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### Semi-parametric decomposition in France, 1970-2019

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# Determinants of the evolution of income inequality

## Semi-parametric decomposition in France, 1970-2019

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November, 2024

### Abstract

This article analyzes the evolution of income inequality in France between 1970 and 2019 and breaks down these variations into the respective contributions of changes in family compositions, occupations, individual earnings, taxes and social benefits, using a semi-parametric decomposition approach by sub-periods. Earnings and retirement pensions had a strong contribution to the decline in inequality during the 1970s and 1980s, before a neutralization and even a recent reversal of the impact. Changes in family compositions, particularly the rise of single-parent households, led to a moderate but continuous rise in inequality. The strong increase in female employment during that period did not lead to a uniform fall in inequality of household equivalized income, partly because of homogamy. Overall, direct taxes and social benefits have been more and more inequality-decreasing across the period, although this trend was temporarily reversed during the first decade of the twenty-first century.

**Keywords:** Long-term inequality; Redistribution; Demographic trends.

**JEL:** H53; I32; J11.

# 1 Introduction

The analysis of long-term changes in inequality occupies an important place in the economic literature, especially because of the recent construction of long-term databases that are comparable across countries, thanks to improved access to administrative data and new methodologies (Piketty, 2003; Piketty and Saez, 2003; Atkinson, Piketty, and Saez, 2011; Piketty and Zucman, 2014). Overall, intra-country inequality in developed countries has been on the rise since the turn of the 1970s and 1980s, after a long post-World War II period of relatively low inequality by historical standards. The evolution of inequality between countries is less monotonous when we look at inequality at the level of the world population (Lakner and Milanovic, 2016).

Several phenomena have been highlighted in the academic literature to explain these changes. The polarization of the labor market, initially highlighted in the United Kingdom (Goos and Manning, 2007) and the United States (Autor and Dorn, 2013), is caused by the evolution of the skills demanded by employers in a period of high task automation. In parallel, a race between education (the supply of skilled labor) and technology (the demand for skilled labor) has led to a decrease or increase in inequality, depending on the relative growth of the two determinants (Goldin and Katz, 2009).

At the same time, the labor market has been characterized by a steady increase in the participation rate of women (Mosisa and Hipple, 2006). This is due to cultural, economic and demographic changes, but also to policies that increase access to childcare (Baker, Gruber, and Milligan, 2008; Lefebvre and Merrigan, 2008). While this appears to be a factor in improving living standards, it may not be enough to reduce income inequality.

In a context of increasing female participation in the workforce, homogeneity actually increases inequality between households (Bouchet-Valat, 2017), and public policies can cause strong inequalities in access to childcare and consequently in labor market participation opportunities between mothers of different socioeconomic status (Carbonnier and Morel, 2018; Ferragina, 2020; Carbonnier and Palier, 2022). Transfer policies can also impede the partic-

ipation of some women in the labor market, even if they are not formally gendered (Pérvier and Verdugo, 2019; Carbonnier, 2021). In particular, parental leave increases periods of inactivity in the years following childbirth (Piketty, 1998), which can affect women’s careers in the long run (Lequien, 2012). Moreover, these gender differences can vary greatly between women of different socioeconomic categories, and even more so when access and public incentives differ by occupational category.

These social and demographic changes are accompanied by a shift in public policies that affect not only the labor force participation rate and the distribution of households’ labor income, but also their disposable income through taxes and social benefits. This redistribution has a direct impact on income inequality, and has significantly changed in developed countries, both on the taxes and on the transfers side.

The purpose of this paper is to assess the contribution of these determinants to the evolution of income inequalities in France. In particular, we aim to document how tax and family policies interact with socioeconomic inequalities to shape inequalities that cross socioeconomic and gender dimensions. Thus, we analyze the evolution of income inequality in France between 1970 and 2019, separating the respective contributions of changes in family compositions, occupations, individual earnings, taxes and transfers to the evolution of income inequality.

Over the past fifty years, the French economy and population have undergone major changes. Many of these changes reflect what has happened in most developed countries over the same period: population aging, increasing participation of women in the labor market, rising unemployment, skill-biased technological change, declining average household size, etc. But in some respects France’s trajectory is unique: a sharp reduction in income inequality until the 1990s, followed by a more moderate rise in inequality than in some other countries, and a massive escape from poverty among retired households thanks to rising pensions.

We decompose this French trajectory of inequality by analyzing representative data on French households from 1970 to 2019. These data, newly available following a harmonization

exercise (Blasco and Picard, 2019), are an exact matching of survey data on the sociodemographic profile of households (family composition, occupation, activity status) and of administrative data on income, taxes and benefits (earned income, pensions, taxes, social benefits). The analysis allows not only a precise measurement of changes in income distributions over time (as well as inequality indicators), but also a decomposition of these changes according to several parameters, in particular changes in redistributive policies, family composition, labor force participation and the interaction of these different parameters with changes in occupational structures and skills.

A critique from the sociological literature insists on the importance of not considering inequalities solely through uniform and continuous differences in income or wealth, and on the need for an analytical grid linked to occupational categories (Pierru and Spire, 2008; Duvoux and Papuchon, 2022). Similarly, economic literature has challenged the way in which different forms of wealth are considered homogeneous (Bonnet et al., 2015), opening up a debate on the valuation of real estate wealth and its consequences in terms of socio-economic inequalities (Carbonnier, 2015, 2018). Thus, this paper analyzes the evolution of income inequality in the light of the evolution of household categories and, in particular, the occupational category. In fact, the decomposition attempts to distinguish the changes in income inequality that are due to changes in the composition of the global labor force from those that are due to changes in the relative earnings of different occupations or to earnings dispersion within occupations.

The results show a strong contribution of earnings and retirement pensions to the reduction of inequality between 1970 and 1990, before a neutralization and even a slight opposite effect from the 2000s onwards. The strong increase in female employment, although an important structural change, did not lead to a uniform decline in income inequality between households, and even led to an increase in some subperiods due to the dispersion of income within the lower half of the income distribution. This is an indication that the effect of homogamy was greater than the pure effect of reducing inequality by increasing the labor

income of non-working women. Overall, taxes and benefits reduced inequalities, with the exception of the 2003-2012 period. The changes in household compositions and male occupations had a smaller contribution at each period, but a very persistent contribution which accumulated in a non-negligible inequality increase over the fifty past years.

The remainder of this article is organized as follows: the second section presents the database in detail in a first subsection, followed by the decomposition method in a second subsection. The third section presents the results by temporal sub-periods for a general perspective, and then by determinants for a more in-depth analysis of the impact of the factors driving inequality over time. Finally, the fourth section concludes and comments on the lessons and limitations of this decomposition.

## 2 Material and method

### 2.1 Data

This decomposition is based on the analysis of representative annual data of French households from 1970 to 2019. These data, which have recently been made available following a consistency study (Blasco and Picard, 2019), are derived from linking survey data on the socio-demographic profile of households (family composition, occupation, employment status) with tax and social security data on income (earned income, pensions, taxes, social benefits). These are the data from the tax income surveys (ERF) and the tax and social income surveys (ERFS). Initially, the surveys, based on the population census, were conducted approximately every five years: in 1970, 1975, 1979, 1984 and 1990. Two major changes occurred from 1996 onwards: first, the survey became annual; second, it was linked to the labor force survey and was thus enriched with data on employment.

Survey and tax data are matched in the following way: a representative sample of households is drawn from respondents of the population census (or from the labor force survey from 1996 onwards). The actual income tax returns of all individuals living in this house-

hold are then matched. This provides detailed information on the different types of income received and taxes paid by the household as a whole. Social transfers are imputed according to existing rules and scales for the years 1970 to 2004, using information available from the tax administration as well as information from the population census. From 2005 onwards, social transfers are matched using individual data from benefit funds.

