)
- Bottom 50% (post-tax income)

Distributions of pretax national income and disposable income among equal-split adults (income of married couples divided by two).

Figure 3a. Inequality and Redistribution: France vs. U.S. (T10/B50 inequality indicator)
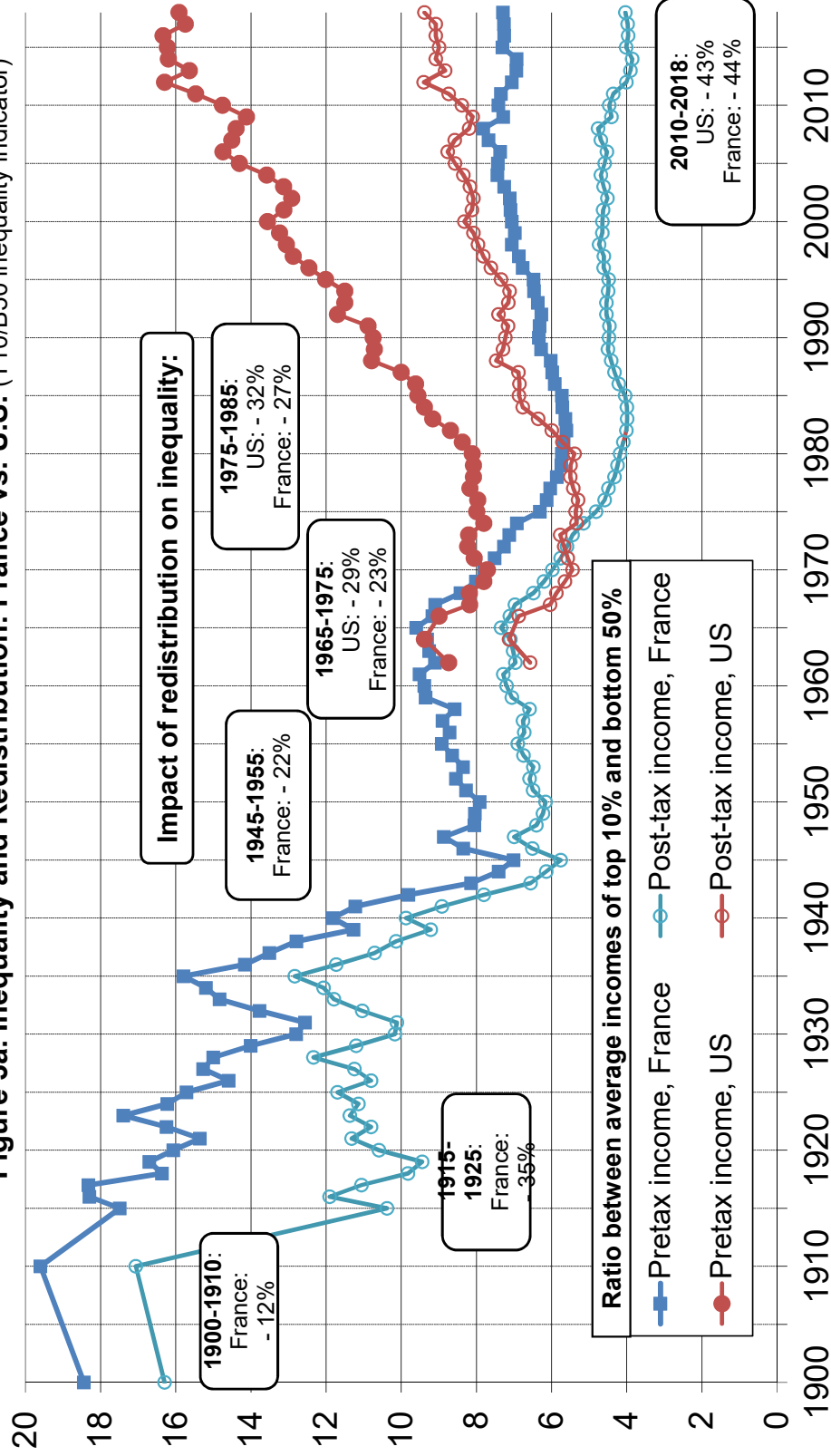
Impact of redistribution on inequality:

1900-1910:
France: - 12%

1915-1925:
France: - 35%

1945-1955:
France: - 22%

1965-1975:
US: - 29%
France: - 23%

1975-1985:
US: - 32%
France: - 27%

2010-2018:
US: - 43%
France: - 44%

Ratio between average incomes of top 10% and bottom 50%

Pretax income, France
Pretax income, US
Post-tax income, France
Post-tax income, US

Distributions of pretax national income and post-tax income among equal-split adults (income of married couples divided by two). Estimates for the U.S are from Piketty, Saez and Zucman (2018).

Figure 3b. Inequality and redistribution: France vs. U.S. (T10/B90 inequality indicator)

Impact of redistribution on inequality:

1925-1935:
US: - 12%
France: - 11%

1945-1955:
US: - 23%
France: - 11%

1975-1985:
US: - 19%
France: - 16%

2010-2018:
US: - 27%
France: - 28%

Ratio between average income of top 10% and bottom 90%

Pretax income, France
Post-tax income, France
Pretax income, US
Post-tax income, US
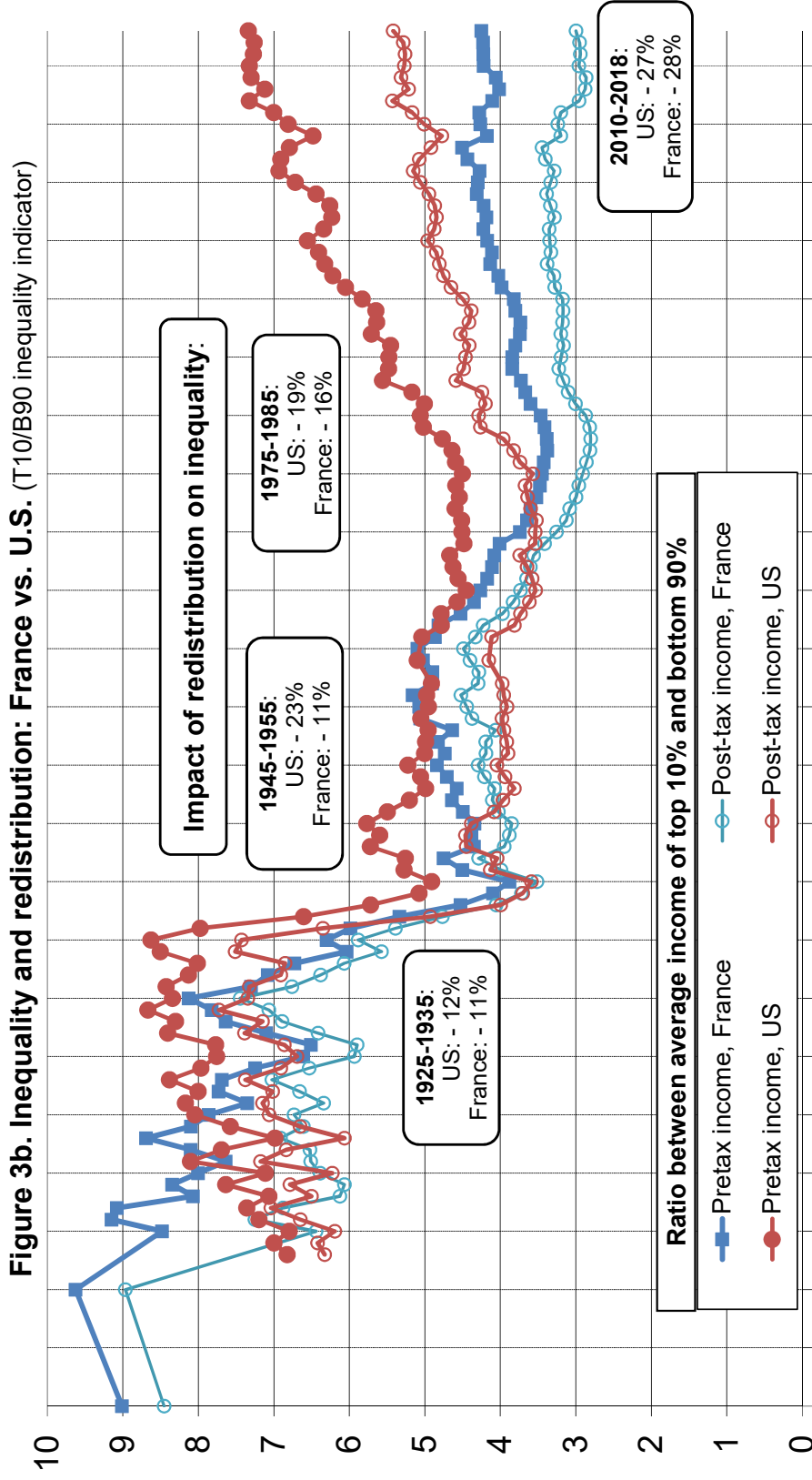
Distributions of pretax national income and post-tax income among equal-split adults (income of married couples divided by two).
Estimates for the US are from Piketty, Saez and Zucman (2018).

Figure 4a. Extent of Redistribution (T10/B50): France vs. U.S., 1900-2018

Distributions of pretax and post-tax income among equal-split adults (income of married couples divided by two).
Estimates for the U.S are from Piketty, Saez and Zucman (2018).

Figure 4b. Extent of Redistribution (T10/B90): France vs. U.S., 1900-2018
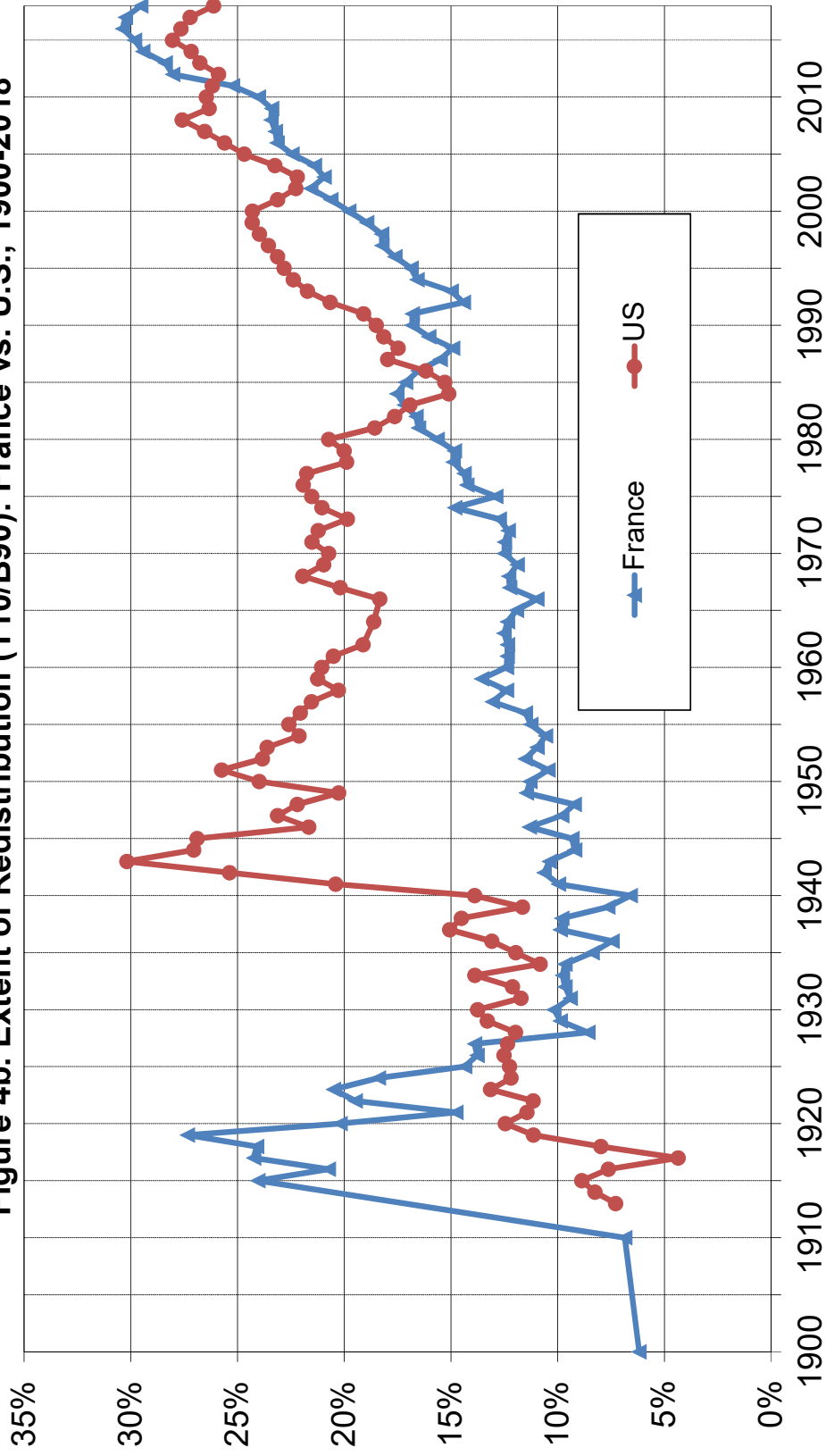
Distributions of pretax and post-tax income among equal-split adults (income of married couples divided by two).
Estimates for the U.S are from Piketty, Saez and Zucman (2018).

Figure 4c. Extent of Redistribution (T10/B90): France vs. U.S., 1900-2018 (posttax V1 versus V3)

Distributions of pretax and post-tax income among equal-split adults (income of married couples divided by two). Estimates for the U.S are from Piketty, Saez and Zucman (2018).

Figure 4d. Extent of Redistribution (T10/B90): France vs. U.S., 1900-2018 (posttax V1 versus V2)

- France Post-tax V1   ■ US Post-tax V1
- France Post-tax V2   □ US Post-tax V2

Distributions of pretax and post-tax income among equal-split adults (income of married couples divided by two).
Estimates for the U.S are from Piketty, Saez and Zucman (2018).

Figure 5. Average income and productivity: ratio France/USA, 1962-2018

France: 57.2 €
USA   : 56.2 €
Ratio : 102%

France: 38 550 €
USA   : 54 870 €
Ratio : 70%

- National income per adult
- GDP per hour worked
- Hours worked per worker
- Employment-to-adult population ratio
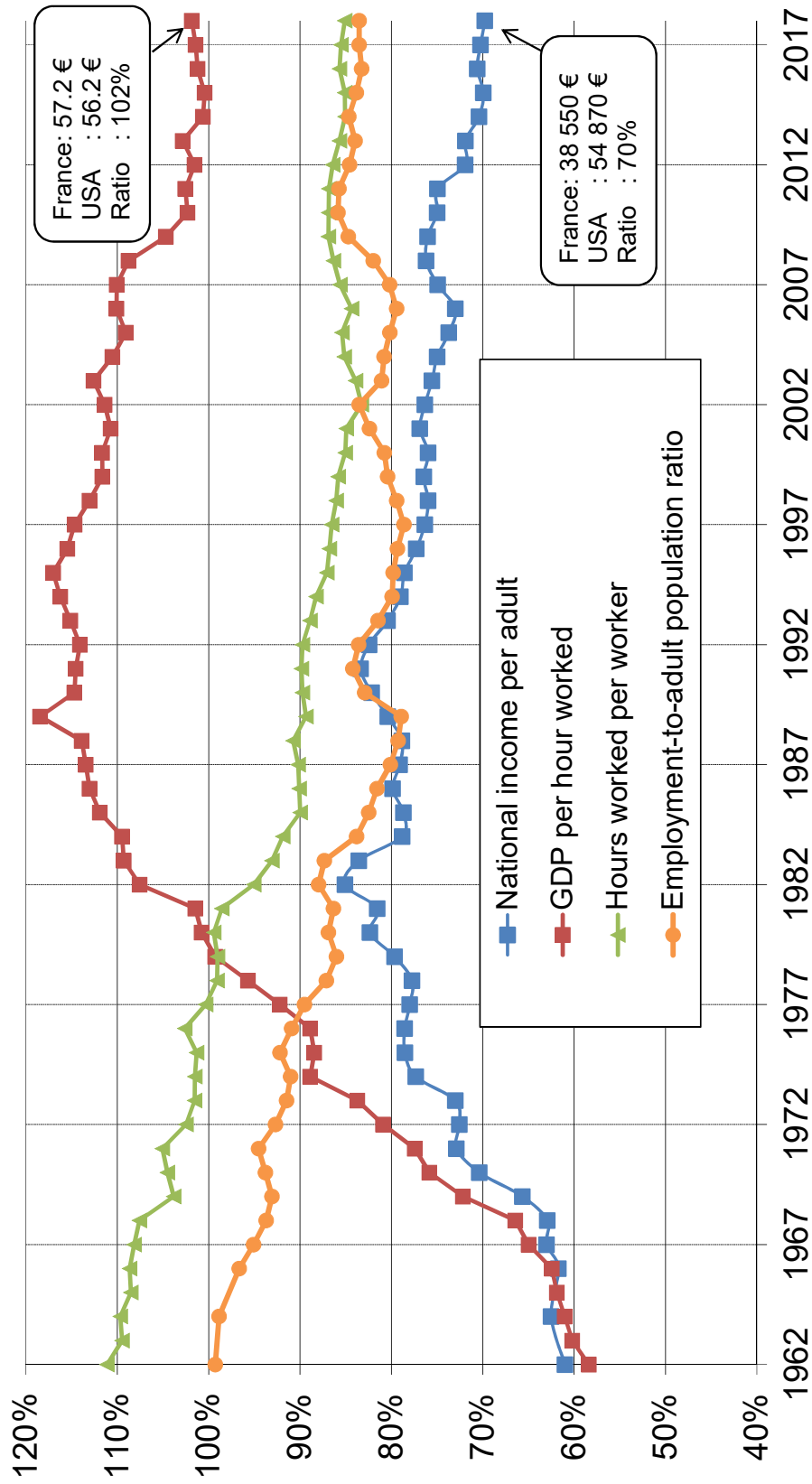
Ratios France/USA for GDP per hour of work (OECD series) and per adult national income (WID.world).
Both series are expressed in PPP 2018 €.