These databases are representative samples of the population (ranging from 25,000 households for the first vintages to 50,000 households for the most recent vintages) and contain detailed information on households that allows us to go beyond income. Unlike tax data, which can at best group individuals by tax units, households can be defined as people living under the same roof and can be disaggregated by age and occupational categories of household members. For some household categories, such as joint custody of children, it may be difficult to define membership. In our method, we use the household members as reported in the survey.

It is thus possible to create categories that cross household composition (single man or woman, couple, with or without dependent children) and occupational categories (crossed for the man and woman in the case of a heterosexual couple). Therefore, in the rest of the study, we consider as different household categories a low-skill employed woman in a couple with an executive man and an executive woman in a couple with a low-skill employed man, even if they have the same number of children. Same-sex couple households, because of their small numbers and the fact that they were not reported as couples in early versions of the survey, are grouped together with other types of households made up of several cohabiting adults.

Regarding income, it is possible to break down pre-tax income into wages and salaries, self-employment income, unemployment benefits<sup>1</sup>, retirement pensions, and other income.

On the other hand, due to the structure of the survey, the available samples are not representative of incomes at the top of the income distribution. Thus, the goal is to analyze

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<sup>1</sup>For survey years up to 1990, unemployment benefits are included within wages and salaries.

the evolution of inequality among households in the bottom 99 percent of the income distribution, which may lead to significant differences with inequality measures that focus on the highest incomes, including income not distributed by firms (Yonzan et al., 2022; Garbinti, Goupille-Lebret, and Piketty, 2018, 2021).

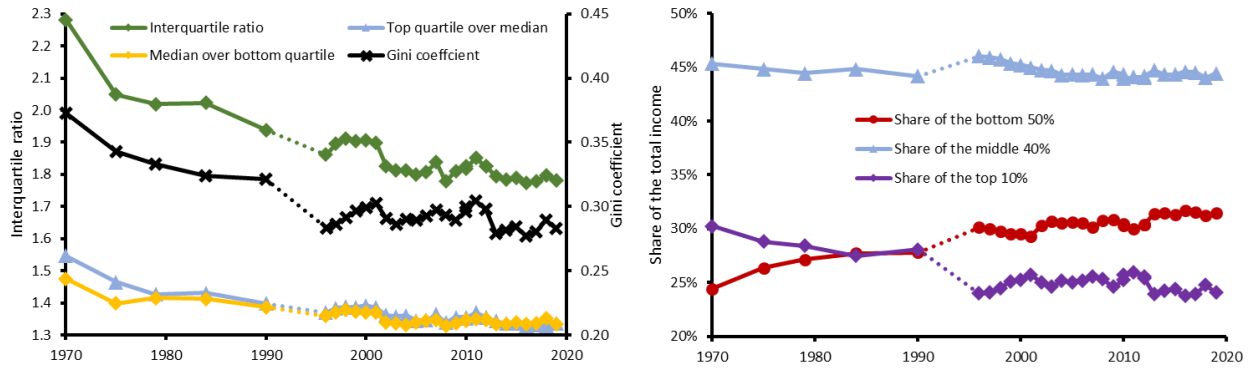
Another weakness of these data is the variable coverage of capital income. Indeed, the obligation to report it has varied over time and only a small fraction of it may be available in tax sources. However, this problem is corrected by imputation in the ERFIS from 1996 onwards, using models of asset holdings based on household surveys and a simulation of financial income based on bank sources. Therefore, changes in capital income cannot be interpreted for the period 1990 to 1996, as the differences reflect the introduction of new measures rather than actual changes in household income. However, the decomposition step associated with these incomes is retained, not for direct interpretation, but as a control for this effect vis-à-vis the other determinants of inequality trends.

Since different inequality indicators measure different phenomena, we use several of them to understand the evolution of inequality in its entirety and complexity.<sup>2</sup> As our study focuses on the changes in the middle class (and not at the upper tail of the income distribution), we focus on inequality indexes at the middle of the distribution, preferably the interquartile ratio. To distinguish between changes in inequality in the upper and lower middle classes, sub-indexes are also used: the ratio of the upper quartile over median and the ratio of median over the lower quartile. Furthermore, the shares of the overall income accruing to the different parts of the income distribution are also measured: the share of the bottom 50%, the share of the middle 40% and the share of the top 10%. Figure 1 shows the evolution of these indexes over the period studied.

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<sup>2</sup>To take account of household size, the income considered for the inequality statistics is equivalized with respect to the OECD-modified equivalence scale: one for the first member of the households, 0.5 for each additional above 14 year old member and 0.3 for each additional above 14 year old member. The quantiles of the equivalized income distributions are measured so that each decile (respectively quartile) of the distribution consists in the households constituting 10% (respectively 25%) of the individual members with similar household equivalized income.

Figure 1: Evolution of income inequalities in France, 1970 – 2019

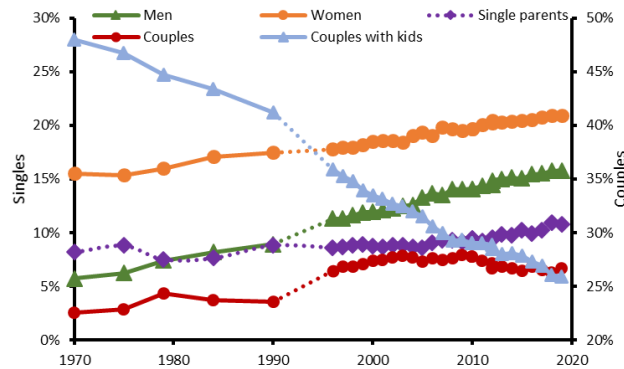


Scope: Metropolitan France, households excluding collective housing, 1970-2019.

Source: ERF-ERFS, Insee.

Thus, it appears that inequality has declined overall for all indicators, with a rapid decline in the 1970s, 1980s, and first half of the 1990s, followed by a halt or even an increase in inequality in the second half of the 1990s, the 2000s, and the 2010s. Compared to other works (especially those that distribute total national income), the increase in inequality since the beginning of the 21<sup>st</sup> century is much less pronounced here. This is due to the limitations mentioned above. Yonzan et al. (2022) show that survey and tax data are very comparable for all but the top 1% of the population. Yet this top 1% of income has made a significant contribution to the recent rise in inequality, as measured in particular by Chancel et al. (2022).

Figure 2: Evolution of family compositions in France, 1970 – 2019



Scope: Metropolitan France, households excluding collective housing, 1970-2019.

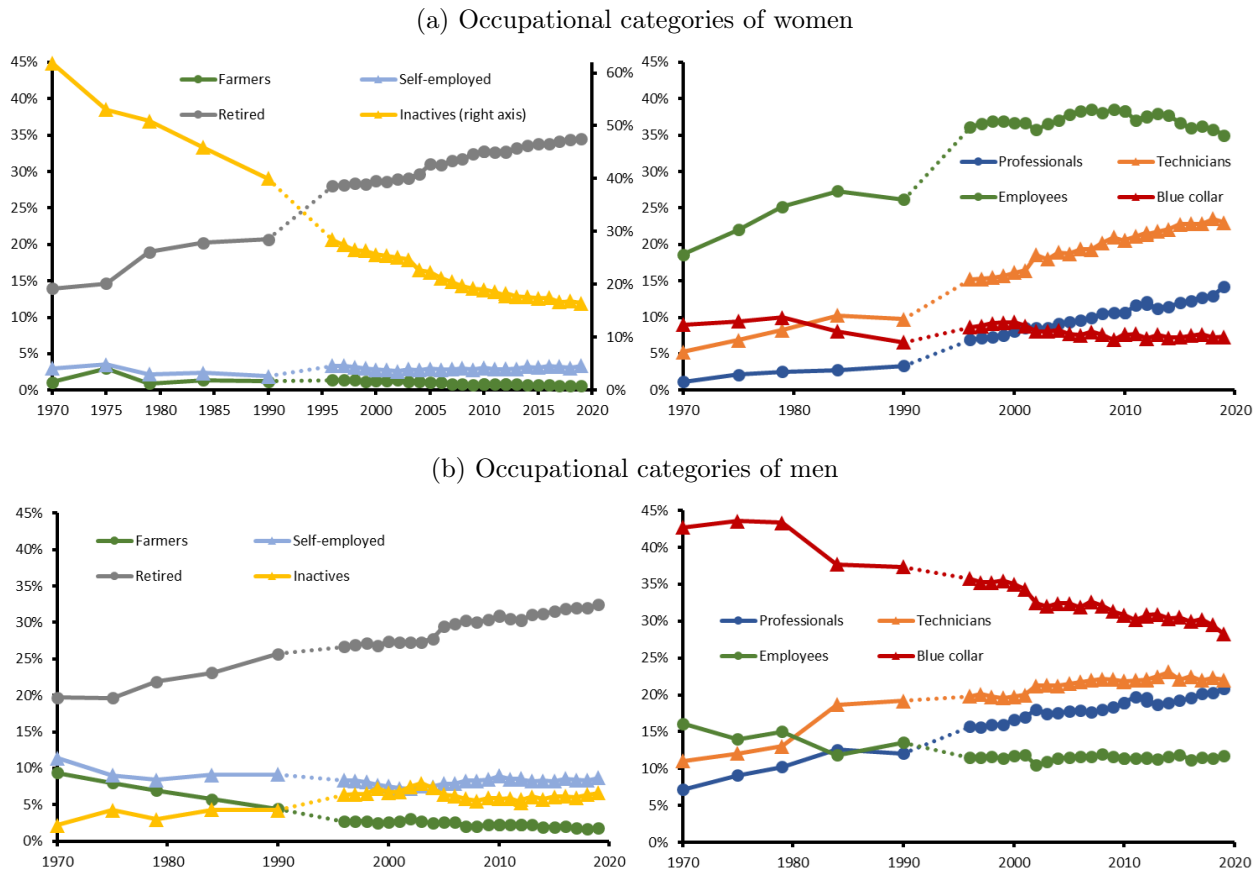
Source: ERF-ERFS, Insee.

Among the variations in family compositions (Figure 2), the general picture is one of a sharp decline in couples with children, absorbed by all the other categories. However, the growth rates of these other categories differ. The category of single men has grown strongly, from the rarest composition in 1970 to approaching single women at the end of the period. The other categories have grown much more slowly on average, with steady, low growth for single women and couples without children, and concentrated growth at the end of the period for single-parent families. The growth of single persons and couples without children is partly due to the aging of the population, as the share of retired households increased steadily over the period. The increase in the number of single persons with children (mainly single mothers) does not appear very large in the figures, but should not be neglected for at least two reasons: first, the absolute change may be small, although the relative change is larger; second, the increase in the number of single mothers is much larger as a proportion to non-retired households.

Regarding the labor force (Figure 3), the first thing to note is the large increase in the share of retired people. As a result of the ageing of the population, their share in the adult population has almost doubled over the whole period. The main trends concerning occupational categories are the general rise in qualifications – for both men and women – and the very sharp decline in the number of non-retired inactive women. This decline is steady in relative terms over the whole period, but seems to be slowing down in absolute terms as the stock becomes smaller.

Farmer and self-employed women, who were very few in number at the beginning of the period, have kept a low share, and even seen their share decline further for farmers. Blue-collar women were less rare in 1970 (around 10% of non-retired women) and their share declines along the period. The strongest growth rates are observed among the most highly qualified women – professionals and technicians – although they are still in the minority compared to women employees. For the latter, three periods can be distinguished, with growth from 1970 to 1999, stabilization from 1999 to 2007 and then a decline from 2007

Figure 3: Evolution of occupational categories in France, 1970 – 2019



Note: With the exception of the category retired calculated as the share of all men or women, the share of the other occupational categories are among non-retired persons.

Scope: Metropolitan France, households excluding collective housing, 1970-2019.

Source: ERF-ERFS, Insee.

onwards, which continued after the economic crisis, even during the period of clear recovery from 2016 to 2019.<sup>3</sup>

Among men, the largest decline in relative terms is among farmers and the largest decline in absolute terms is among blue-collar workers. Self-employed and employees experienced a steady decline, similar to that of blue-collar in relative terms, but starting from a much lower base. The growth of professionals and technicians is very similar over the early part of the

<sup>3</sup>In the French administrative databases, occupations are recorded following a different categorization than the International Classification of Occupations (ISCO): the category professionals corresponds to the managers and most professionals categories in ISCO, technicians corresponds mainly to the technicians and associate professionals in ISCO. The remaining – less skilled – occupations are split in two: blue collar and the rest among a general category called employees.

period, but that of technicians seems to have stopped since 2002, or even reversed since 2014, while that of professionals continues. The rate of non-retired inactive men has risen sharply, but still remains the rarest category apart from farmers.

## 2.2 Method

To decompose the evolution of income inequality due to changes in the structure of the population, the labor market and socio-fiscal policies, we follow the method used by Biewen and Juhasz (2012) to analyze wage inequality in Germany from 1999/2000 to 2005/2006. They adapted a semi-parametric decomposition method developed by DiNardo, Fortin, and Lemieux (1996) to decompose the increase in inequality in the U.S. labor market between 1973 and 1992 into three factors. Our adaptation of the method allows us to account for a larger number of factors, including differential changes in types of income that not all households earn, by separating between developments in the extensive and intensive margins.

### 2.2.1 Determination of the sub-periods

In addition, the available data allow us to analyze a much greater depth of time. However, this long period is analyzed by sub-periods because the different determinants have had variable or even opposite contributions over the long time scale considered: from 1970 to 2019. The choice of sub-periods for the end of the 20<sup>th</sup> century is limited by the fact that the survey data from 1970 to 1996 were not annual, but about every five years. Therefore, we analyze the period from 1970 to 1975 with the end of the post-war boom, then from 1975 to 1984 with the decade of recession following the energy crisis. The recovery from 1984 to 1990 is followed by a new recession from 1990 to 1996.<sup>4</sup>

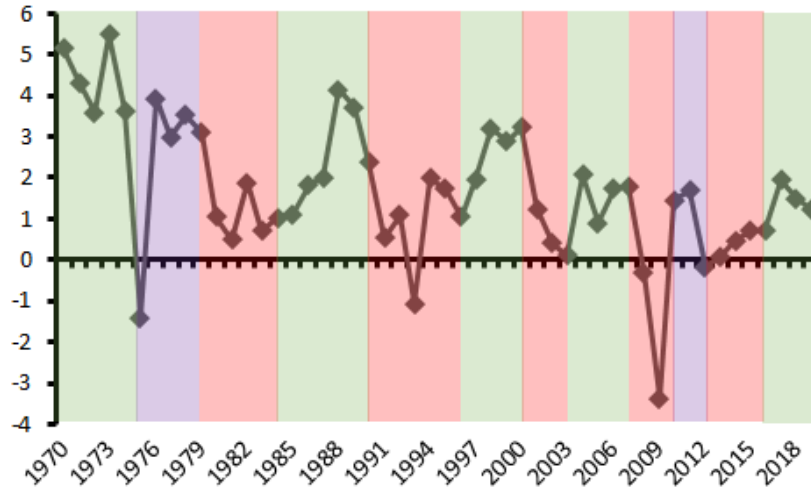
For the beginning of the 21<sup>st</sup> century, another constraint is imposed due to breaks in the data series in 2010 and 2012 (but with two databases in each of the statistical conventions for these key years): we therefore have a study period from 2010 to 2012. After 2012, we

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<sup>4</sup>Nevertheless, this last period cannot be properly interpreted due to changes in database building between 1990 and 1996, see section 2.1.

choose to divide the period according to the economic cycles (see Figure 4) and therefore divide between 2012 and 2016 and between 2016 and 2019. An alternative breakdown based on the electoral cycle takes 2017 as a transition year. Before 2010, and still based on the business cycle, the periods are 1996 to 2000, before the Internet bubble burst from 2000 to 2003, a new growth phase from 2003 to 2007, before the subprime crisis from 2007 to 2010. An alternative based on the electoral cycle considers the periods from 1997 to 2002, from 2002 to 2007, and from 2007 to 2012.