Figure 6. Average real income by income group: ratio France/U.S.
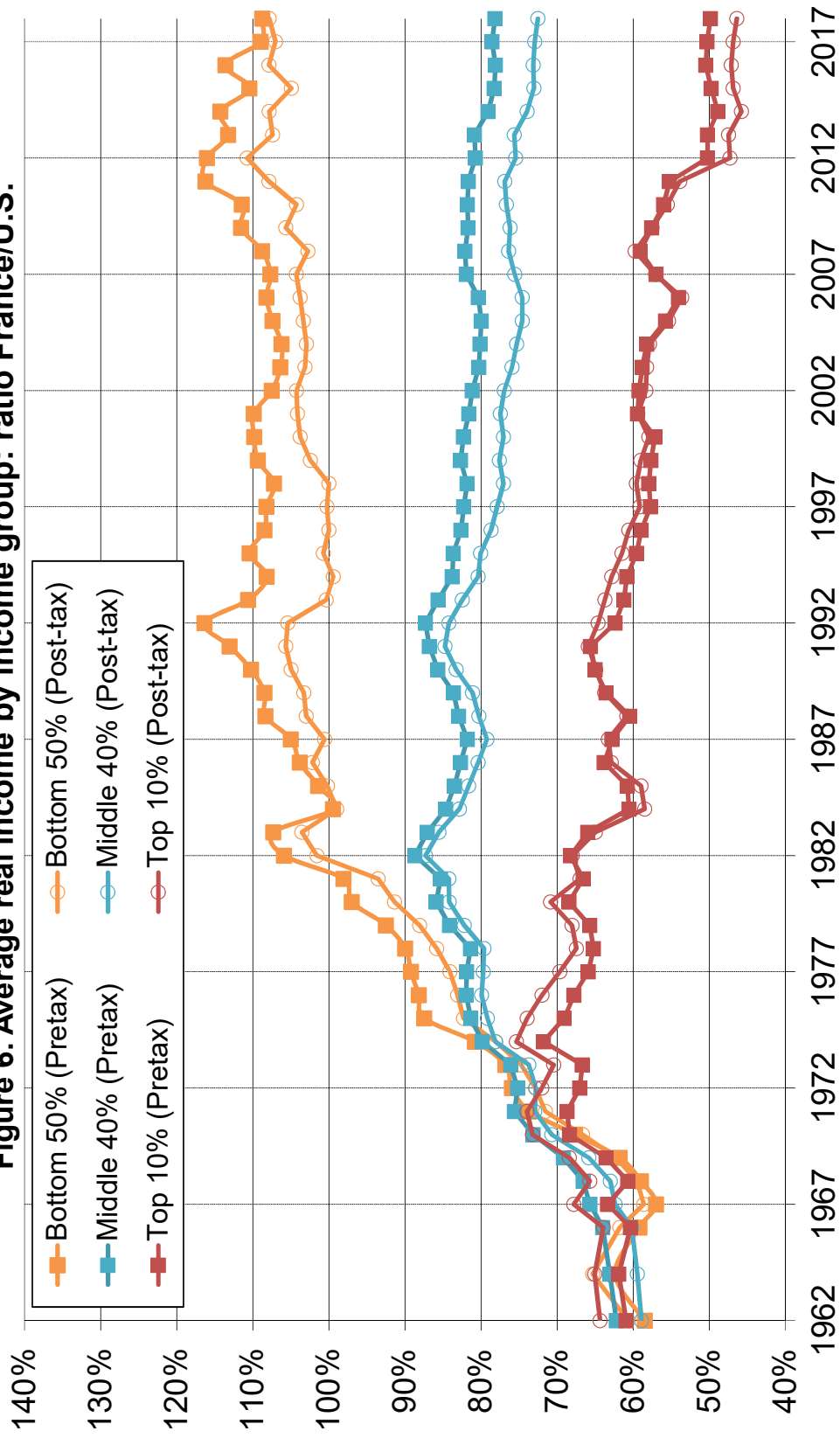
Figure 7.a Structure of taxes (% national income), France 1900-2018
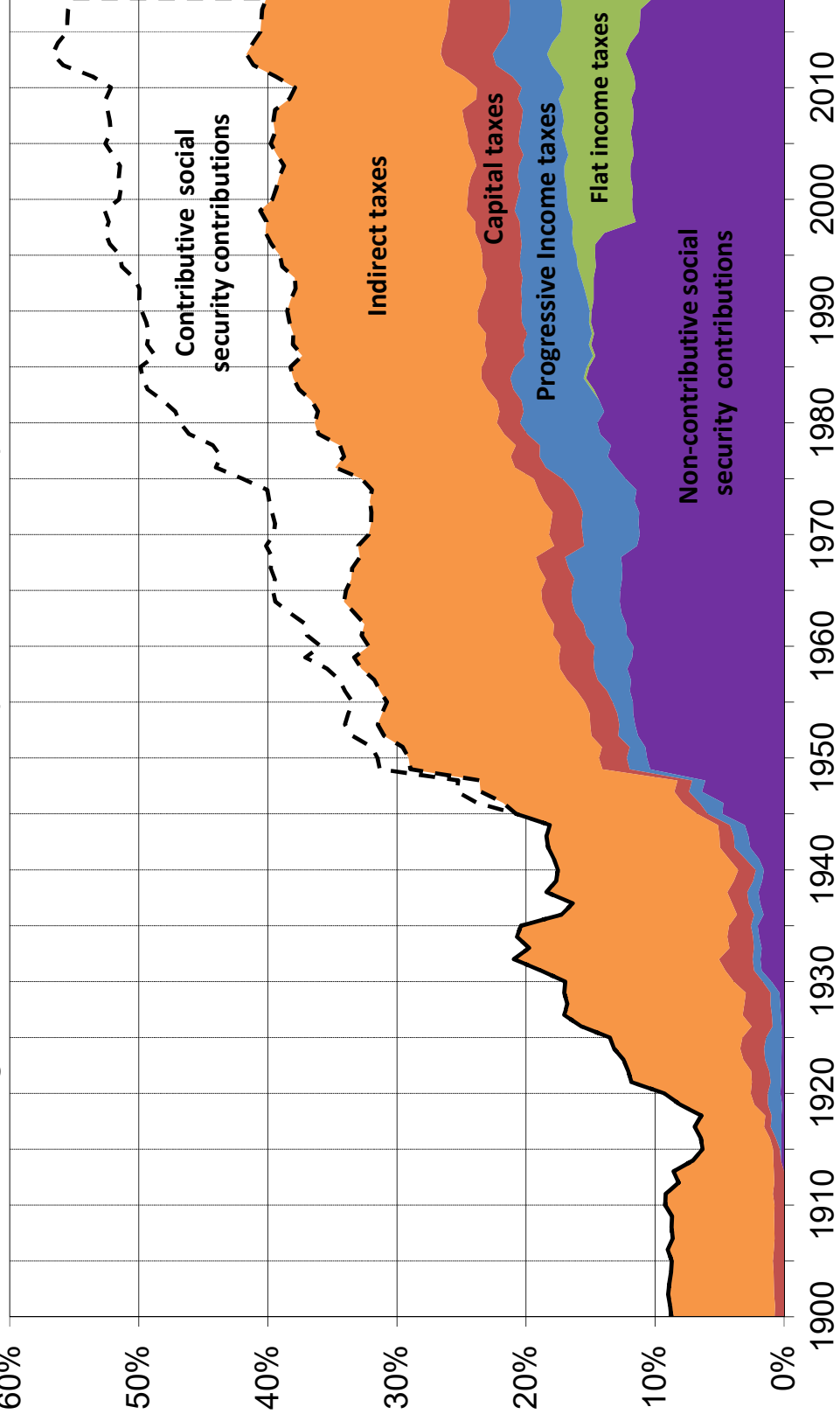
Figure 7.b Structure of taxes (% national income), U.S. 1913-2018
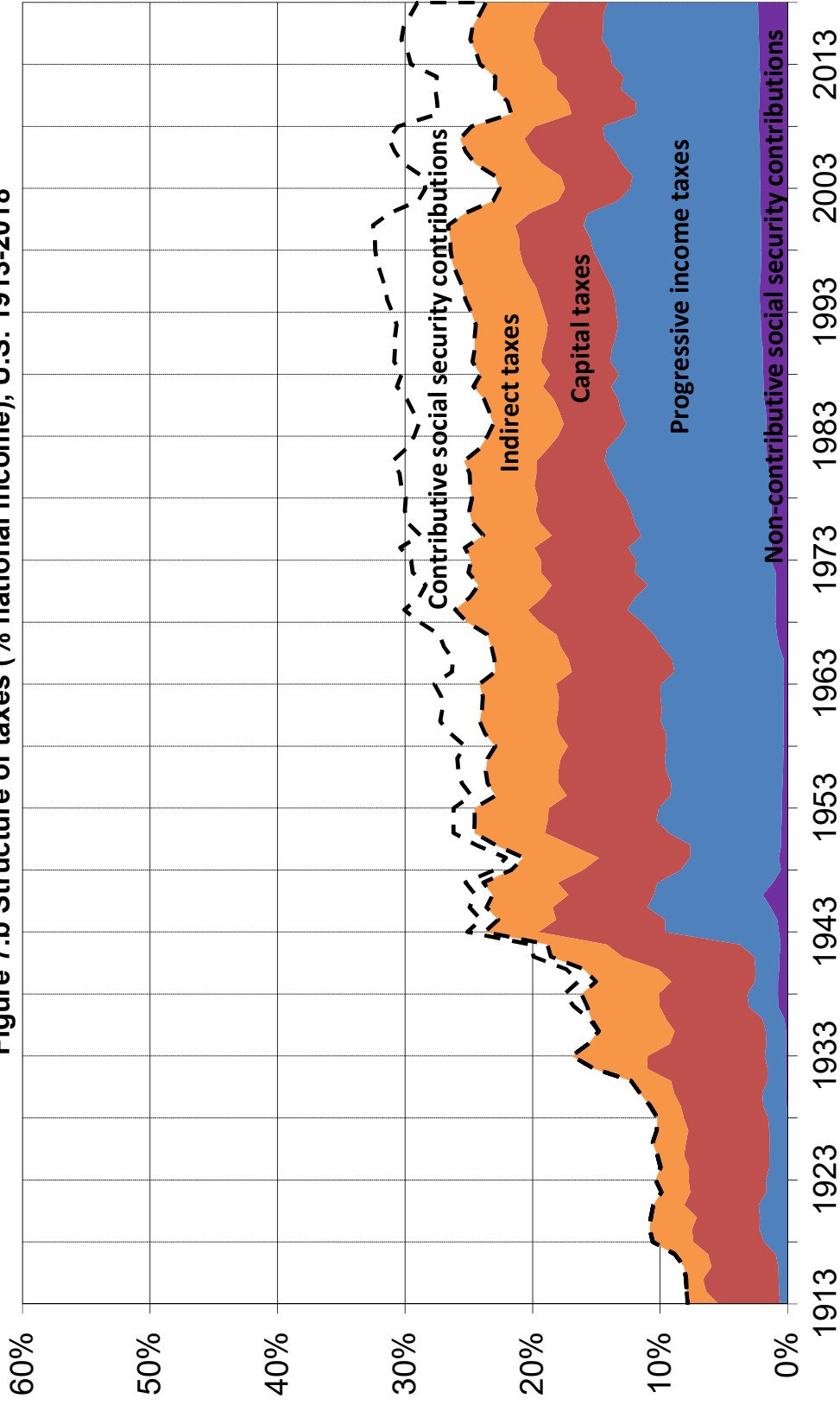
Figure 8. Taxes paid by pretax income group, France vs U.S. 1970-2018
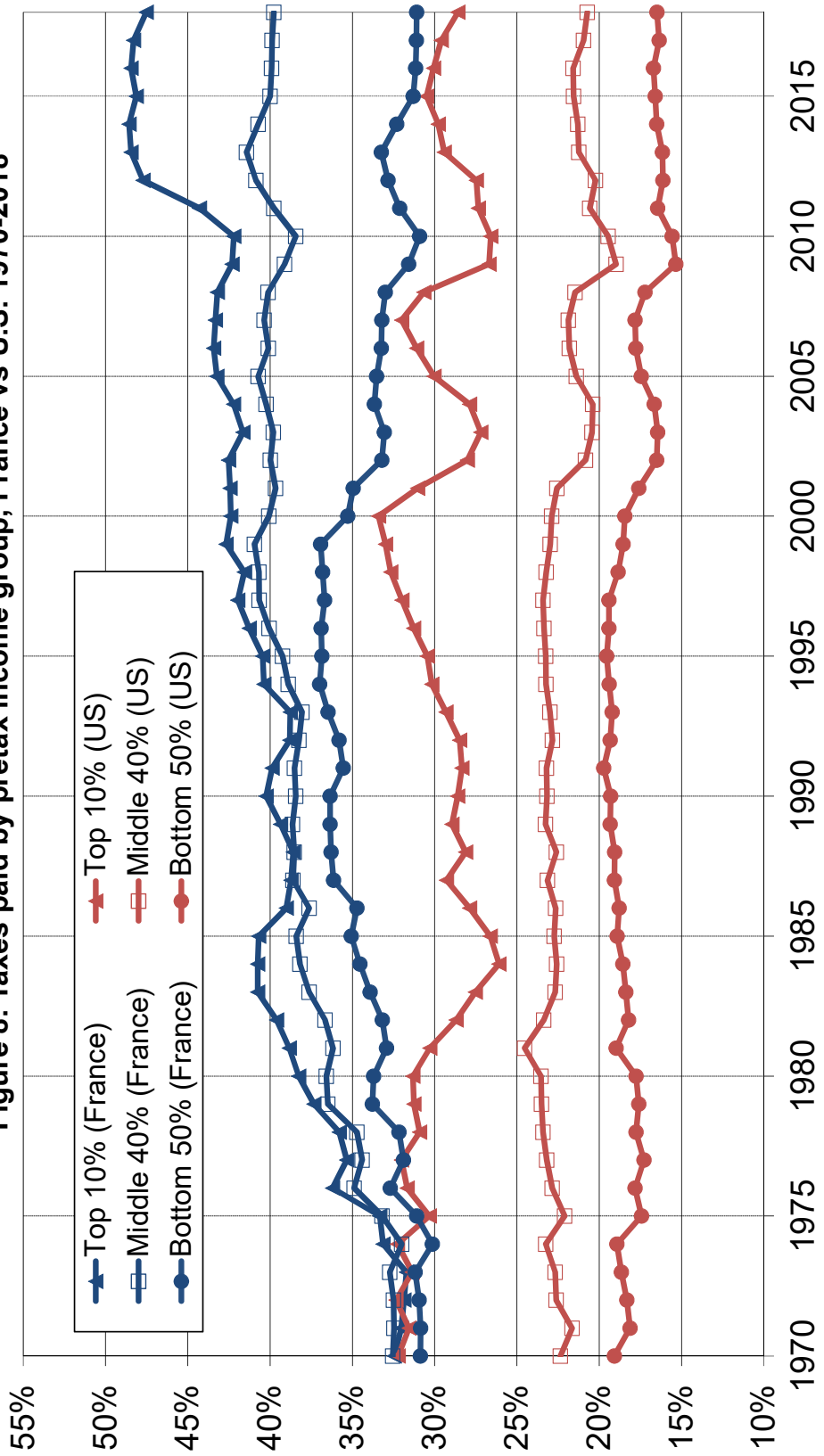
Legend:
- Top 10% (France)
- Middle 40% (France)
- Bottom 50% (France)
- Top 10% (US)
- Middle 40% (US)
- Bottom 50% (US)

Average tax rates by pretax income group of equal-split adults for France and the U.S. Total taxes exclude contributive social contributions. US series: Piketty, Saez and Zucman (2018)

Figure 9. Taxes paid by pre-tax income group, France vs U.S. 1970-2018
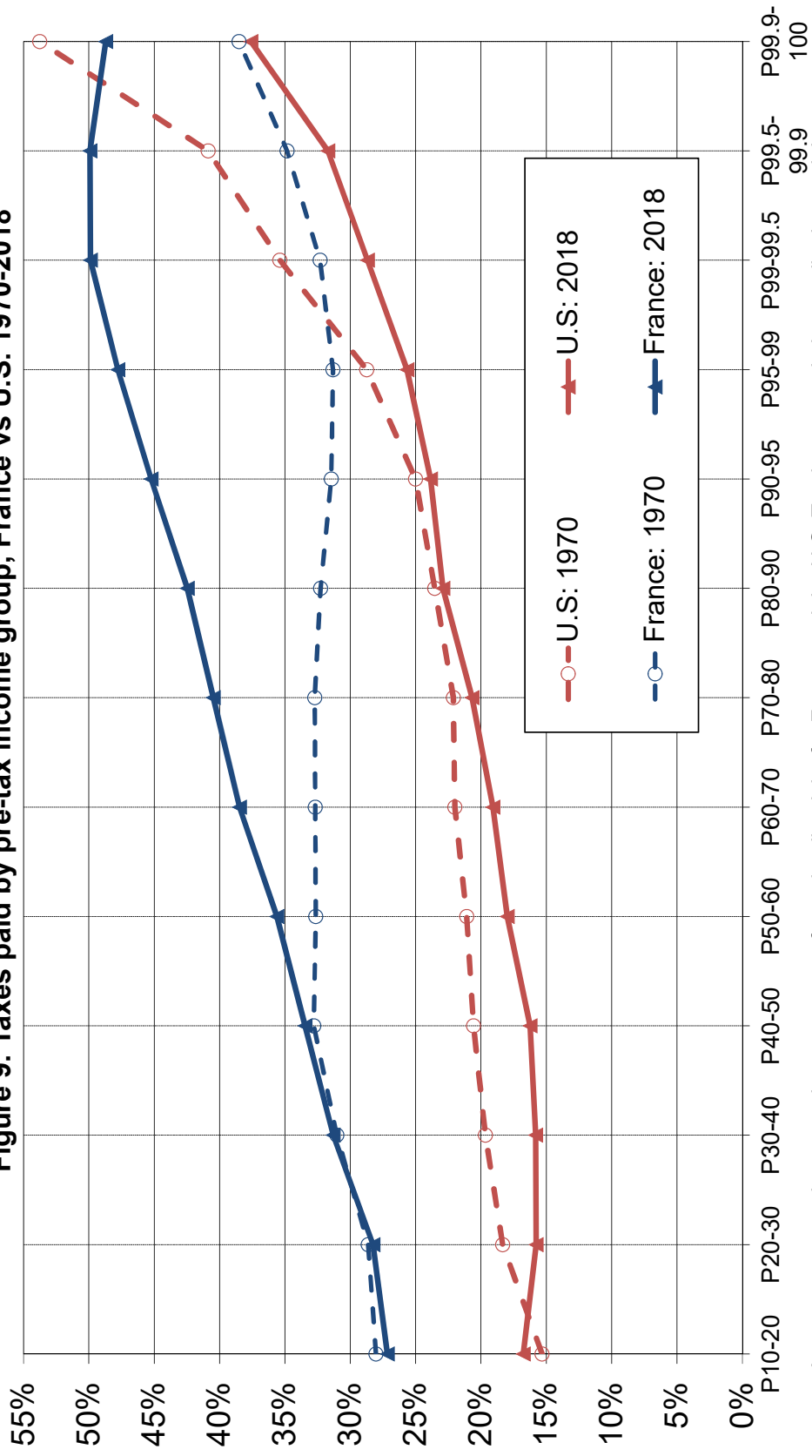
Average tax rates by pretax income group of equal-split adults for France and the U.S. Total taxes exclude contributive social contributions. US series: Piketty, Saez and Zucman (2018)