Figure 4: GDP growth in France, 1970 – 2019 and chosen decomposition periods



Scope: France, 1970-2019.

Source: Annual national account, Insee.

### 2.2.2 Evolution of the distribution of households' characteristics

For each sub-period, we start from the income distribution of the initial year (noted with index 0) and build a counterfactual income distribution by modifying each determinant of income, so that the underlying structure corresponds to the characteristics of the final period (with index 1). First, we modify the weights of the observations so that the frequencies of the family compositions of the modified period 0 correspond exactly to those of period 1. Then, we operate sequentially on the other characteristics (the share of retired men, the

distributions of men’s occupational categories, the share of retired women, the distributions of women’s occupational categories) so that they also correspond.

For example, to obtain the corrected weights  $w_{\Delta\Theta\Lambda}^0$  so that the weighted frequencies of categories  $D$  in the feature set  $\Delta$ , categories  $T$  in the feature set  $\Theta$ , and categories  $L$  in the feature set  $\Lambda$  correspond to the frequencies of period 1, the initial survey weight  $w_i^0$  of household  $i$  (belonging to categories  $D_i$ ,  $T_i$ , and  $L_i$ ) in period 0 is modified according to formula (1):

$$w_{i,\Delta\Theta\Lambda}^0 = w_i^0 \times \left( \frac{\sum_{j \in D_i T_i L_i} w_j^1}{\sum_{k \in \text{period}_1} w_k^1} \right) / \left( \frac{\sum_{j \in D_i T_i L_i} w_j^0}{\sum_{k \in \text{period}_0} w_k^0} \right) \quad (1)$$

That is to say, households who belong in categories that are relatively more frequent in period 1 than in period 0 will see their weights increased, while households who belong in categories that are less frequent in period 1 than in period 0 will see their weights decreased. Each step of such reweighting is done sequentially and conditionally of previous decompositions.

### 2.2.3 Evolution of the income per type

The following steps modify the distributions of categorical incomes. For each type of income other than taxes and social benefits (labor income, unemployment benefits, retirement pensions, capital income), a first sub-step modifies the weights of the observations to correct for the extensive part that is the rates of beneficiaries of these incomes, in the same way as is done in previous steps. For taxes and benefits, we do not correct for extensive margins via reweighting, as changes in the share of households affected by taxes or benefits conditionally on the changes in the structure of the population should be interpreted as changes in the taxes and benefits designs, not changes in the structure of the population (see following subsection).

In a second sub-step, the amounts themselves are modified to take into account the evolution of the intensive margin. The incomes of the last period are normalized so that the

average equivalized disposable income is the same in the two periods, in order to measure the evolution of the shape of the income distributions and not their level, and to neutralize the effect of the order of the incomes taken into account in the decomposition.

The intensive sub-step corresponds to taking into account changes in the distributions of income conditional to the household categories of the previous step. This involves regressing the amount of categorical income considered on all household characteristics (for those households that benefit from it), according to equation (2).

$$Y_{it} = \alpha_t + \sum_j \beta_{jt} \mathbb{1}_{[i=j]} + \sum_k \gamma_{kt} X_{ikt} + \epsilon_{it} \quad (2)$$

Where  $Y_{it}$  is the considered income of household  $i$  in period  $t$ ,  $\mathbb{1}_{[i=j]}$  the indicator equal to 1 if household  $i$  belongs to category  $j$  and 0 otherwise,  $X_{ikt}$  the values of the other characteristics  $k$  of household  $i$  in period  $t$ ;  $\alpha_t$ ,  $\beta_{jt}$  and  $\gamma_{kt}$  are the coefficients of the regression and  $\epsilon_{it}$  the residual. Other  $k$ -controls include age, age squared, and pre-tax & transfers income and its square for the tax and benefit regressions.

From these regressions, it is possible to calculate for each household  $i$  of period 0 the value  $\hat{Y}_{i0}^0$  of income predicted by the period 0 regression and the value  $\hat{Y}_{i0}^1$  predicted by the period 1 regression. Then, the actual value  $Y_{i0}$  of household  $i$ 's income in period 0 is corrected homothetically to  $Y_{i0}^{cor}$ :

$$Y_{i0}^{cor} = Y_{i0} \frac{\hat{Y}_{i0}^1}{\hat{Y}_{i0}^0} \quad (3)$$

In order to avoid outliers, the income correction is bounded in proportion to the initial value: actually, the correction cannot divide or multiply the initial value by more than 2.

Once income type  $Y$  has been corrected, the disposable income  $DY_{i0}$  of household  $i$  in period 0 is corrected (in  $DY_{i0}^{cor}$ ) for the evolution of income types  $Y$  of her category  $j$  according to equation (4).

$$DY_{i0}^{cor} = DY_{i0} + (1 - \tau_{i0}) (Y_{i0}^{cor} - Y_{i0}) \quad (4)$$

Where  $\tau_{i0}$  is the average tax rate of household  $i$  in period 0.

Furthermore, robustness test are implemented by correcting incomes by alternative methods. A first alternative (called the additive alternative) consists in computing an additive correction thanks to the results of the same regressions:

$$Y_{i0}^{cor} = Y_{i0} + \left( \hat{Y}_{i0}^1 - \hat{Y}_{i0}^0 \right) \quad (5)$$

The second alternative methodology for taking into account changes in categorical incomes (called the intra-category alternative) takes into account both inter-category and intra-category changes in income through changes in the intra-category standard deviation of each type of income. To compute this, the averages  $m_{jt}^Y$  and standard deviations  $\sigma_{jt}^Y$  of the income considered  $Y$  for each category  $j$  at each period  $t$  are calculated. The income of household  $i$  is thus corrected to present the conditional averages and standard deviations of the period 1:

$$Y_{i0}^{cor} = Y_{i0} + m_{j1}^Y - m_{j0}^Y + \left( \sigma_{j1}^Y - \sigma_{j0}^Y \right) \frac{Y_{i0} - m_{j0}^Y}{\sigma_{j0}^Y} \quad (6)$$

Only the results of the central methodology are presented and discussed in the body of this article; the results of the alternative methodologies, as well as alternative orders in the corrections of the determinants, are presented in online appendices. They are essentially similar to those of the central methodology. The rare and small differences – according to order of determinants correction and according to methodology for correcting incomes – are presented in Appendix B.

#### 2.2.4 The extensive margin due to tax and allocation schedules

For taxes and benefits, the extensive margins step concerns changes in the schedules and not only demographic changes of potential beneficiaries or taxpayers. Therefore, a specific methodology at the extensive margins is implemented. Let be  $x_0$  and  $x_1$  the respective shares at period 0 and 1 of households affected by taxes (the same is done separately for benefits).

We compute a binomial logistic regression that models the probability of being affected by positive taxes or positive benefits in period 1. Thanks to the parameters of this regression applied on the observations of period 0, we compute the probability for observation of period 0 to be affected by taxes in period 1. If  $x_1$  is lower than  $x_0$ , we consider as not affected in period 1 the proportion  $x_0 - x_1$  with the lowest probability of being affected in period 1 among the households actually affected in period 0. On the opposite, if  $x_1$  is larger than  $x_0$ , we consider as affected the proportion  $x_1 - x_0$  with the highest probability of being affected in period 1 among the households actually non-affected in period 0.

For households who were affected by taxes or benefits at period 0 and are predicted to be so at period 1, the amounts are corrected following the method described in the previous section. For those who were actually affected at period 0 but are predicted not to be at period 1, the corrected tax or benefit becomes zero. For those who were not affected at period 0 and are predicted to be affected in the modified distribution, we attribute the average of corrected taxes or benefits among  $i_0$ 's 4-nearest neighbors in terms of predicted probability (a technique generally used for imputing missing values in administrative or survey data, see Little and Rubin, 2019).

### **2.2.5 Decomposition of inequality evolution between periods**

Following previous steps and recording the databases after each gradual transformation from period 0 to period 1, we have a set of databases for which some determinants have been modified to correspond to those of period 1 and some other determinants still corresponding to period 0. For each database, it is possible to calculate the usual indicators for measuring inequality (the interquartile ratio, the Gini coefficient for average inequality over the whole distribution, the poverty rate for inequality at the bottom of the distribution and the share of the richest 10% for inequality at the top of the distribution). The pattern of variation of these indicators over time allows us to observe the contributions of the different determinants to the evolution of inequality between periods 0 and 1.

## 3 Results

In this section, we present the results of our decompositions on the subperiods defined in Section 2.2.1: the pivot years are 1970, 1975, 1979, 1984, 1990, 1996, 2000, 2003, 2007, 2010, 2012, 2016, 2019.

First, we present the general outlook of period-by-period decompositions. This allows to compare the impact of different determinants and thus to identify the main drivers of inequality during specific periods. Second, we present the long-run effect of each determinant by summing its contributions over all subperiods.

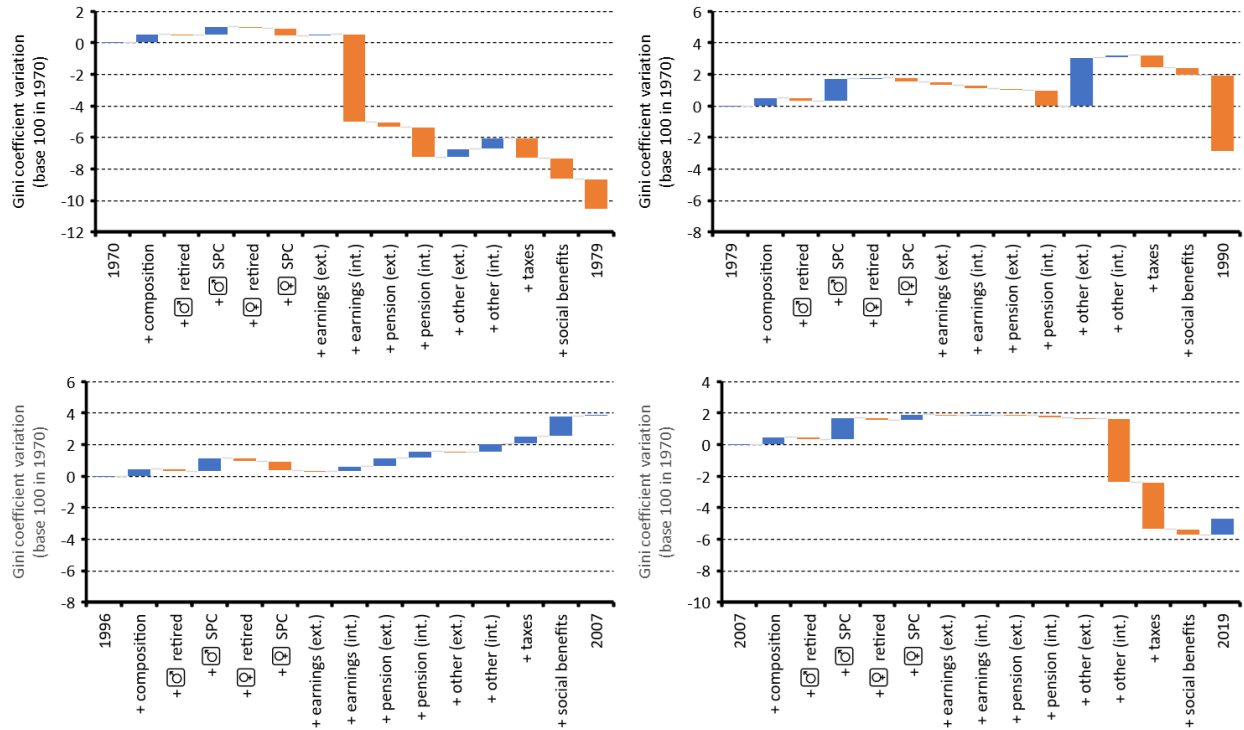
### 3.1 Period-by-period analysis

For better clarity for this part, we consider less and larger sub-periods consisting in aggregations of the study periods by adding the contributions of the determinants after their normalization. Normalization is performed as a base 100 relative to the indicator value at the start of the study window, that is in 1970. The considered sub-periods are close to decades: 1970-1979, 1979-1990, 1996-2007 and 2007-2019. No sub-periods include the period from 1990 to 1996 due to the change in the way the survey was conducted between these two dates (see subsection Section 2.2.1). Figure 5 presents the results concerning the global decomposition of inequalities (measured by the Gini coefficient).

The last bar in each graph represents the difference in income inequality between the fully corrected income distribution for the initial year and the actual income distribution for the final year. Overall, those residues are small, even if a bit larger for pre-1996 computations (see Appendix A for a more extensive presentation of the residues).

First, it can be noted that all sub-periods are different in their shape and thus in their main determinants. The main determinant of the huge drop in inequality during the 1970s is the level of earnings, with substantial contributions of pensions, taxes and benefits. This redistribution is clear when looking at income shares (not shown here for conciseness), as the

Figure 5: Decomposition of inequality evolution by sub-periods (Gini coefficient)



Scope: Metropolitan France, households excluding collective housing, 1970-2019.

Source: ERF-ERFS, Insee.

three determinants have led to an increase in the share of the bottom 50% and a decrease in the share of the top 10% over the period. The share of the middle 40% is evolving less strongly, rising slightly due to earnings and falling due to taxes and benefits. The strong earning determinant may be due to economic and technological change (Autor and Dorn, 2013) but also to institutional factors such as the evolution of the minimum wage, public sector compensation policies and, more generally, social bargaining policies (Carbonnier and Palier, 2022). The evolution of pensions, on the other hand, is the result of demographic changes (aging of the population), cohort effects where more complete careers lead to better pensions, and also political changes in the rules governing public pensions.

The intermediate periods (1979-1990 and 1996-2007) are marked by smaller and more similar contributions from the various explanatory factors, pointing to a slight rise in in-

equality.<sup>5</sup> However, this is not due to regulatory transformations, especially over the period 1996-2007, when the redistribution took place in the top half of the equivalized income distribution: the share of the top 10% rose slightly, while that of the middle 40% fell slightly, with the share of the bottom 50% remaining virtually unaffected.

Socio-demographic determinants (family types, occupational categories, share of pensioners) generally have a smaller impact on the evolution of inequality than income determinants in a given sub-period. This is a reflection of the fact that, even if there are significant income differences between these groups, there is still considerable inequality within groups, and thus changes in household composition are not perfectly correlated with changes in income inequality. Moreover, the structure of the population changes more slowly than incomes. However, their impact can be significant over longer periods of time, as the effects can add up.

The latest sub-period (2007-2019) is fairly similar to the previous period (1996-2007), with two notable differences. Firstly, a fall in inequality is attributable to the distribution of other incomes, with a drop in the share of the 10% and an increase in the other categories. This is probably due to the fall in wealth income following the financial crisis that began in 2008. Secondly, the system of compulsory levies contributed to a fall in inequality over this period, favoring the bottom 50% and disadvantaging the top 10%, without affecting the middle 40%.

### **3.2 Evolution of the demographic characteristics**

As shown in the previous subsection, the evolution of family compositions and occupational categories generally has a smaller impact on household income inequality than the evolution of income distributions in a given sub-period. Here we present the long-run effect of these determinants by summing their contributions over all sub-periods.