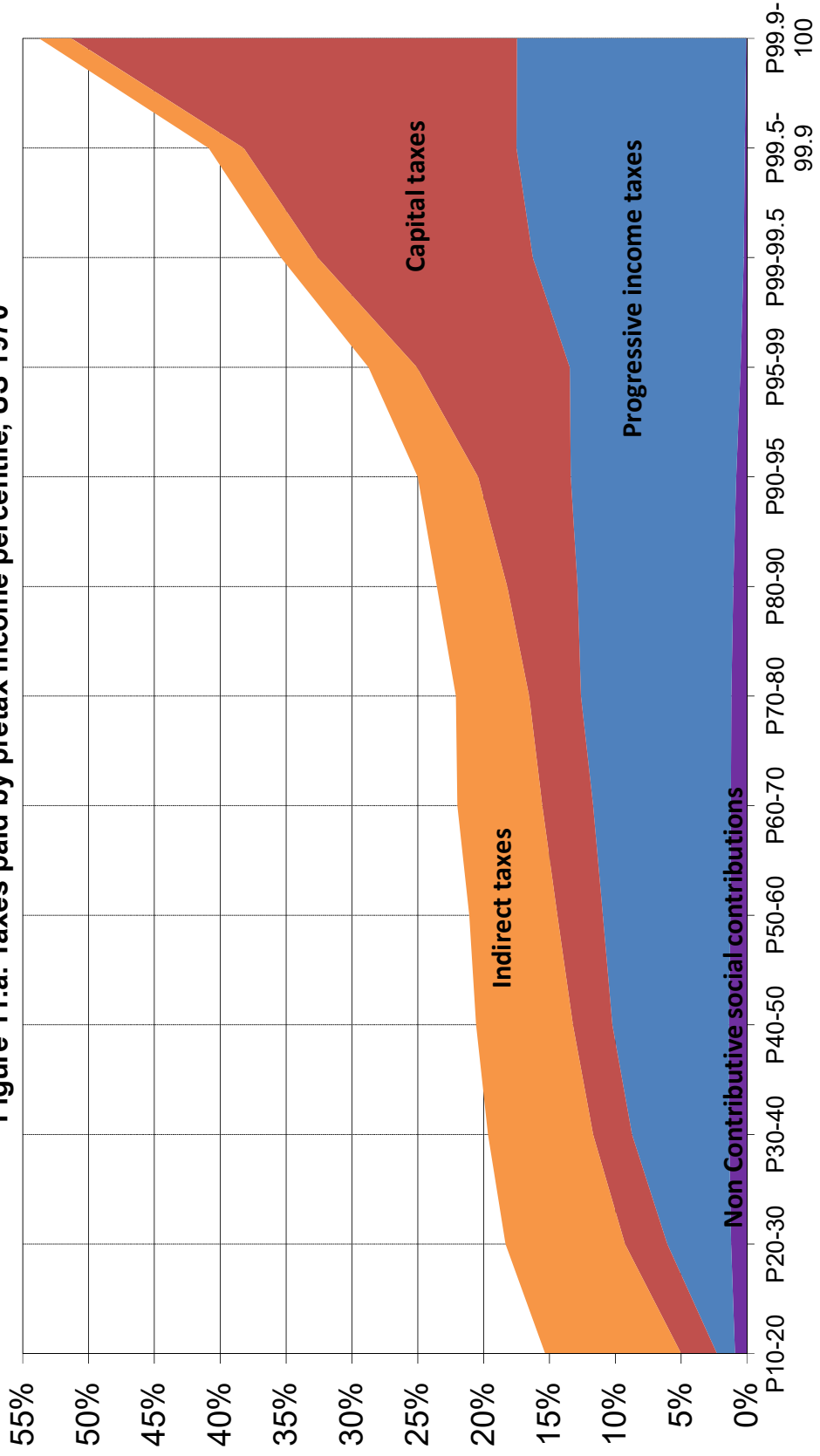# Figure 10.a. Taxes paid by pretax income percentile, France 1970
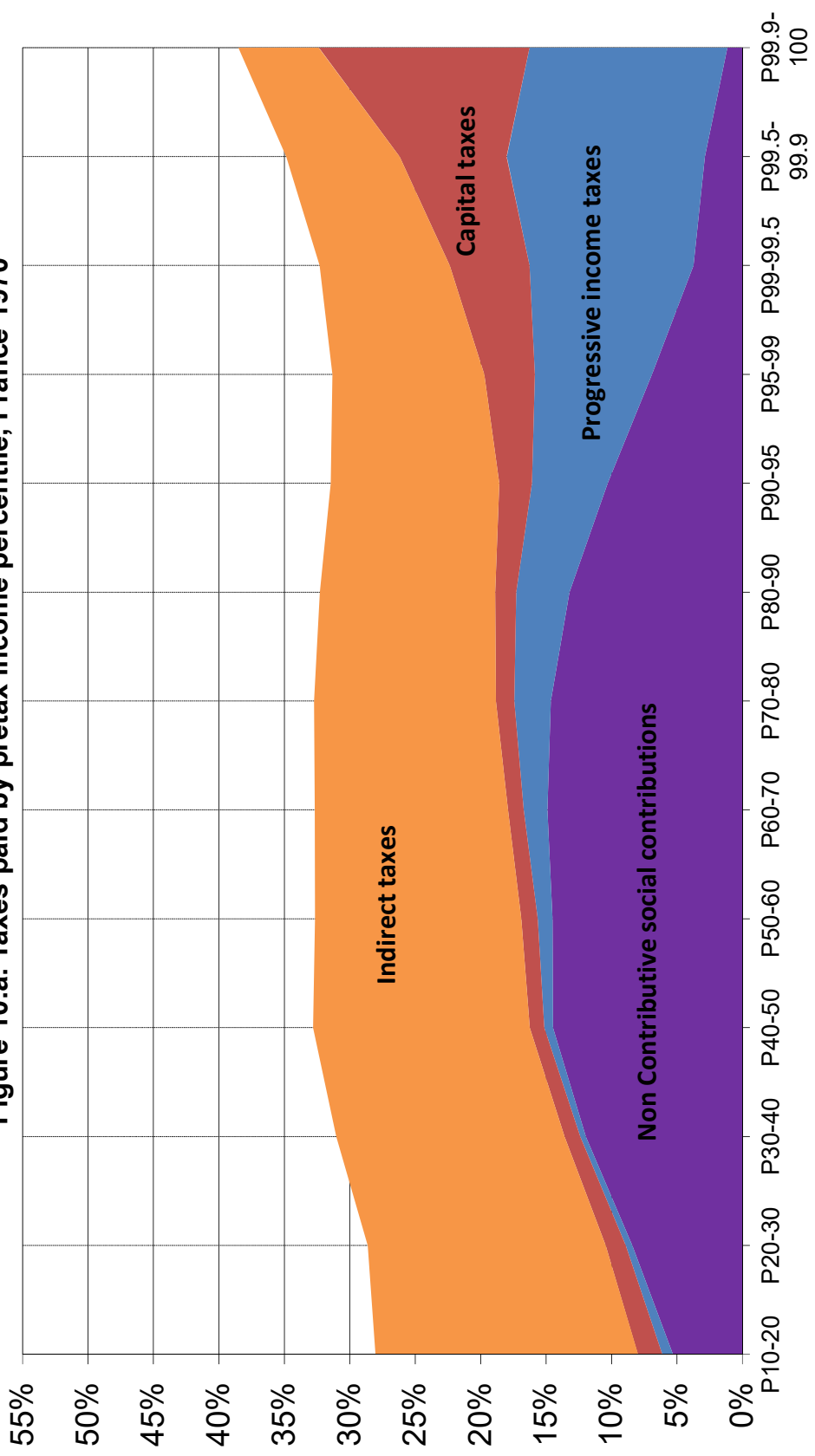
Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

**Figure 10.b. Taxes paid by pretax income percentile, France 1996**
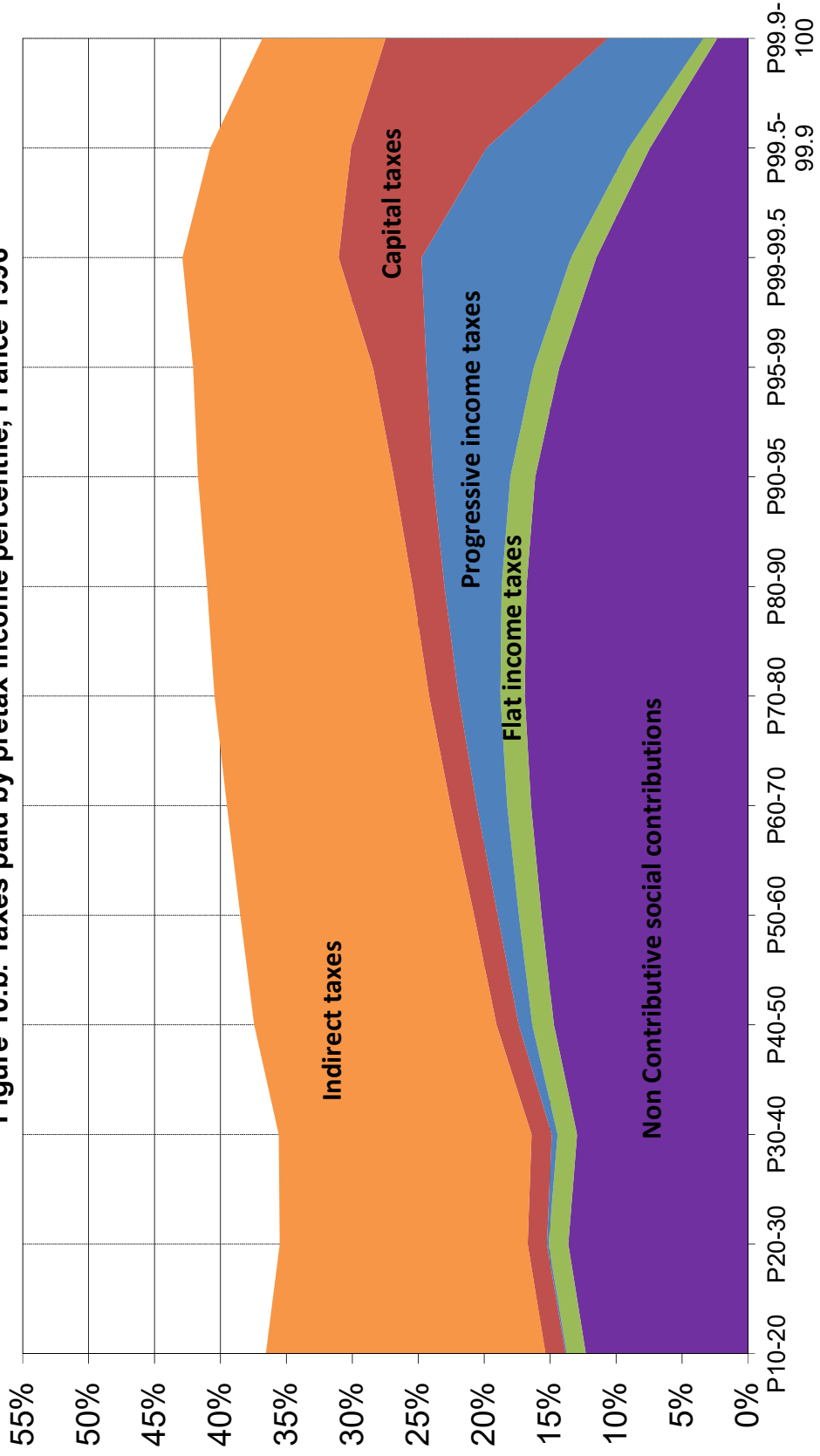
Indirect taxes

Capital taxes

Progressive income taxes

Flat income taxes

Non Contributive social contributions

Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Figure 10.c. Taxes paid by pretax income percentile, France 2016
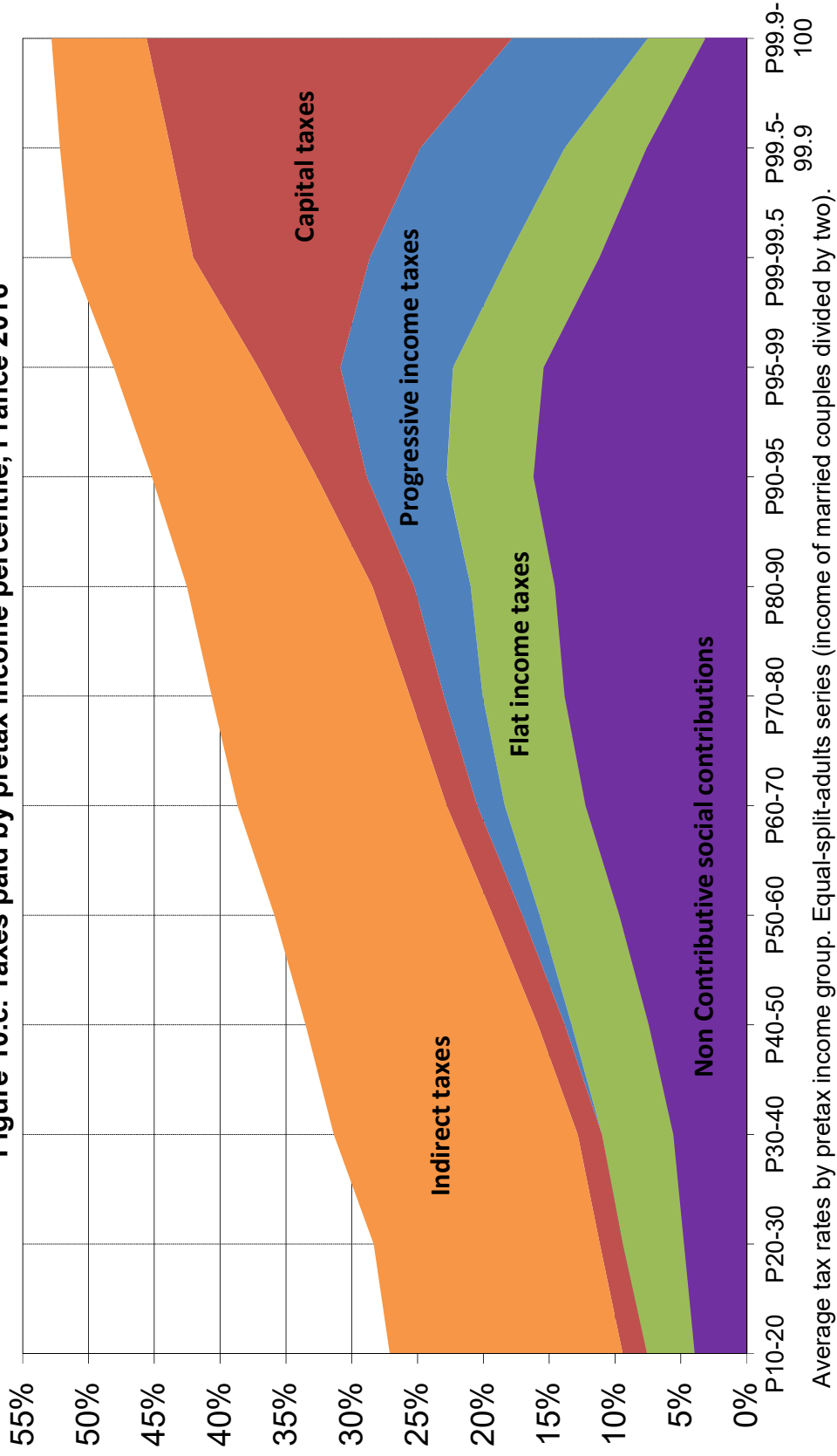
Capital taxes

Progressive income taxes

Flat income taxes

Indirect taxes

Non Contributive social contributions

Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Figure 10.d. Taxes paid by pretax income percentile, France 2018
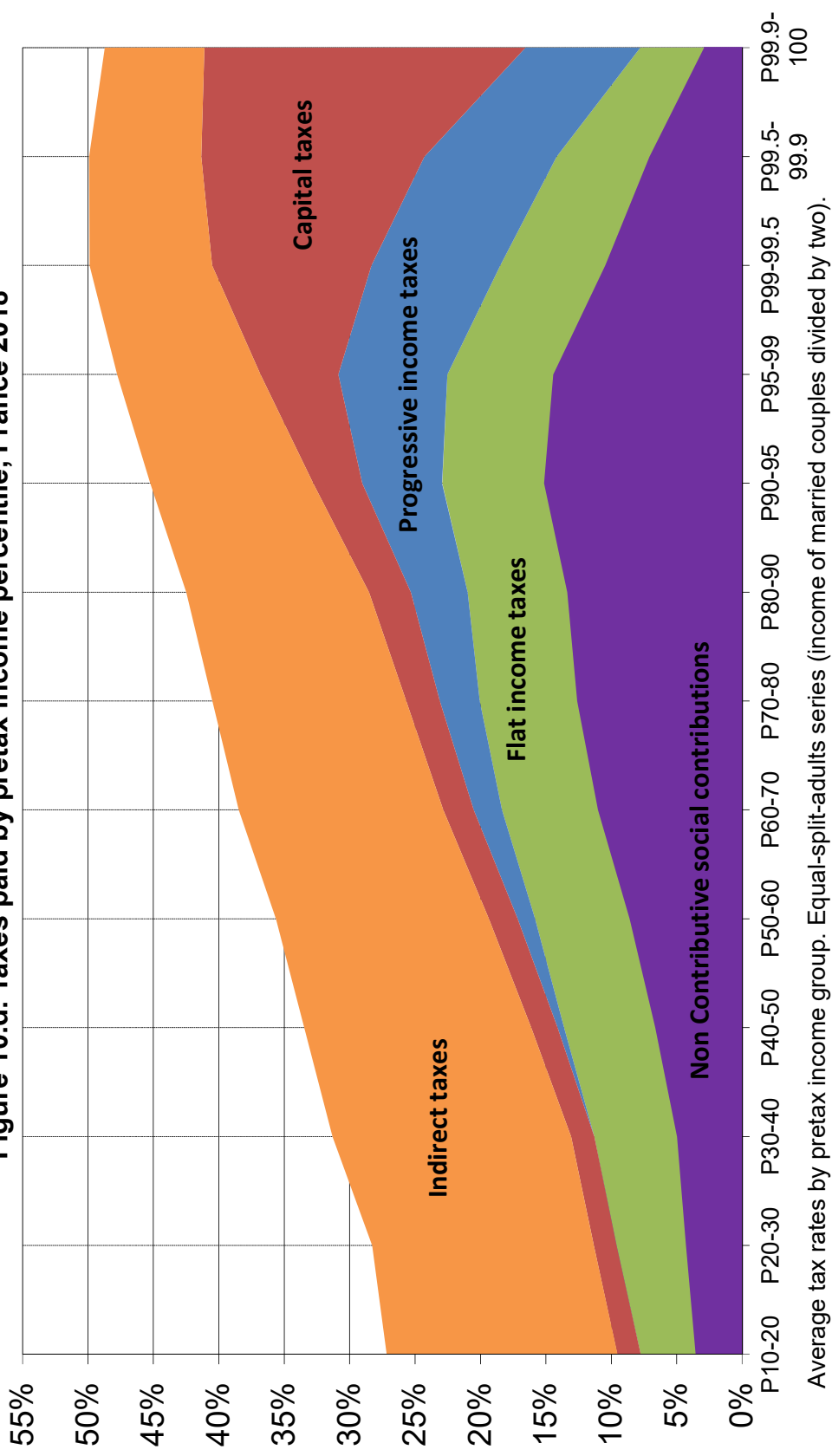
Capital taxes