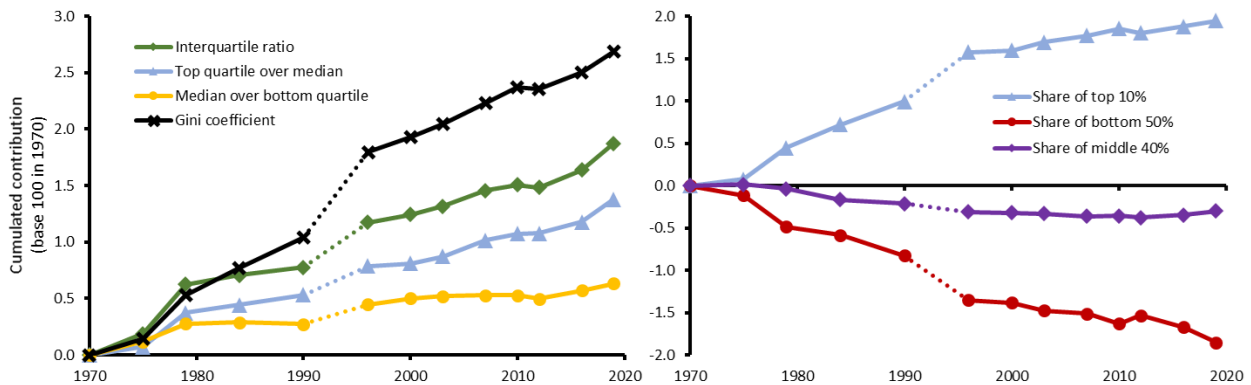
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<sup>5</sup>The 1979-1990 case is marked by a substantial rise in inequality due to “other income” in the extensive margin, but this category is poorly informed for the vintages before the survey was redesigned in 1996.

### 3.2.1 Evolution of the impact of family composition on inequalities

The effect of changes in family compositions on the evolution of income inequality is quite small across the whole period. Adding up sub-periods, we observe a slow and continuous contribution to a rise in inequality: about +2% of the initial level of the interquartile ratio (and +2.5% of the initial level of the Gini coefficient) over the whole period (Figure 6). This can also be seen in the continuous decrease of the share of the bottom half of the distribution due to composition and an increase of the share of the top 10% (the share of the middle 40% is not impacted by the evolution of household compositions).

Figure 6: Evolution of the impact of family composition on inequality



A significant trend over the whole period is the decrease in the average size of households, mainly due to the decline in large families, the ageing of the population and the increase in single-parent families. This can have a significant impact on living conditions, as cohabitation involves economies of scale (thus justifying equivalence scales in the calculation of equivalized incomes).

On the other hand, the share of couples without children has been increasing throughout the period. This has contributed to an increase in income inequality, as couples without children are over-represented at the top of the income distribution.

In the second part of the period, single-parent families have become more common and are over-represented at the bottom of the income distribution (even in poverty). On the other

hand, couples with two or more children became less common, which may have contributed to inequality in the opposite direction, as they also had a higher risk of poverty.

Overall, the effect of family types on the evolution of household income inequality remains moderate, partly because the changes associated with them are very slow compared to other determinants, and because there are still significant inequalities between each family type. This is thus consistent with the fact that the demographic face of low income has changed over time, with more single-parent families and fewer couples (Blasco and Picard, 2019).

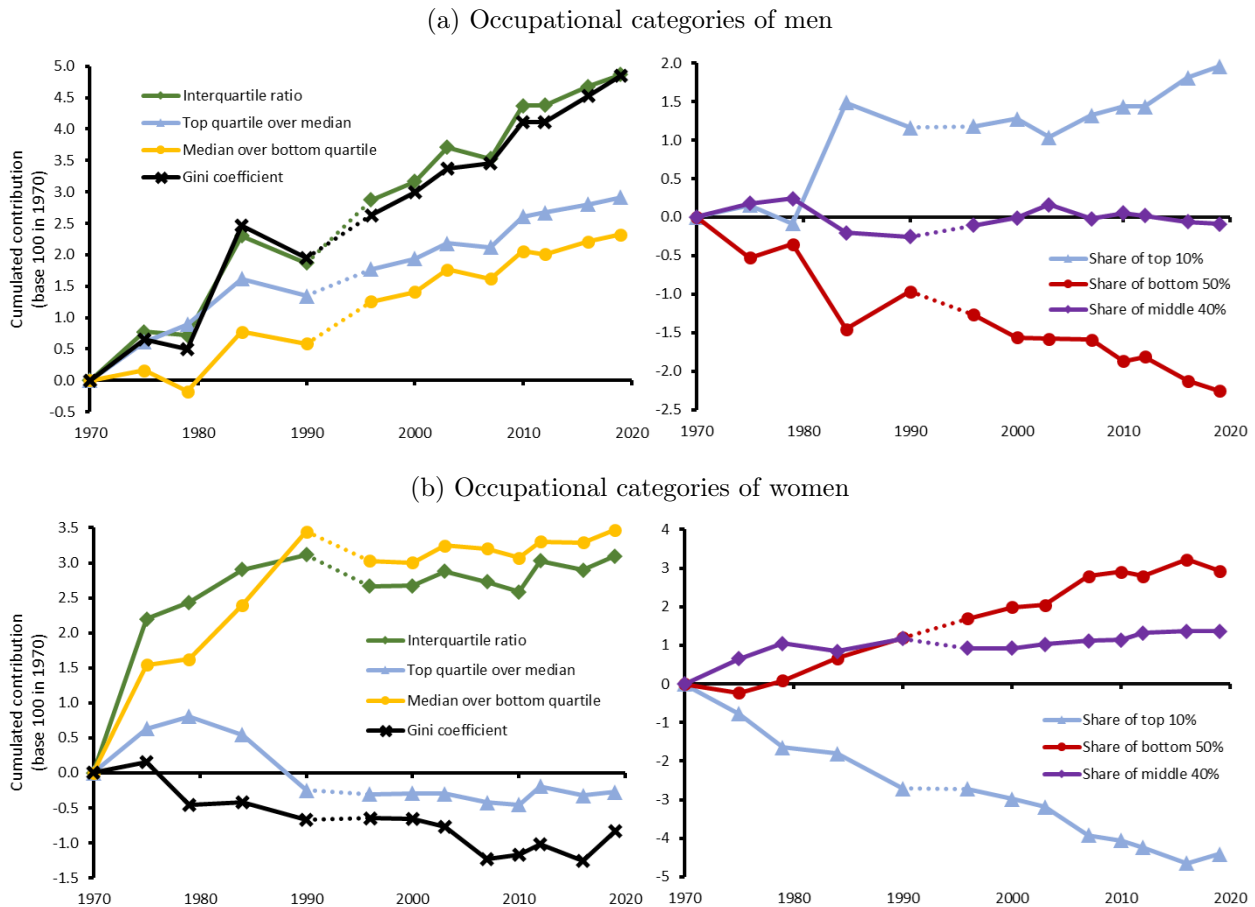
### **3.2.2 Evolution of the impact of occupations on inequalities**

In recent decades, many phenomena related to the labor market and occupations have been highlighted in relation to the evolution of inequality between households. In particular, there has been a significant evolution in the employment of women during this period. The part of the decomposition that measures the impact of occupational categories (separately for women and men) is shown in Figure 7.

The effects of changes in occupational categories are different for men and women, notably because the changes themselves differ (Marchand, 2010). For men, the overall effect on the shares of income captured by the middle 40% is very small, with the exception of the 1979-1984 period. This same period saw a sharp rise in the share of the top 10% and a sharp fall in the share of the bottom 50% due to changes in occupational categories, resulting in a sharp rise in all inequality indicators. Indeed, the early 1980s saw an acceleration in the decline of employees and blue collars, an acceleration in the growth of professionals, technicians and inactives, as well as a pause in the decline, and even an increase, in self-employed workers Figure 3.

In the twenty-first century, trends were slower but monotonous and continuous, leading to significant impacts on inequalities. Changes in men's occupations have contributed to a steady decline in the share of the bottom 50% and a steady increase in that of the top 10%, with a consequent steady increase in all inequality indicators.