Progressive income taxes

Flat income taxes

Indirect taxes

Non Contributive social contributions

Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Figure 11.a. Taxes paid by pretax income percentile, US 1970

Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Figure 11.b Taxes paid by pretax income percentile, U.S. 2018
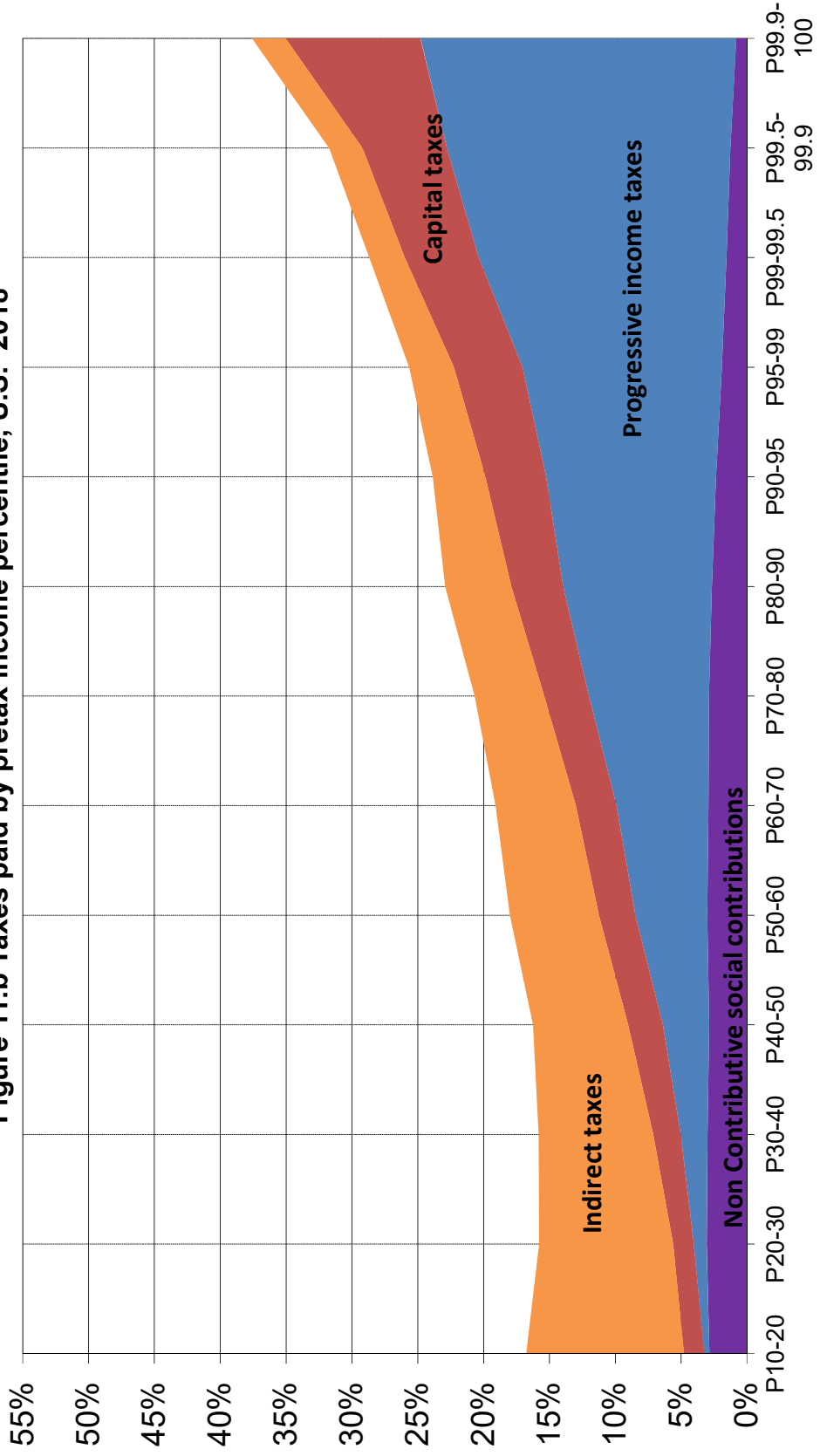
Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Figure 12a. Structure of transfers (% national income), France 1900-2018

Collective consumption expenditure

Education expenditure

Health care expenditure and others

Monetary transfers
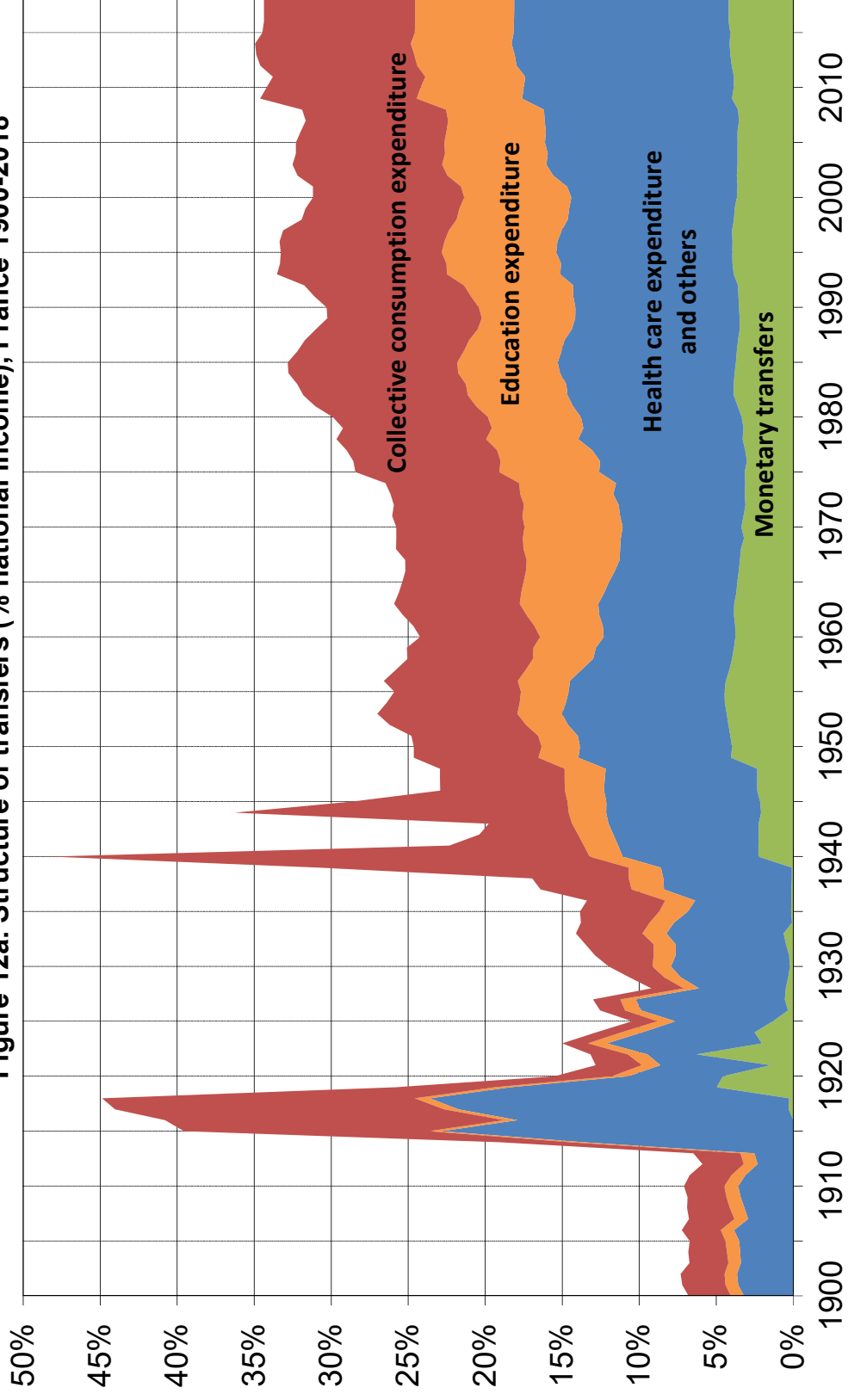
Figure 12b. Structure of monetary transfers (% national income), France 1970-2018
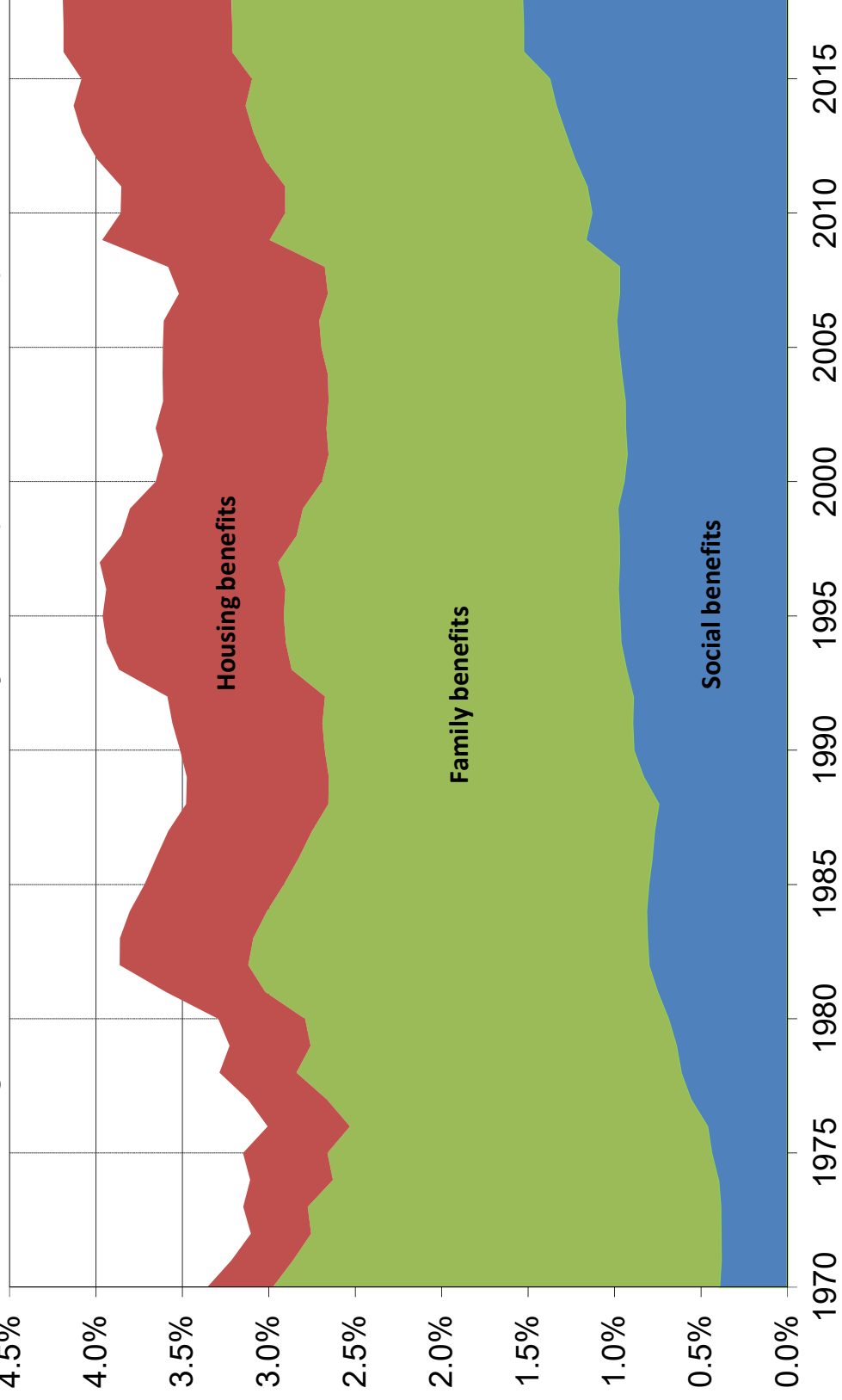
Figure 12c. Structure of transfers (% national income), U.S. 1913-2018

Collective consumption expenditure

Education

Health care expenditure and others

Monetary transfers
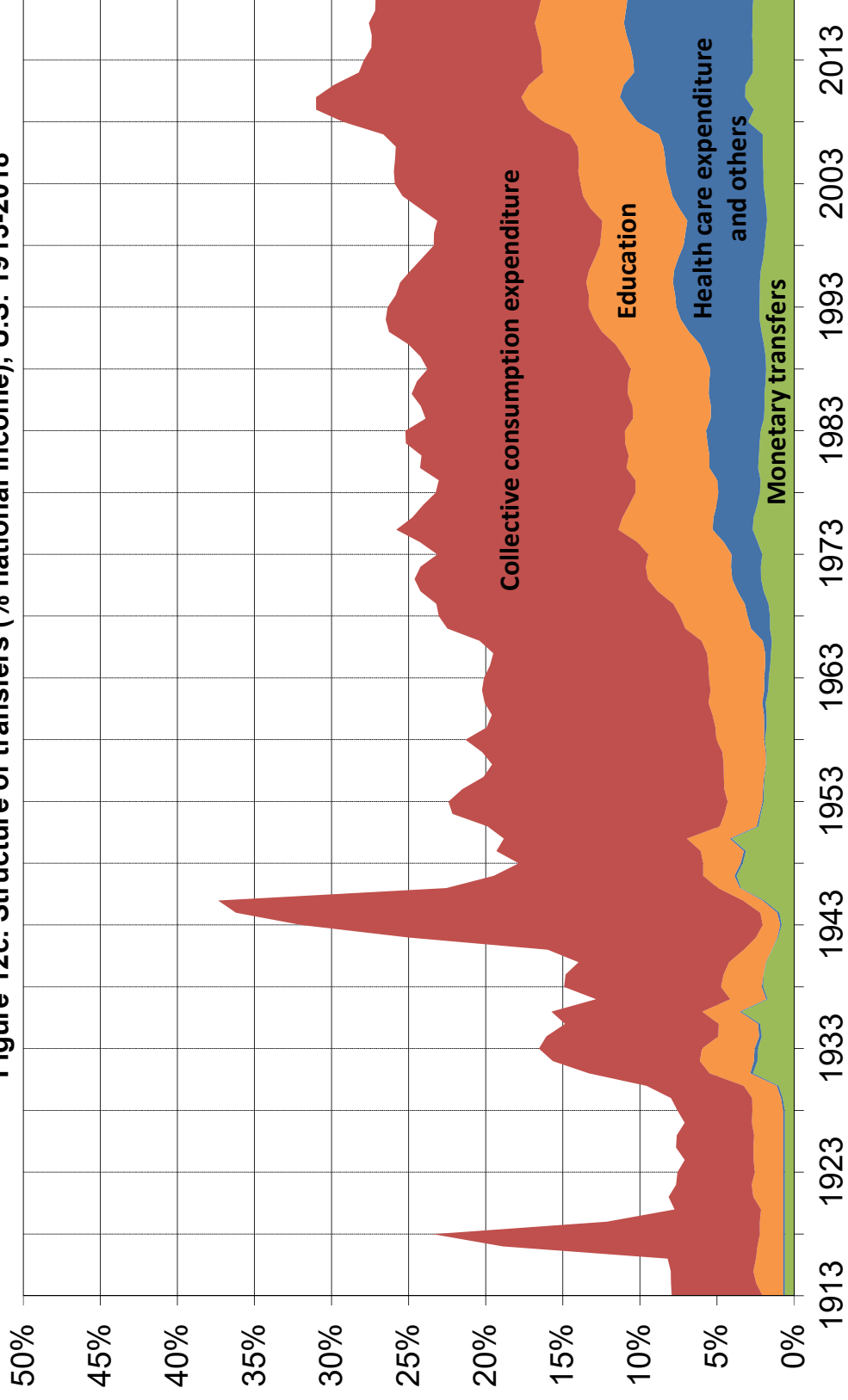
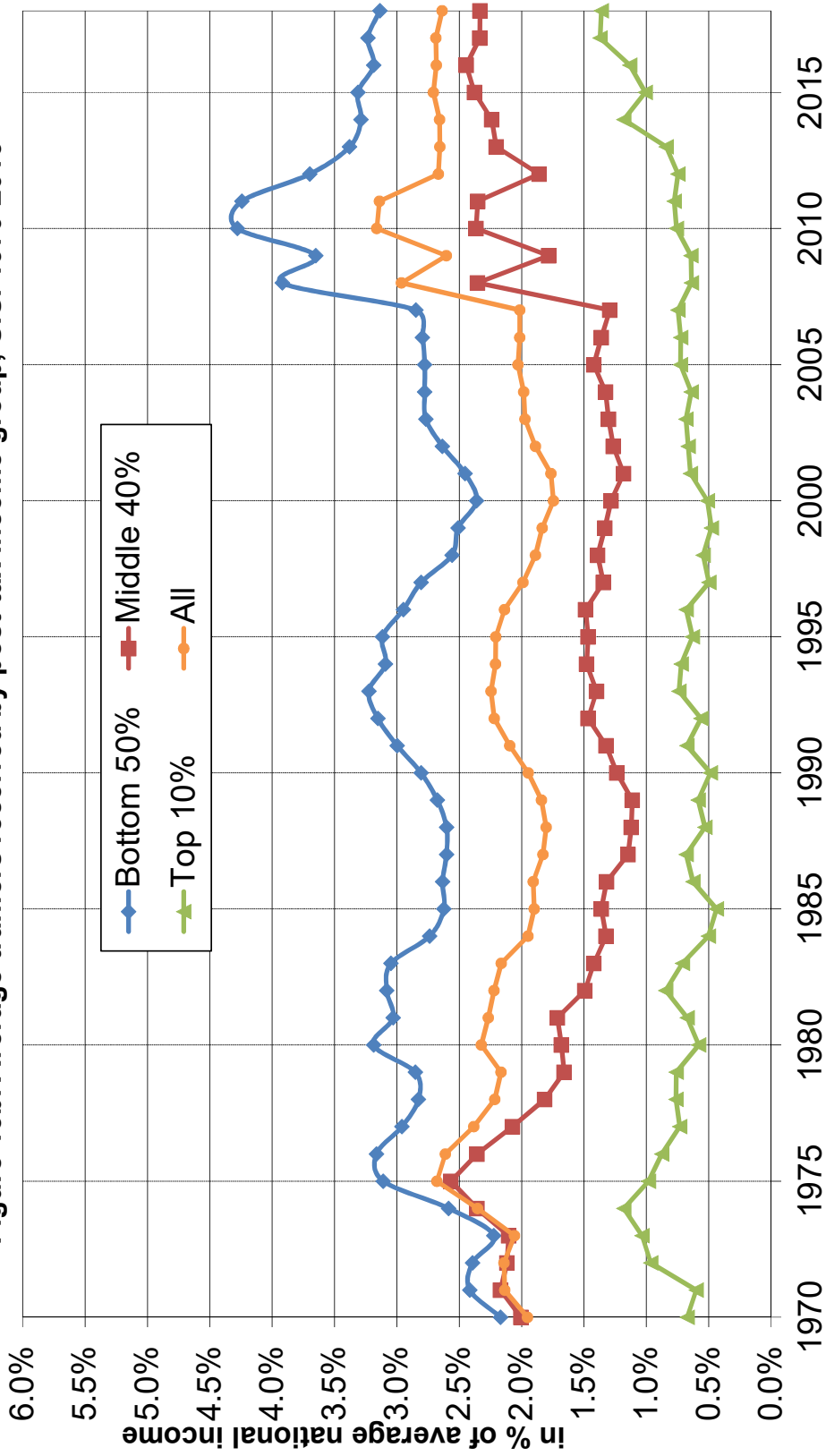Figure 13a. Average monetary tranfers received by post-tax income group, France
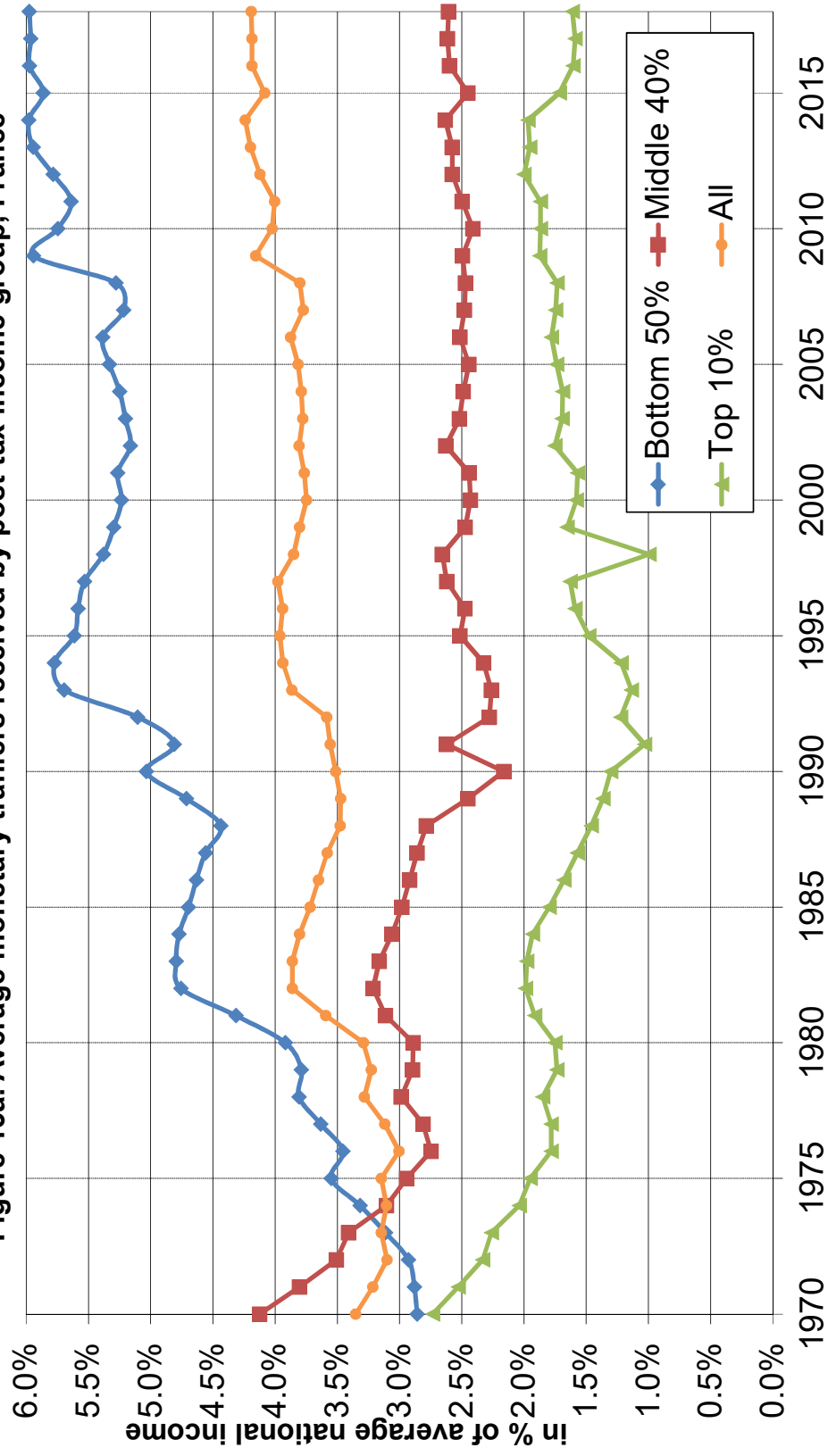
Figure 13b. Average tranfers received by post-tax income group, U.S. 1970-2016