Figure 7: Evolution of the impact of occupational categories



For women, the evolutions are more complex. With the exception of the first half of the 1970s, changes in women's occupations have helped to reduce the Gini coefficient of equivalized disposable income. However, this average masks disparate trends along the income distribution. During the 1980s, the sharp fall in the number of inactive women, and to a lesser extent blue collar women, associated to a sharp rise in the number of women employees, and to a lesser extent of technicians, led to an increase in the average standard of living of modest couples who had become bi-active. This can be seen in the rise in the share of the bottom 50% to the detriment of the share of the top 10%.

It should be noted, however, that this rise in living standards only occurred at the top end of the bottom 50% category, while the rest of this category, which has probably remained single-earner, saw its standard of living fall. Before the rise in female participation, a single

income from employment was sufficient for a couple to live well, but this is becoming less and less sufficient as the norm shifts to dual activity. This reduces inequalities between bi-active couples, but increases the difference with respect to mono-active couples. This can be seen from the fact that, while the Gini coefficient fell slightly during the 1980s and the ratio of the top quartile to the median fell sharply, the interquartile ratio and the ratio of the median to the bottom quartile rose sharply.

The same trend continued into the twenty-first century, albeit more slowly. The fall in the number of inactive and blue collar women was accompanied by a fall in the number of female employees, leading to an increase not only in the number of technicians, but also in the number of professional women. This has led to a steady and significant fall in the share of the top 10% and a rise in the share of the bottom 50%. Once again, the latter was probably driven by the top end of this category of modest households. Actually, while changes in female activity contributed to lower the Gini coefficient (with no major impact on the ratio of top quartile to median), they did lead to a slight increase in the interquartile ratio and the ratio of top quartile to median.

### **3.3 Evolution of income**

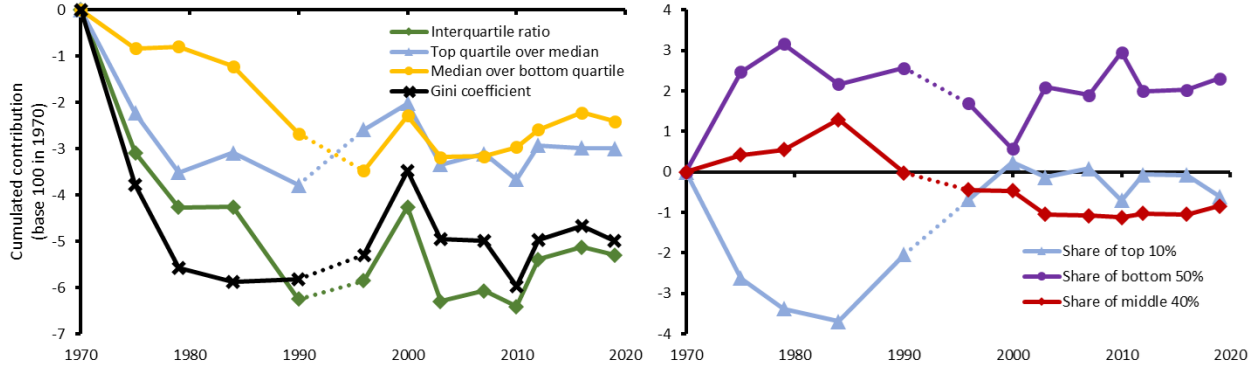
In this section, we present determinant-by-determinant long-run effects on income inequality for the two main sources of household income, which are earned income (including wages, public unemployment insurance, self-employed income) and pensions. We show that incomes (conditional to household characteristics) are the main drivers of the evolution of income inequality, and that their impact has not been monotonic over time.

#### **3.3.1 Evolution of the impact of earned income on inequalities**

First, we analyze the impact of the evolution of earned income (Figure 8) whose effect on inequality depends on the period. There is a clear contribution to a decrease in inequality during the first two decades of the the study windows. For the two first periods - 1970-1975

and 1975-1979 - the evolution of earnings has contributed to a catch-up between households, with a downward influence on the share of the top 10% and an upward influence on the other two categories, but stronger for the bottom 50% than for the middle 40%. This leads to a sharp drop in all inequality indicators.

Figure 8: Evolution of the impact of earned income on inequality



The decade of the 1980s was more complex in the sense that changes in earnings over the period 1979 to 1984 resulted in an increase in the share of the middle 40% and a decrease in the shares of both the bottom 50% and the top 10%, with a neutral effect on overall inequality indices (Gini coefficient and interquartile ratio) but different effects on inequality at the top and bottom of the distribution: an increase in the ratio of the top quartile to the median but a decrease in the ratio of the median to the bottom quartile.

To better understand these complex changes in the structure of the income distribution, table 1 presents for each period and each decile of the equivalized income distribution, the average correction of the earnings' step in the central specification, namely the multiplicative correction according to equation (3) from the regression results (2). As the equivalized disposable income are normalized between the two periods, the sign of the correction does not correspond to actual changes in income but to relative change of earned income compared to overall disposable income aggregated at the population level, hence compared to aggregated

other income sources (this explains why there may be positive or negative corrections for all deciles at the same time).

Table 1: Earned income correction by decile

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
1970-1975	40	41	-5	-39	-210	-435	-916	-1692	-3344	-13757
1975-1979	-4	-286	-607	-770	-1080	-1269	-1748	-2582	-4029	-11801
1979-1984	-258	-851	-1384	-1834	-1913	-2385	-2708	-3064	-3889	-12123
1984-1990	237	50	-382	-808	-1182	-1449	-2028	-2548	-2695	-3169
1996-2000	318	414	613	801	1054	1283	1594	1862	2325	5365
2000-2003	208	240	98	-27	-228	-552	-971	-1346	-1631	-3278
2003-2007	-201	-429	-545	-687	-980	-1097	-1319	-1449	-1817	-3952
2007-2010	-81	-194	-191	-200	-173	-329	-512	-715	-1447	-4232
2010-2012	-155	-267	-400	-436	-434	-469	-345	-371	-331	-325
2012-2016	229	397	505	644	758	929	993	1071	1373	2091
2016-2019	203	274	309	358	370	378	422	454	390	68

During the period 1979-1984, labor income grew less rapidly than total income for all deciles. However, while the relative loss increases with position in the equivalized income hierarchy, this increase is moderate in absolute terms at the middle of the distribution, and is therefore less penalizing in relative terms for the upper middle class. A number of factors may explain this downturn in wages, not only the economic crisis in general, but in the case of France in particular, the de-indexation of wages from 1982 onwards (Desplatz et al., 2003).

The second half of the 1980s (from 1984 to 1990) saw a different trend, with the correction for the top decile very similar in absolute value to the other upper deciles (leading to an increase in the share of the top 10%) and a much smaller fall for the bottom half of the distribution, and even an increase for the bottom two deciles (leading to an increase in the share of the bottom 50%). Earnings trends thus contributed to a decline in the share of the middle 40%. This leads to a fall in inequality measures in the middle of the distribution (interquartile ratios) and a rise in inequality at the top (share of top 10%), without any major change in the Gini coefficient (Figure 8).