Distribution of disposable income among equal-split adults (income of married couples divided by two).

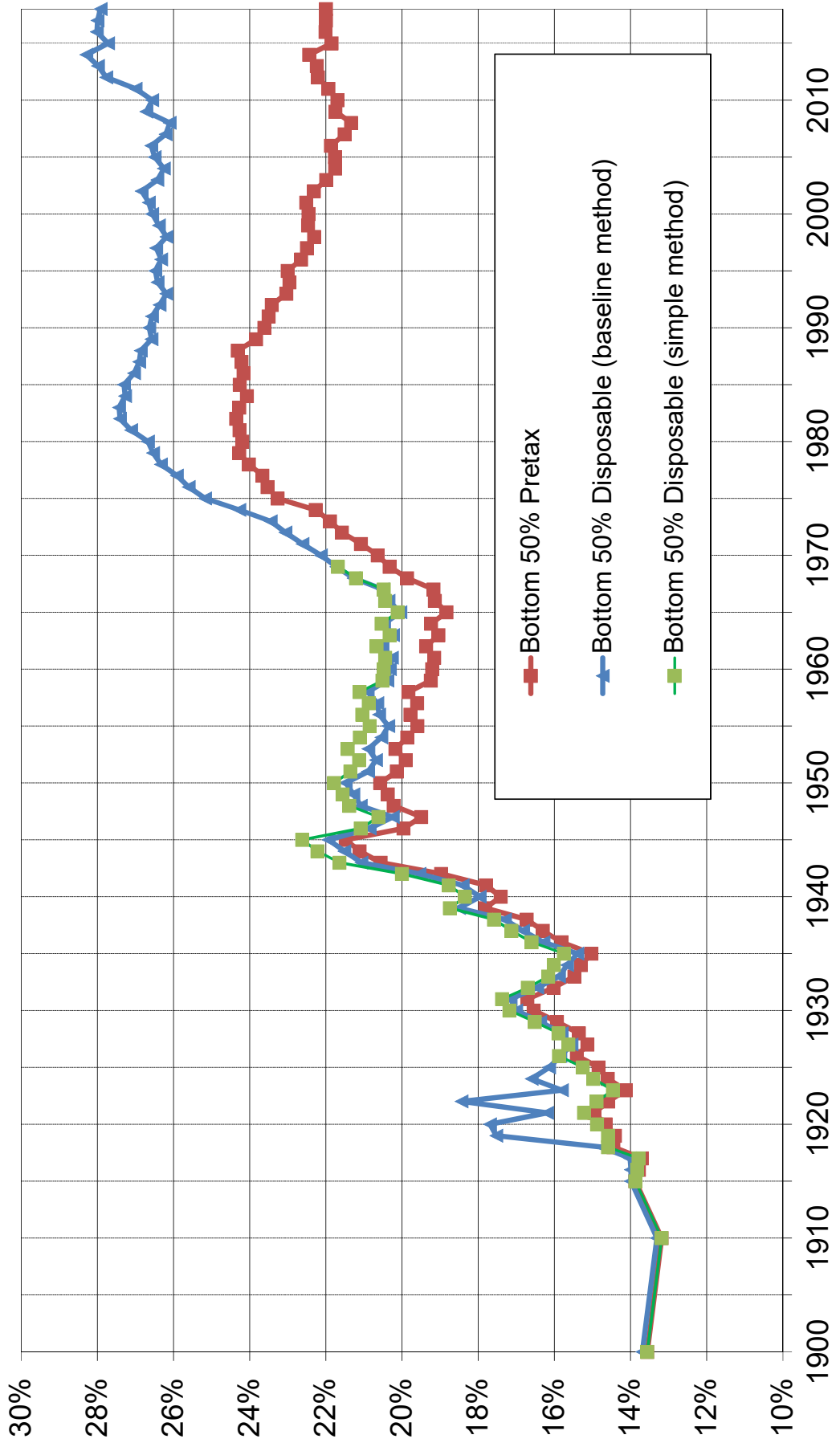## Appendix Table 1. Complementary indicators for redistribution: France vs. U.S, 1970-2018

Inequality indicators: Post tax/Pretax income

France	1970-1979	1980-1989	1990-1999	2000-2009	2010-2018
Total inequality (T10/B50)	-24%	-28%	-31%	-37%	-44%
Total inequality (T10/B90)	-14%	-16%	-17%	-22%	-28%
Upper inequality (T10/M40)	-7%	-9%	-8%	-12%	-18%
Lower inequality (M40/B50)	-19%	-22%	-25%	-29%	-31%
Gini (Reynolds–Smolensky index)	-6%	-8%	-9%	-11%	-13%
Theil	-10%	-11%	-12%	-16%	-19%
p75/p25	-9%	-13%	-17%	-21%	-22%
Palma ratio (share T10/share B40)	-13%	-19%	-23%	-29%	-36%

Inequality indicators: Post tax/Pretax income

U.S	1970-1979	1980-1989	1990-1999	2000-2009	2010-2016
Total inequality (T10/B50)	-32%	-31%	-38%	-40%	-43%
Total inequality (T10/B90)	-21%	-17%	-22%	-25%	-27%
Upper inequality (T10/M40)	-15%	-10%	-14%	-17%	-19%
Lower inequality (M40/B50)	-20%	-23%	-28%	-28%	-30%
Gini (Reynolds–Smolensky index)	-8%	-8%	-9%	-10%	-11%
Theil	-15%	-14%	-20%	-24%	-26%
p75/p25	-20%	-21%	-22%	-21%	-23%
Palma ratio (share T10/share B40)	-31%	-29%	-33%	-33%	-36%

Reading: Total inequality between pretax and posttax incomes, as measured by the ratio between the average incomes of the top 10% and the bottom 50%, drops by 26% in France and by 31% in the US on average over the 1970-1979 period.
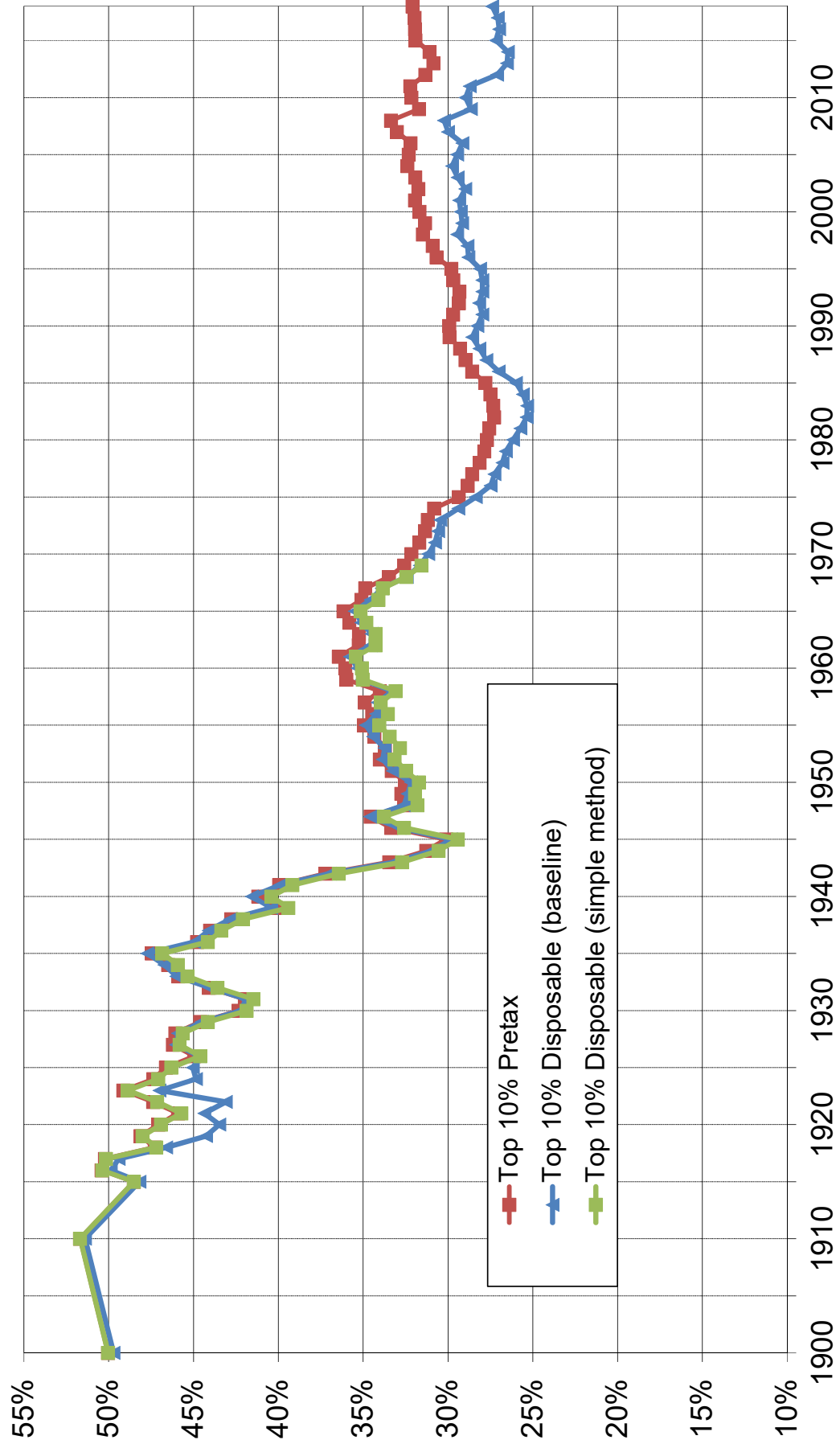
Appendix Table 2. Decomposition of the evolution of post-tax income inequality: France vs. U.S.

| | Post-tax income V1 (Lump-sum imputation of health expenditures, and imputation of education and collective expenditures proportionnal to disposable income) | | | | | | Post-tax income V2 (Lump-sum imputation of health, education and collective expenditures) | | | | | | Post-tax income V3 (health, education and collective expenditures proportionnal to disposable income) | | | | | |
| | France | | | U.S | | | France | | | U.S | | | France | | | U.S | | |
Panel A: T10/B50 indicator	1900-2018	1900-1983	1983-2018	1913-2018	1913-1983	1983-2018	1900-2018	1900-1983	1983-2018	1913-2018	1913-1983	1983-2018	1900-2018	1900-1983	1983-2018	1913-2018	1913-1983	1983-2018
Changes in post-tax income inequality	-75%	-76%	1%			48%	-78%	-79%	3%			45%	-73%	-74%	5%			61%
Due to pretax inequality	-50%	-64%	26%			67%	-48%	-61%	26%			67%	-52%	-65%	27%			71%
Due to taxes and monetary transfers	-21%	-9%	-21%			-9%	-20%	-9%	-21%			-9%	-21%	-9%	-21%			-10%
Due to in-kind and collective expenditures	-5%	-3%	-4%			-10%	-10%	-9%	-2%			-12%	0%	0%	0%			0%
Panel B: T10/B90 indicator	1900-2018	1900-1983	1983-2018	1913-2018	1913-1983	1983-2018	1900-2018	1900-1983	1983-2018	1913-2018	1913-1983	1983-2018	1900-2018	1900-1983	1983-2018	1913-2018	1913-1983	1983-2018
Changes in post-tax income inequality	-65%	-67%	7%	-14%	-37%	37%	-68%	-70%	7%	-22%	-43%	36%	-62%	-65%	10%	-6%	-35%	45%
Due to pretax inequality	-47%	-59%	24%	7%	-29%	51%	-45%	-57%	24%	6%	-27%	50%	-48%	-60%	24%	7%	-29%	52%
Due to taxes and monetary transfers	-13%	-5%	-13%	-13%	-6%	-7%	-13%	-5%	-13%	-12%	-6%	-7%	-14%	-5%	-14%	-13%	-6%	-7%
Due to in-kind and collective expenditures	-4%	-2%	-3%	-8%	-2%	-7%	-10%	-8%	-3%	-17%	-9%	-8%	0%	0%	0%	0%	0%	0%

Appendix Figure 1a. Robustness checks on disposable income inequality: 1900-1969

Legend:
- Bottom 50% Pretax
- Bottom 50% Disposable (baseline method)
- Bottom 50% Disposable (simple method)

Appendix Figure 1b. Robustness checks on disposable income inequality: 1900-1969

Legend:
- Top 10% Pretax
- Top 10% Disposable (baseline)
- Top 10% Disposable (simple method)

Appendix Figure 2a. Top 10% post-tax national income shares in France
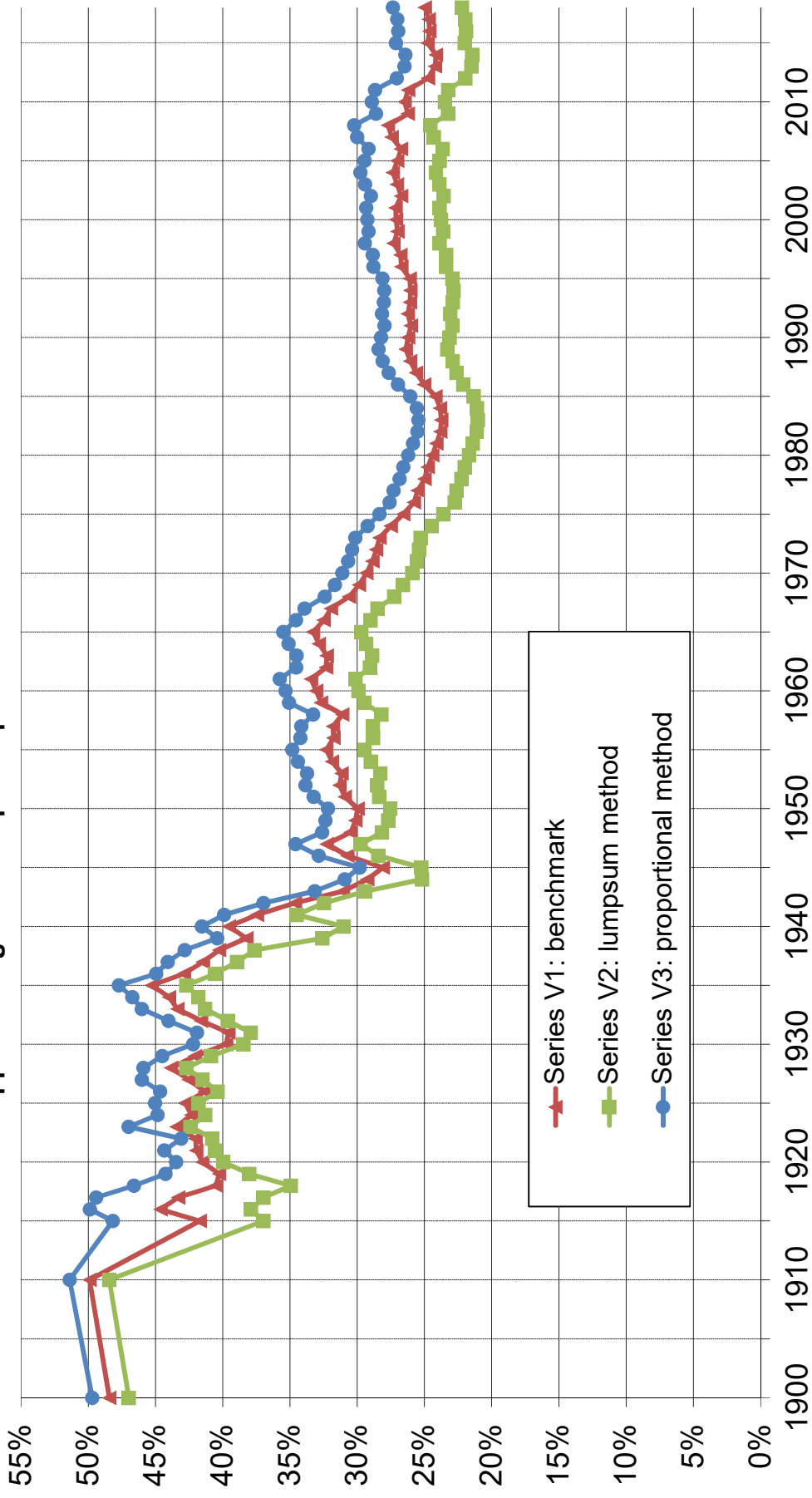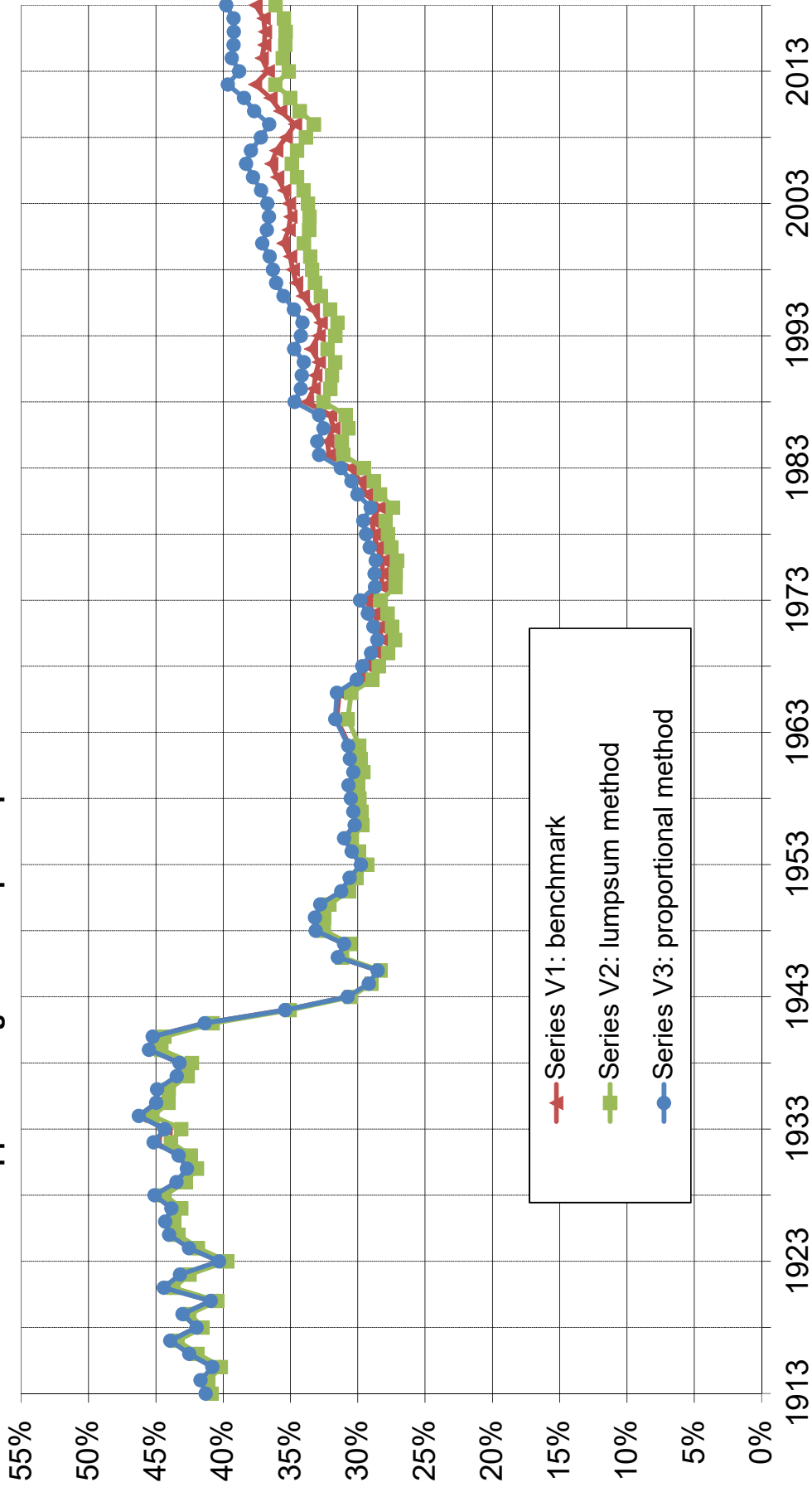
Notes: Series V1 assume lump-sum imputation of health expenditures to the beneficiaries, and proportional imputation for all other items. In-kind transfers and collective expenditures are imputed either on a lump sum basis in series V2 or in proportion to post-tax disposable income in series V3.

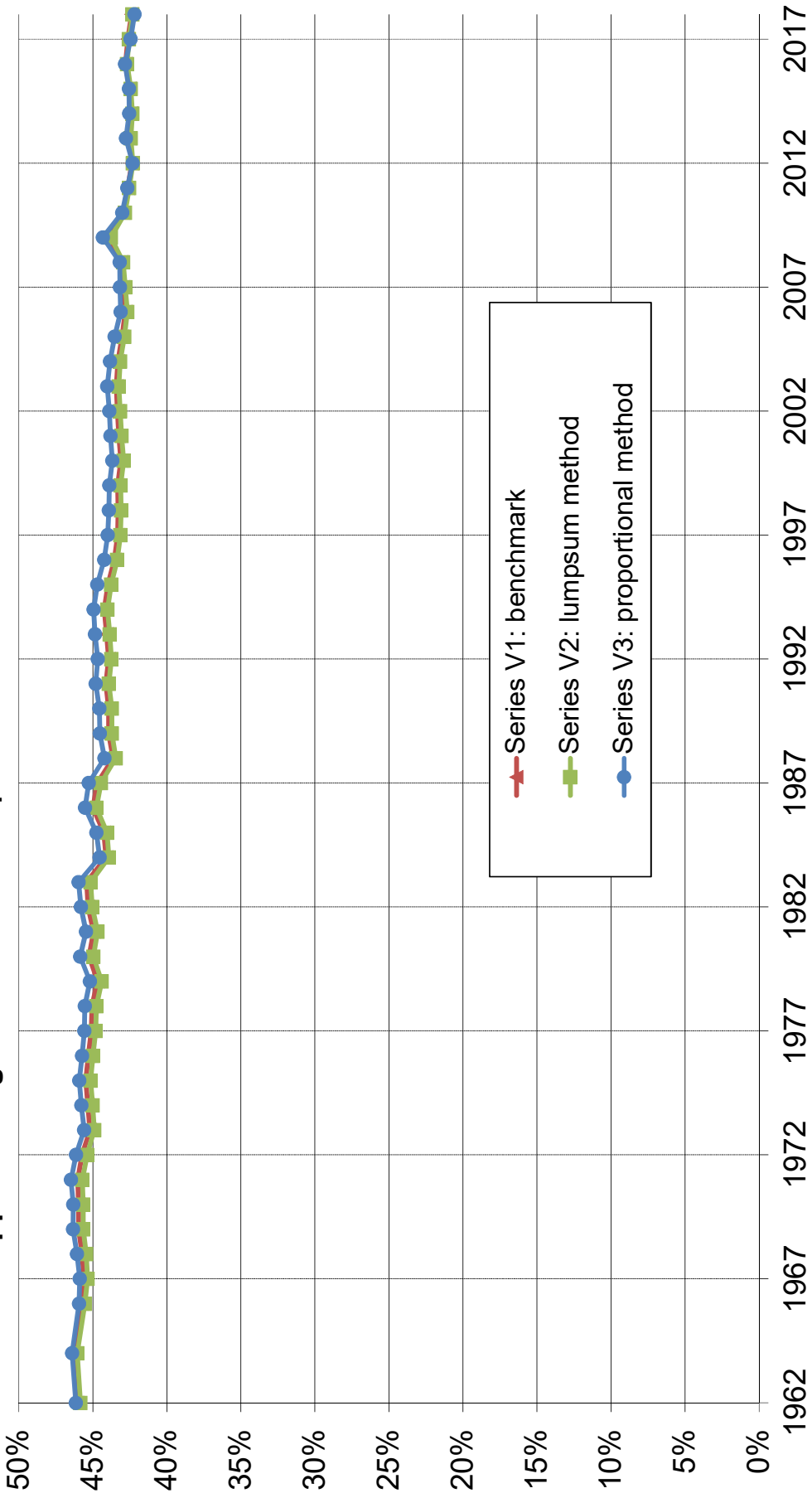**Appendix Figure 2b. Middle 40% post-tax national income shares in France**
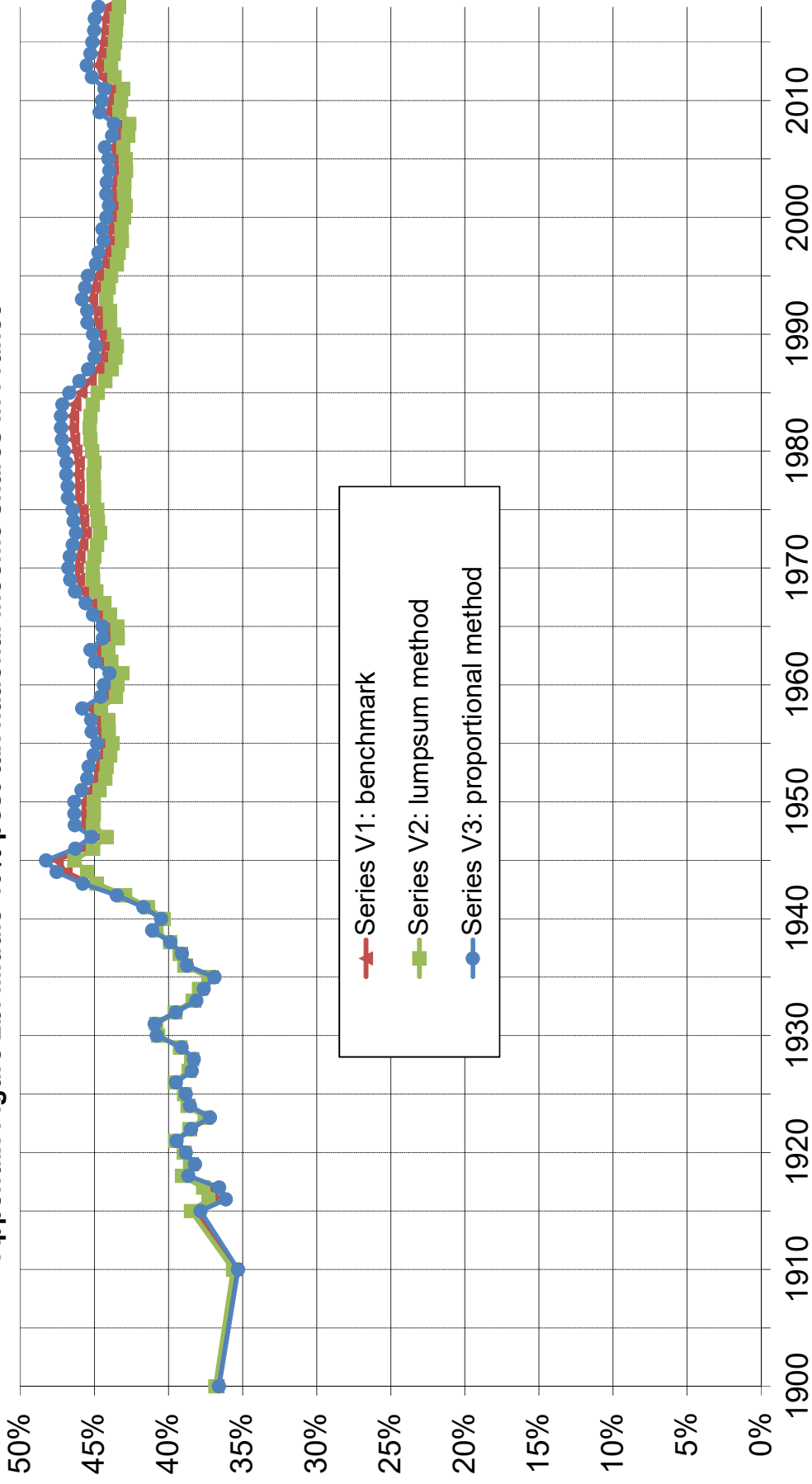
Notes: Series V1 assume lump-sum imputation of health expenditures to the beneficiaries, and proportional imputation for all other items. In-kind transfers and collective expenditures are imputed either on a lump sum basis in series V2 or in proportion to post-tax disposable income in series V3.

Appendix Figure 2c. Bottom 50% post-tax national income shares in France
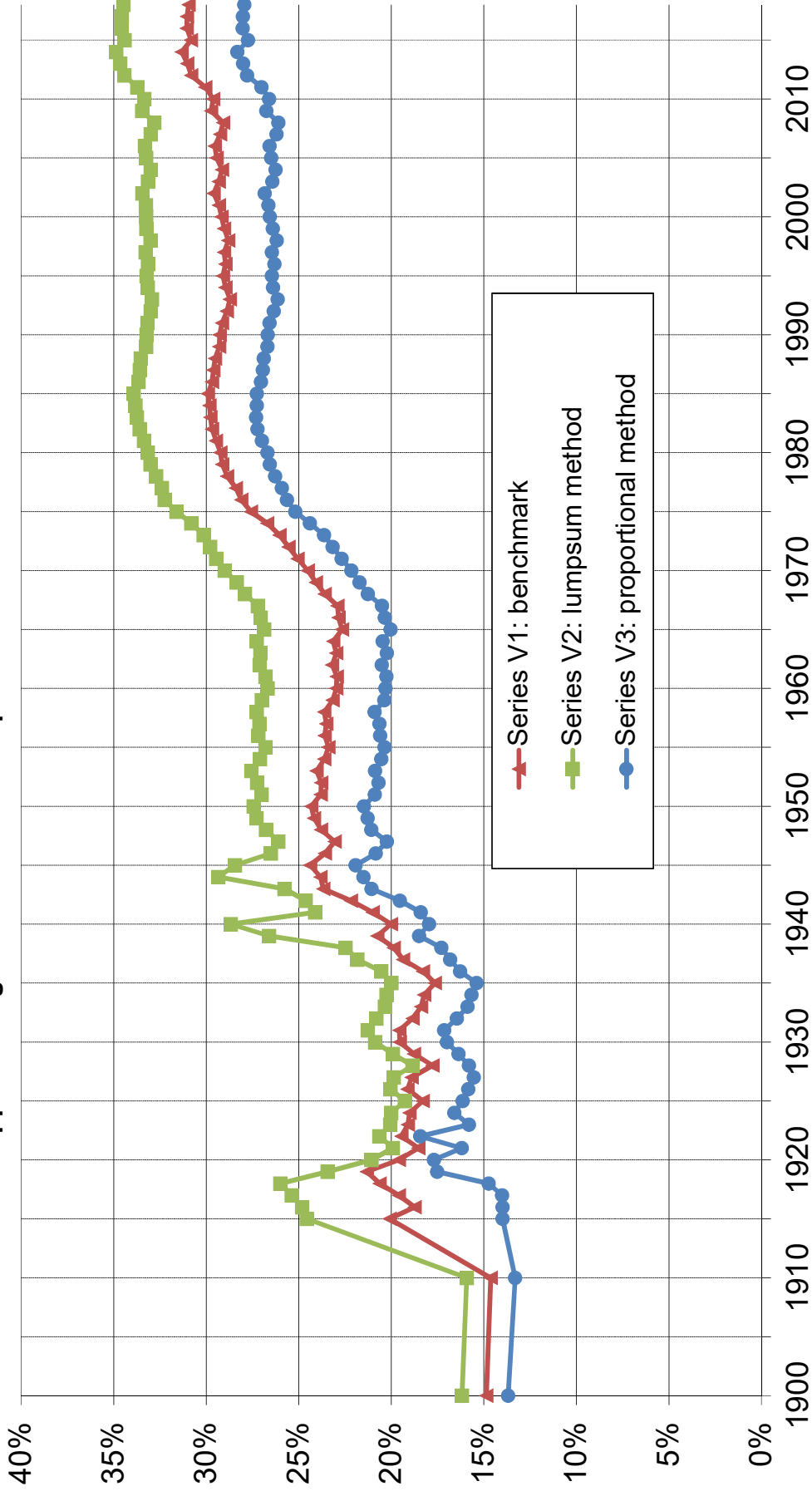
Series V1: benchmark
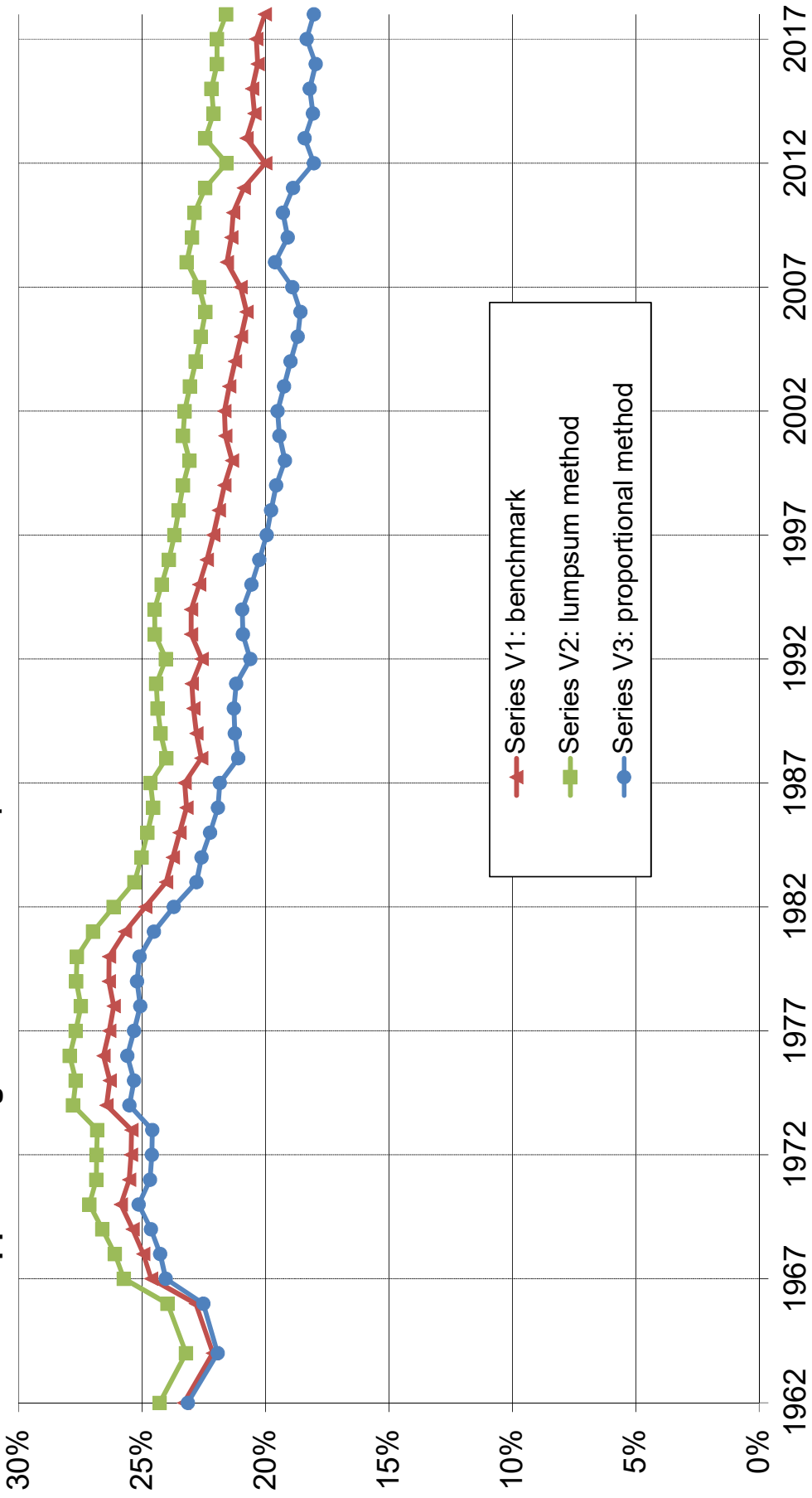Series V2: lumpsum method
Series V3: proportional method

Notes: Series V1 assume lump-sum imputation of health expenditures to the beneficiaries, and proportional imputation for all other items. In-kind transfers and collective expenditures are imputed either on a lump sum basis in series V2 or in proportion to post-tax disposable income in series V3.

Appendix Figure 3a. Top 10% post-tax national income shares in the U.S.

Series V1: benchmark
Series V2: lumpsum method
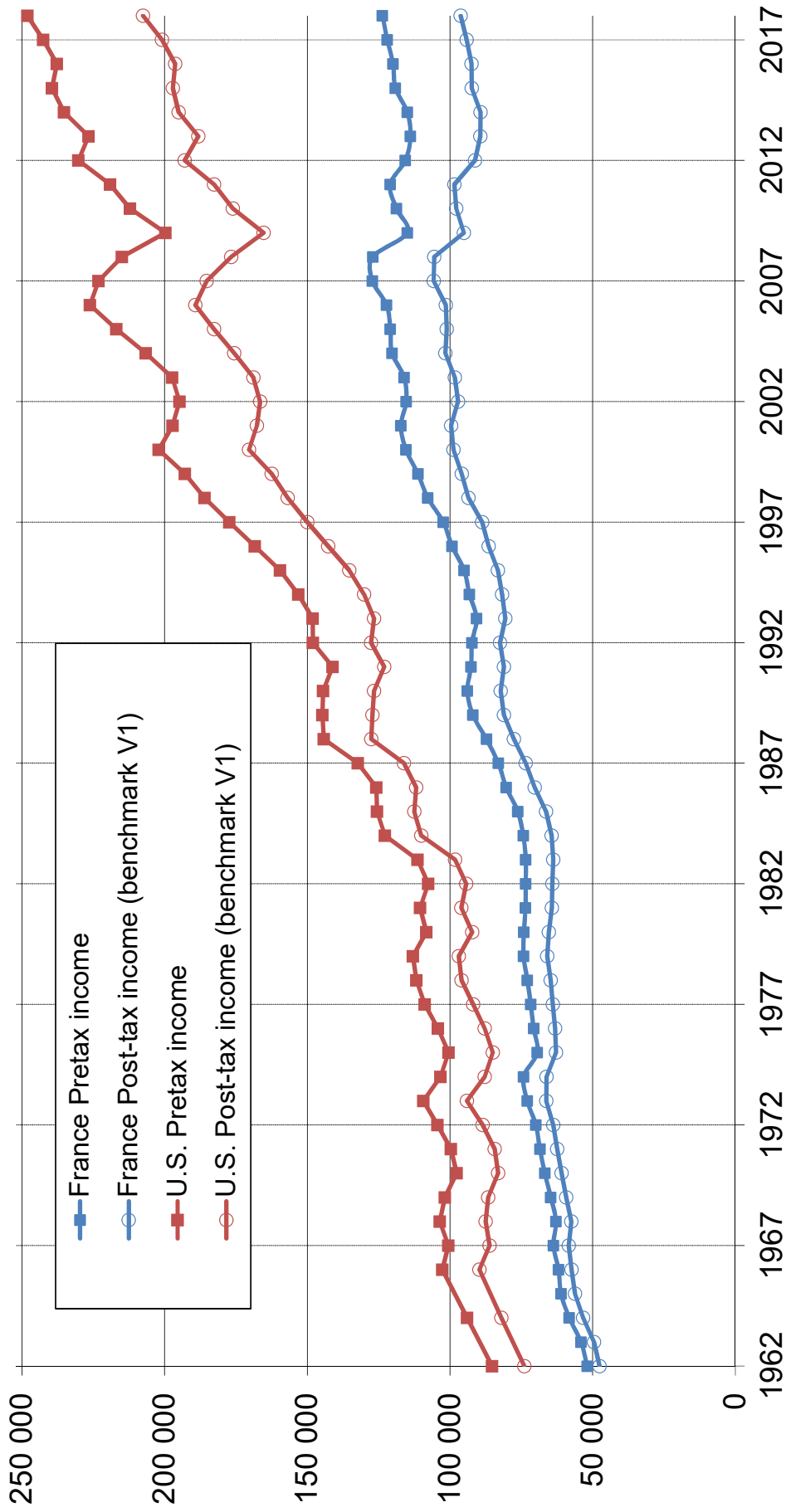Series V3: proportional method

Notes: Series V1 assume lump-sum imputation of health expenditures to the beneficiaries, and proportional imputation for all other items. In-kind transfers and collective expenditures are imputed either on a lump sum basis in series V2 or in proportion to post-tax disposable income in series V3.

Appendix Figure 3b. Middle 40% post-tax national income shares in the U.S

Notes: Series V1 assume lump-sum imputation of health expenditures to the beneficiaries, and proportional imputation for all other items. In-kind transfers and collective expenditures are imputed either on a lump sum basis in series V2 or in proportion to post-tax disposable income in series V3.

Appendix Figure 3c. Bottom 50% post-tax national income shares in the U.S.

Series V1: benchmark
Series V2: lumpsum method
Series V3: proportional method

Notes: Series V1 assume lump-sum imputation of health expenditures to the beneficiaries, and proportional imputation for all other items. In-kind transfers and collective expenditures are imputed either on a lump sum basis in series V2 or in proportion to post-tax disposable income in series V3.

Appendix Figure 4a. Top 10% real income (2018 euros PPP): France vs US, 1962-2018

Legend:
- France Pretax income
- France Post-tax income (benchmark V1)
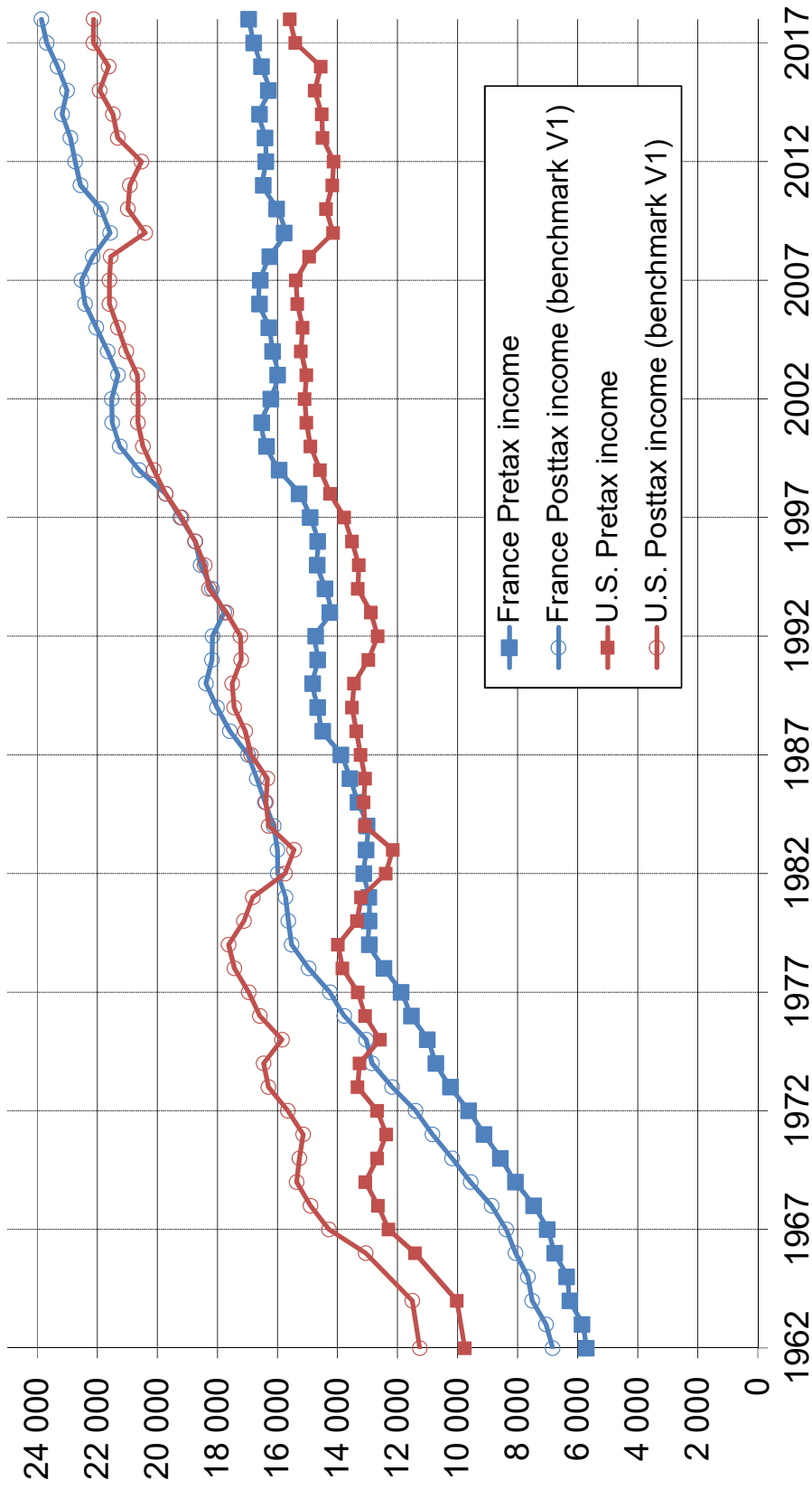- U.S. Pretax income
- U.S. Post-tax income (benchmark V1)

Equal-split-adults series (income of married couples divided by two).
Estimates for the U.S are from Piketty, Saez and Zucman (2018).

Appendix Figure 4b. Middle 40% real income (2018 euros PPP): France vs US, 1962-2018
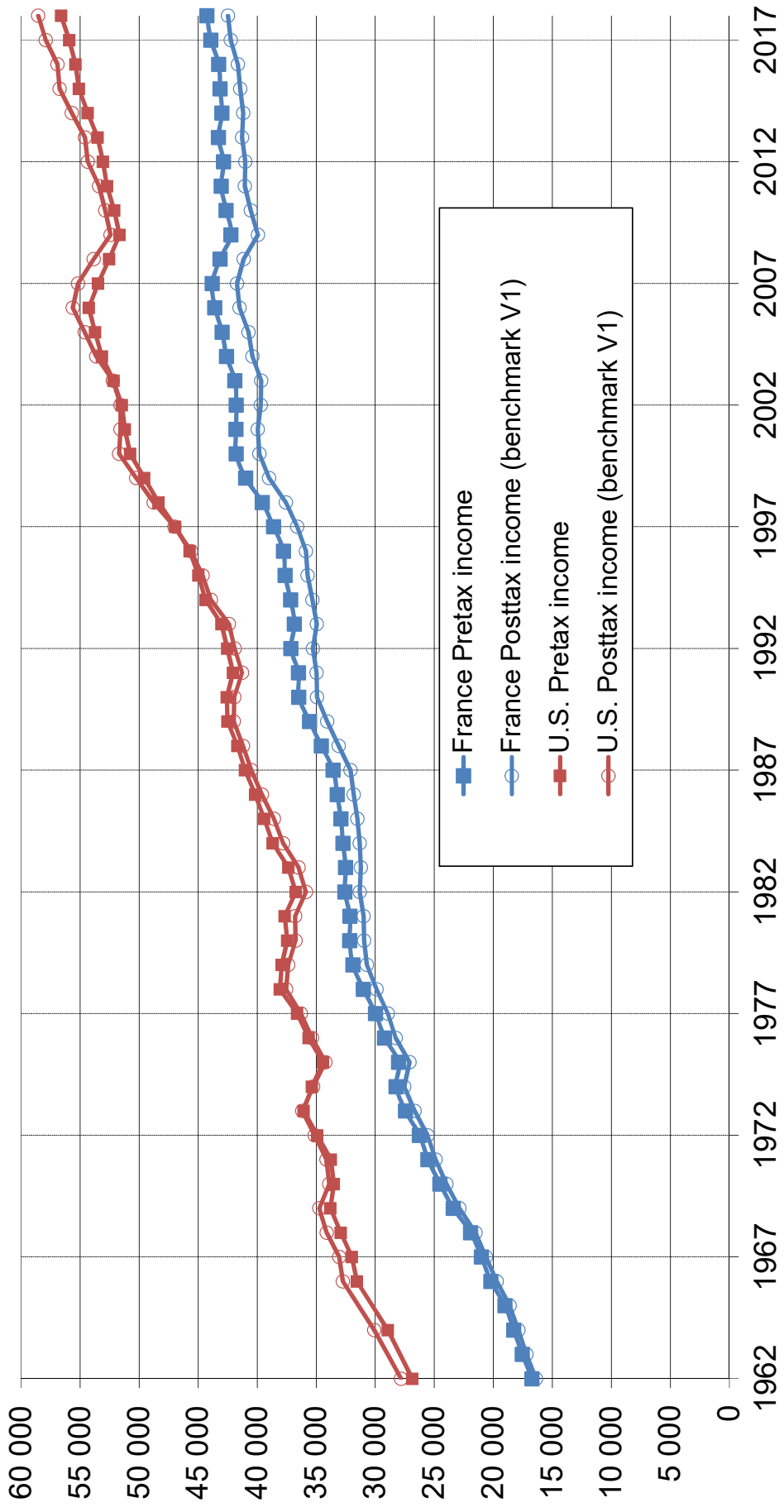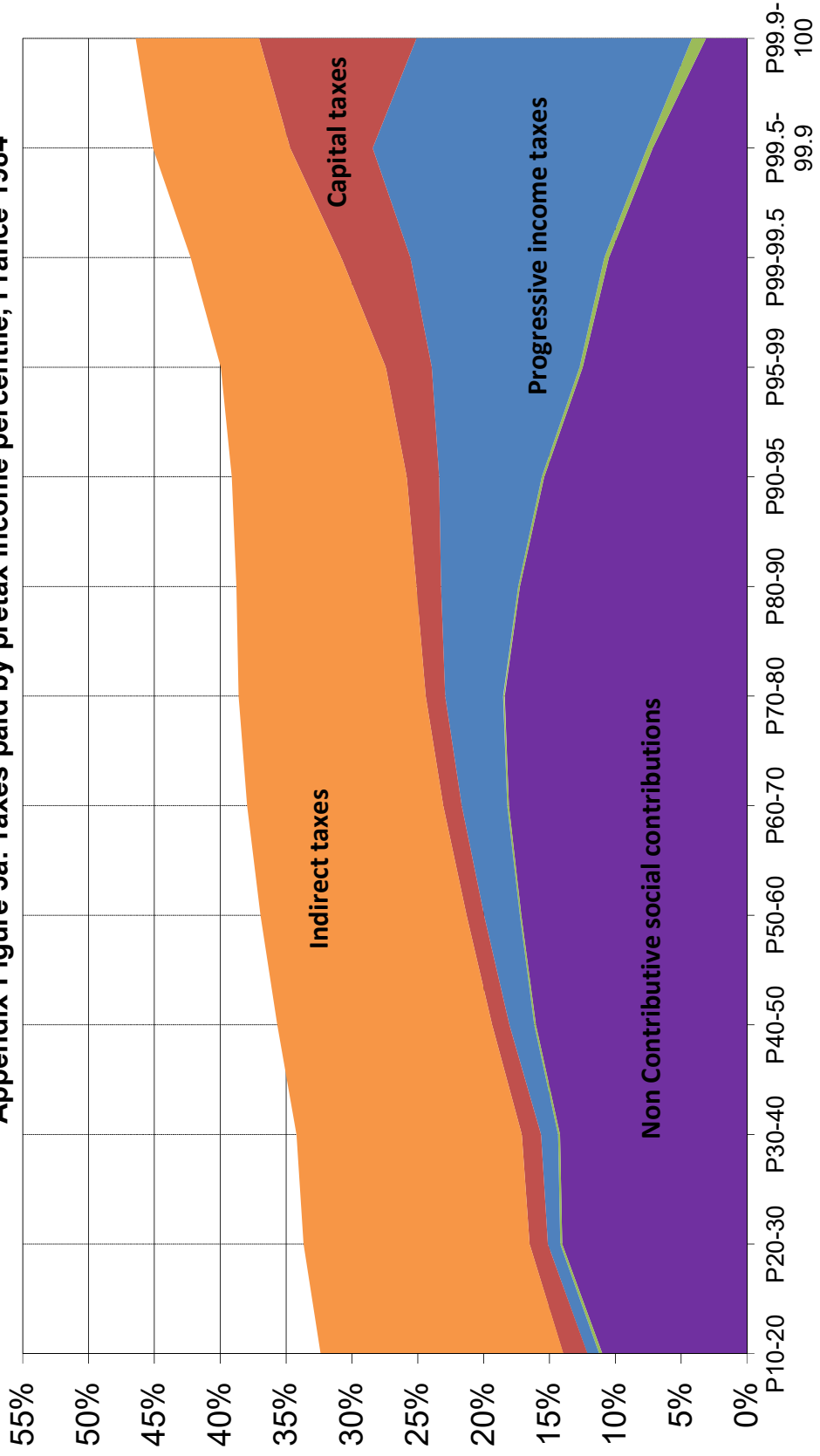
Equal-split-adults series (income of married couples divided by two).
Estimates for the U.S are from Piketty, Saez and Zucman (2018).

Appendix Figure 4c. Bottom 50% real income (2018 euros PPP): France vs U.S., 1962-2018

Legend:
- France Pretax income
- France Posttax income (benchmark V1)
- U.S. Pretax income
- U.S. Posttax income (benchmark V1)

Equal-split-adults series (income of married couples divided by two).
Estimates for the U.S are from Piketty, Saez and Zucman (2018).

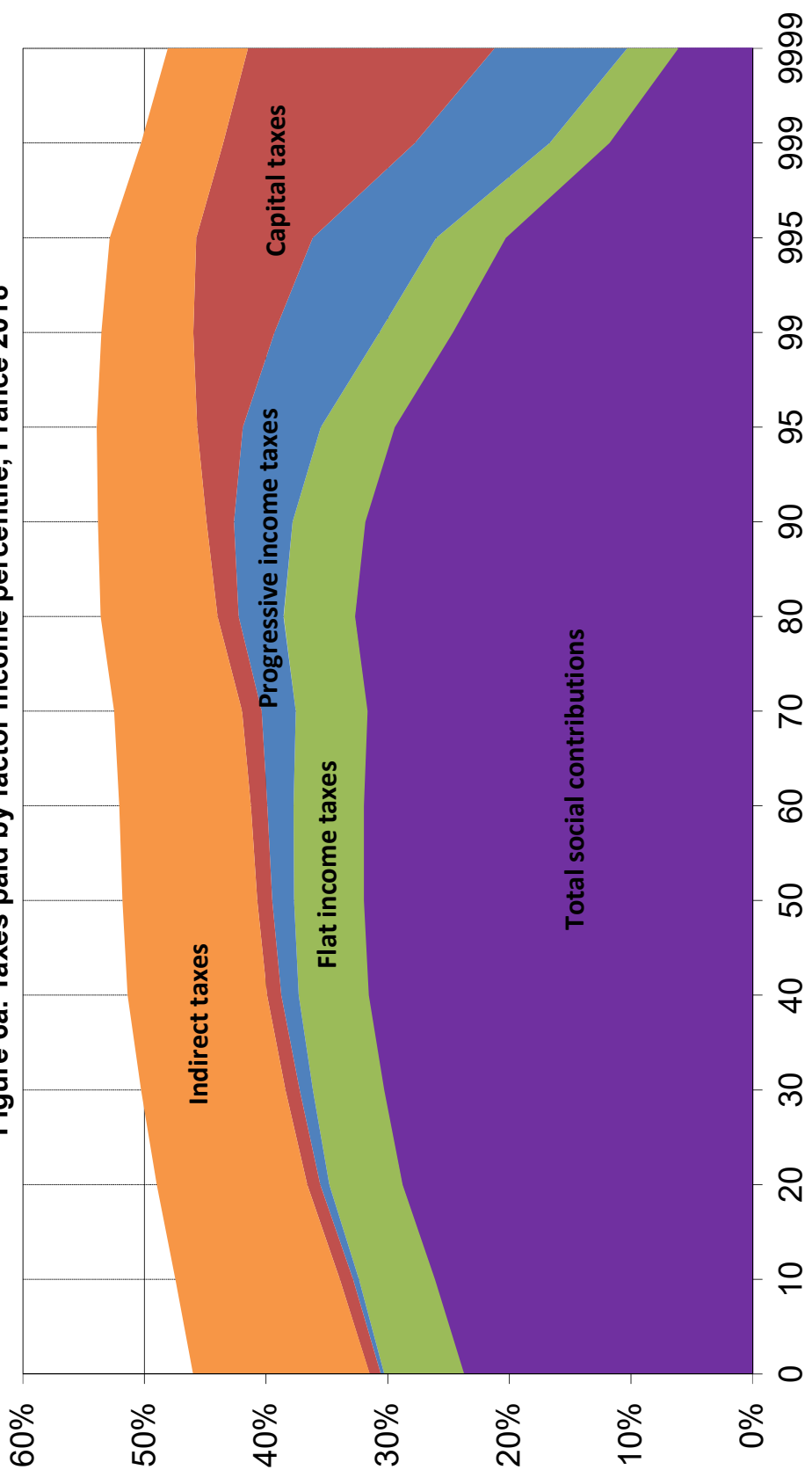Appendix Figure 5a. Taxes paid by pretax income percentile, France 1984

Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Appendix Figure 5b. Taxes paid by pretax income percentile, France 2010
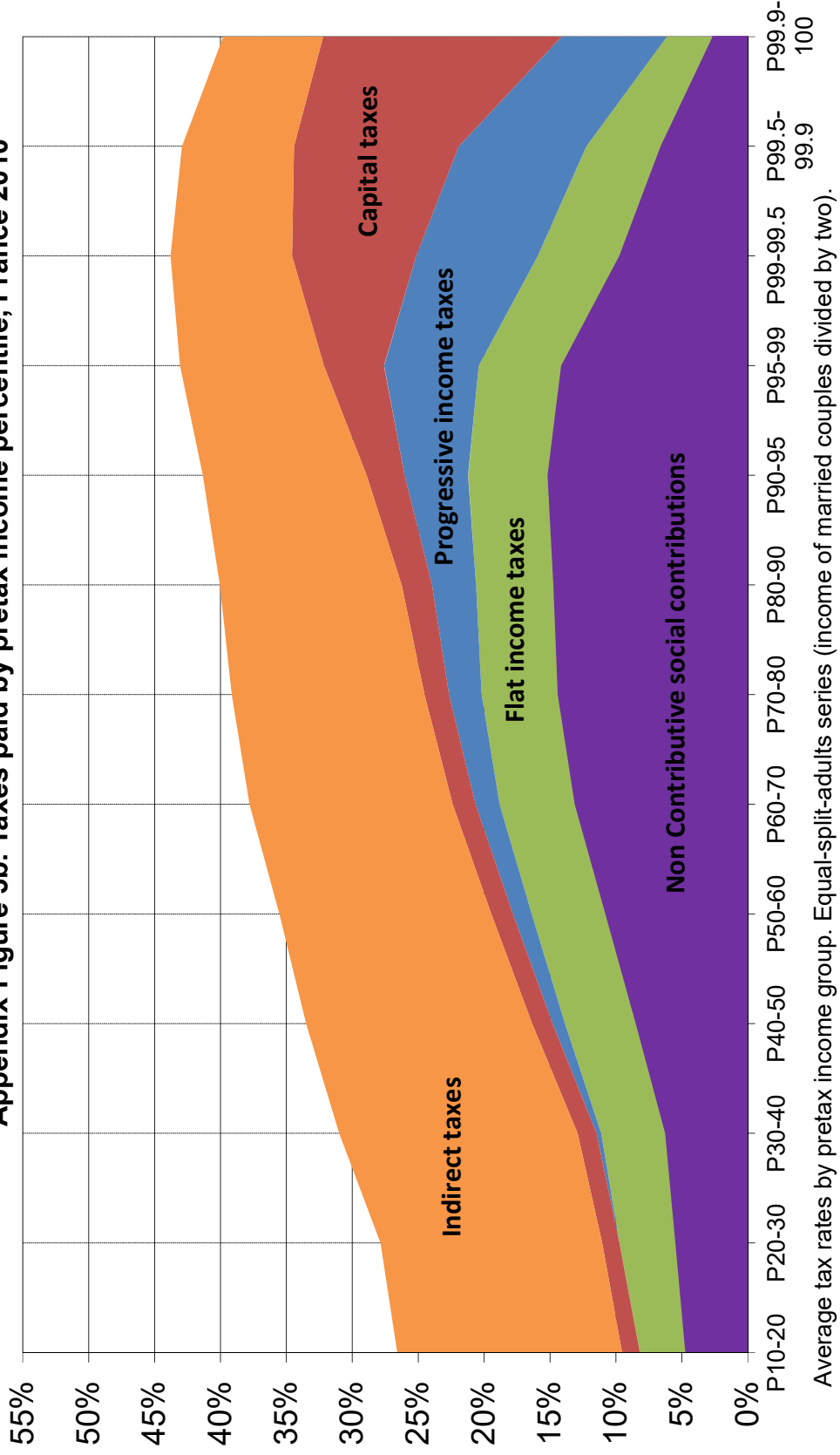
Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Figure 6a. Taxes paid by factor income percentile, France 2018

Indirect taxes

Capital taxes

Progressive income taxes

Flat income taxes

Total social contributions

60%

50%

40%

30%

20%

10%

0%

0   10   20   30   40   50   60   70   80   90   95   99   995   999   9999

Distribution of factor national income among working population, i.e. adults aged 25-60 y.o working at least part-time.

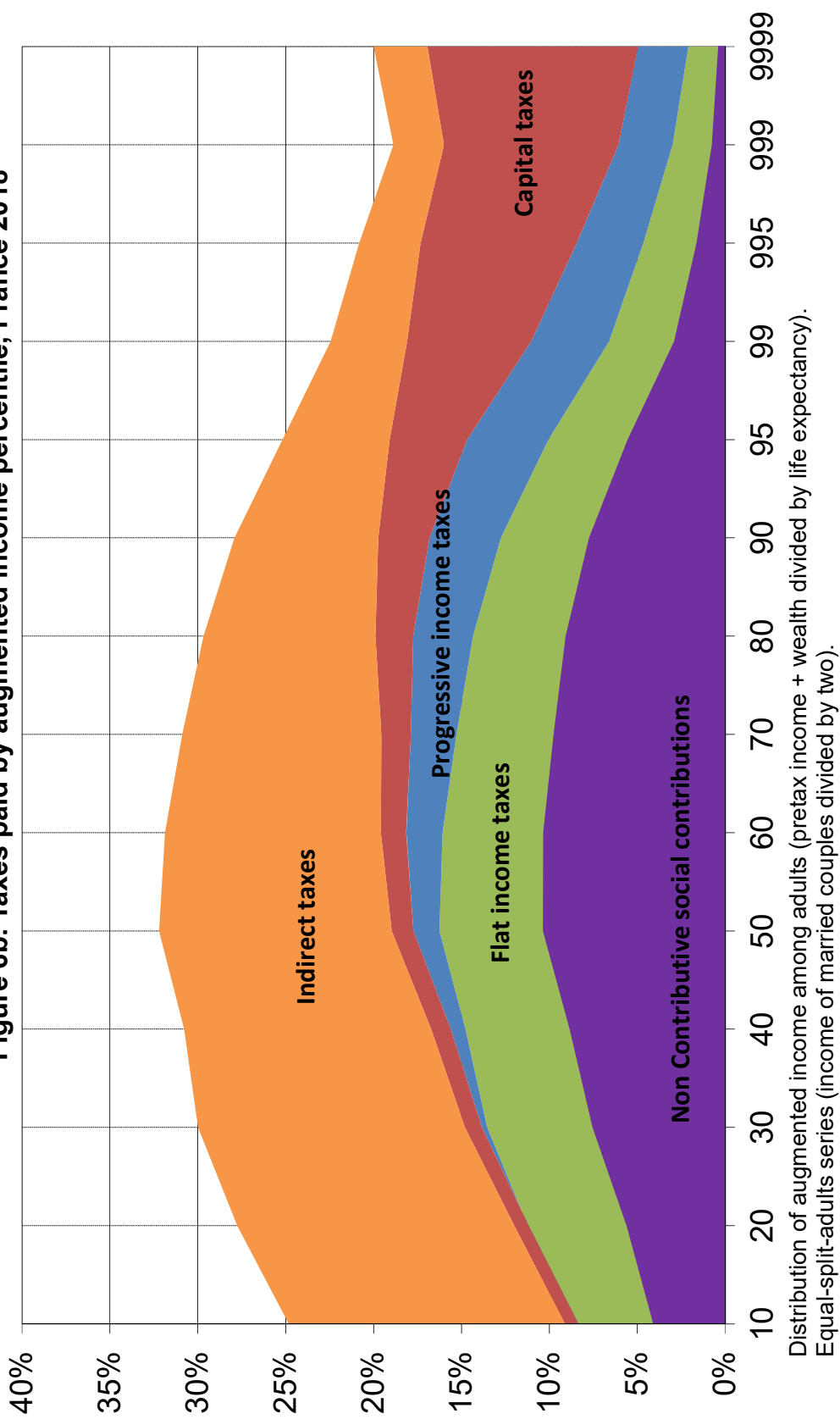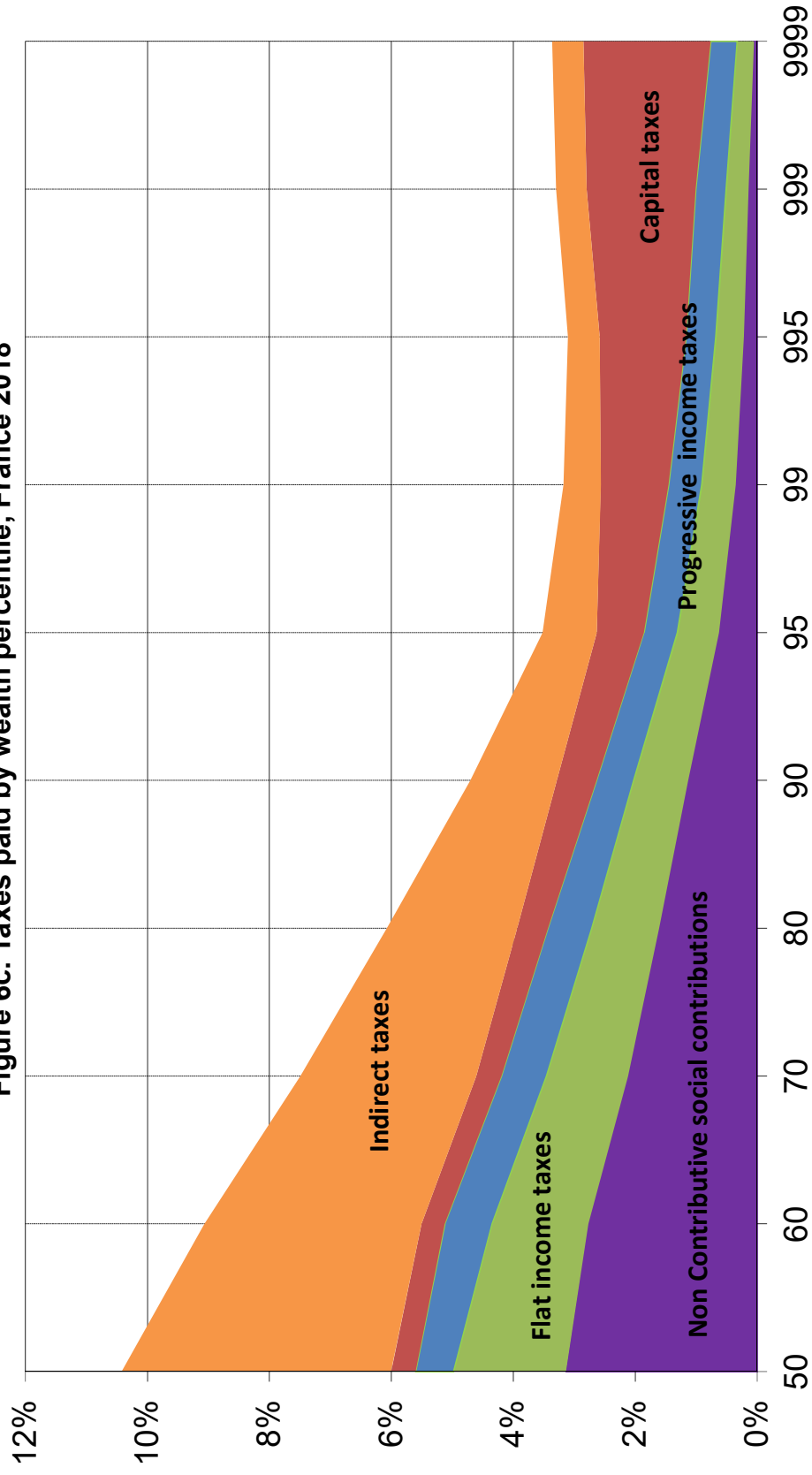**Figure 6b. Taxes paid by augmented income percentile, France 2018**

Indirect taxes

Progressive income taxes

Flat income taxes

Capital taxes

Non Contributive social contributions

Distribution of augmented income among adults (pretax income + wealth divided by life expectancy). Equal-split-adults series (income of married couples divided by two).

Figure 6c. Taxes paid by wealth percentile, France 2018

Indirect taxes

Capital taxes

Progressive income taxes

Flat income taxes

Non Contributive social contributions

Distribution of wealth among equal-split adults (wealth of married coupled divided by two).