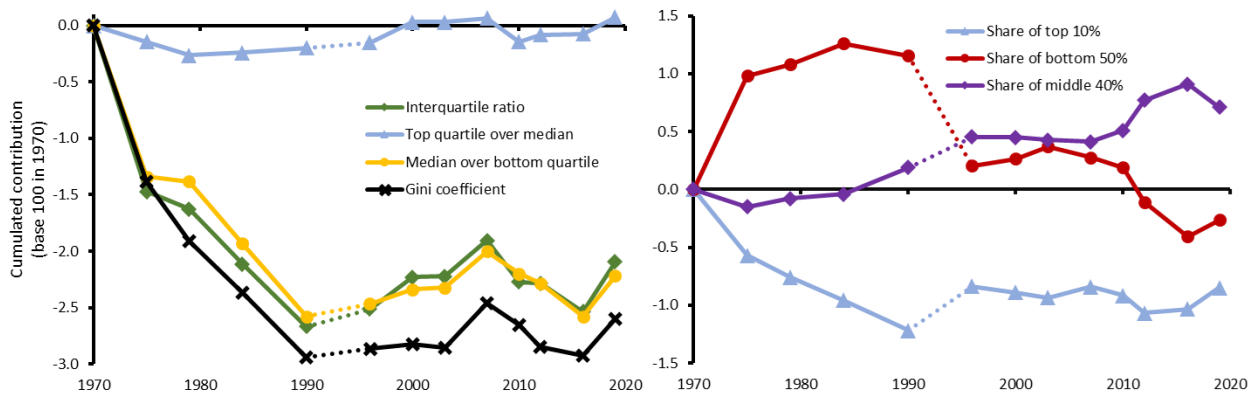
At the end of the twentieth century, the period of growth benefited more to the earnings

of the top 10% than to those of the bottom 50% (the share of the middle 40% being almost unchanged due to earnings' changes), leading to a rise in all indicators of inequality. The crisis of the beginning of the twenty-first century led to a reversal of all these trends. Subsequently, and except for the period marked by the subprime crisis (2007-2010), we observe a neutralization of earnings' impact on income shares with a slight but continuous increase in inequalities at the bottom of the distribution of equivalized income (interquartile ratio and ratio of the median on the lower quartile).

### 3.3.2 Evolution of the impact of pensions on inequalities

As with the other determinants, the dynamics of the contribution of retirement pensions to inequality were very different in the 1970s and 1980s than subsequently. For the first two decades studied, retirement pensions have an large impact on the reduction of income inequality (see Figure 9).

Figure 9: Evolution of the impact of pensions on inequality



During this period, pensions play a continuous and clear role in the reduction in inequality, being one of the most prominent factors. This is clearly visible at the lower part of the income distribution (strong decrease of the ratio of median to bottom quartile) because households of pensioners are among the poorest households during that period. This is due to the fact that those households could not pretend to a full old-age pension, since the main public system

was too recent for them to have contributed during their whole careers. During that period, more and more pensions have been paid to an ever growing part of the population, which was progressively lifted out of poverty. This thus has a significant impact on the shares of income captured by the bottom 50% (increase up to the mid-1980s) and the 10% income (decrease), leveling out incomes between households. This did not have a strong impact on the top quartile to median ratio, given that these households generally did not all cross the median.

Table 2 shows that inequalities are decreasing as a result of the overall rise in the pension system. In fact, for these first two decades, income corrections due to pensions are positive for all deciles of the distribution, showing the growth of this source of income in living standards. In addition, the amount of the correction is virtually the same for all deciles in absolute value, leading to a decreasing correction with respect to the standard of living in relative value.

Table 2: Pensions correction by decile

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
1970-1975	553	712	606	521	461	452	418	443	474	429
1975-1979	302	386	327	338	324	389	334	301	334	411
1979-1984	207	290	309	231	201	160	133	139	88	49
1984-1990	310	648	551	588	482	496	471	471	461	300
1996-2000	32	46	85	37	152	88	68	135	146	2
2000-2003	18	28	3	-6	-27	4	-37	-69	-98	-127
2003-2007	-254	-382	-382	-453	-409	-416	-432	-483	-560	-822
2007-2010	161	307	369	370	409	391	388	482	547	797
2010-2012	227	360	446	494	524	531	581	686	821	1052
2012-2016	85	272	353	359	352	329	344	450	526	764
2016-2019	-200	-383	-481	-511	-616	-636	-703	-782	-934	-1217

Subsequently, the period of relative economic growth from 1996 to 2007 was marked by a slight increase in inequality at the lower end of the distribution (interquartile and median to lower quartile ratios, but not upper quartile to median ratio). But there was no change in the shares of the major household categories (top 10%, middle 40% and bottom 50% shares remained stable).

As the pensions are determined through an inter-temporal schedule, they are not impacted by the business cycle in the short term (except for specific decision not to adjust the pensions with inflation). Hence, the global correction is the opposite way as the business cycle as it is a relative contribution to income evolution. This can be particularly seen from 2000; previously the overall increase in the amount of pensions – due to the retirement of new pensioners having had full career in time of growth – allow the pension growth to match earned income growth even in time of GDP growth.

Consequently, during the period of economic crisis that followed the subprime crash, retirement pensions gained in relative importance compared to other incomes, implying positive corrections for all deciles, and a decline in inequality indicators. These positive corrections occurred despite the fact that mean pensions, which had continued to grow until late 2000's, have generally decreased since then (because of pension reforms and less complete careers of the following generations, see DREES, 2022). Hence, these positive corrections are lower in absolute value for lower deciles than for upper deciles, leading to transformations in the sharing of overall equivalent incomes: stability in the share of the top 10%, rise in the share of the middle 40% and fall in the share of the bottom 50%. The latest period of economic recovery from 2016 to 2019 saw a reversal of all these trends.

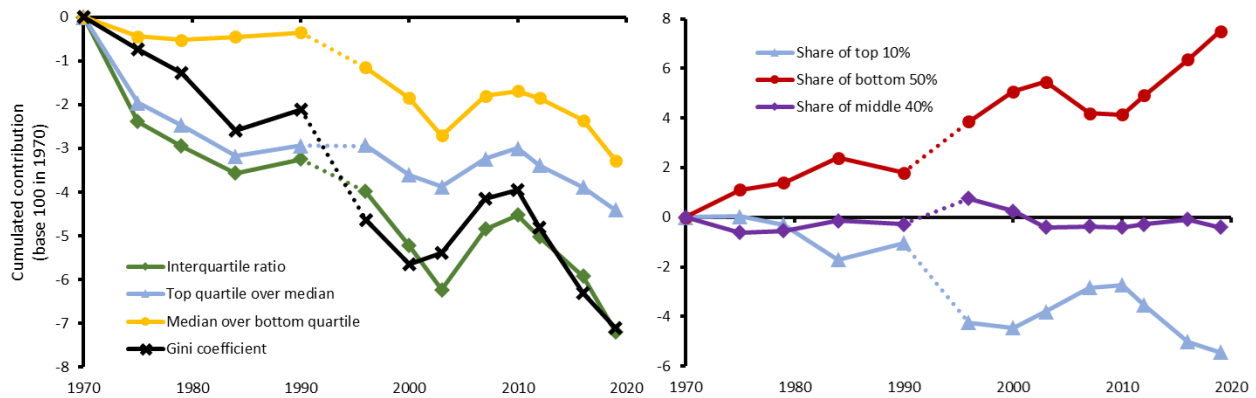
### **3.4 Evolution of redistribution**

The last two elements of the decomposition are taxes and benefits. Since these determinants are modified conditionally on all previous determinants, measured contributions ought to be interpreted as changes in tax and benefits schedules.

#### **3.4.1 Evolution of the impact of taxes on inequalities**

Overall and by subperiods, the impact of taxes on the evolution of disposable income inequality is large (Figure 10) and contributes to the decrease of inequalities, with the exception of a contribution increasing inequalities between 2003 and 2010.

Figure 10: Evolution of the impact of taxes on inequality



Opposite impacts of direct taxes are observed at the two ends of the income distribution but not in the middle, since the share of income captured by the middle 40% is not impacted. The share of the top 10% decreases due to taxes during the overall period (with the exception of an increasing share between 2000 and 2010) and the share of the bottom 50% increases (with the exception of a decreasing share between 2003 and 2010).

Several changes in the structure of French direct taxes may explain this trends. In addition to the personal income tax, the second direct tax is the generalized social contribution (CSG), which grew all over the period. Created in 1991 and which main rate was raised from 1.1% to 7.5% in 1998 and 9.2% in 2018. It is close to a flat tax and thus has limited direct redistributive effect; however, the rate on capital income is greater than those on earned income and the tax base present much less exemption than the personal income tax: both characteristics contribute to redistribution. Direct taxes also include housing taxes, of lower magnitude and which do not present a clear redistributive pattern: a regressive pattern due to the tax base (housing consumption) is partially compensated by progressive schemes added in the schedules – tax reduction depending on income, age and children in charge (Carbonnier, 2019).

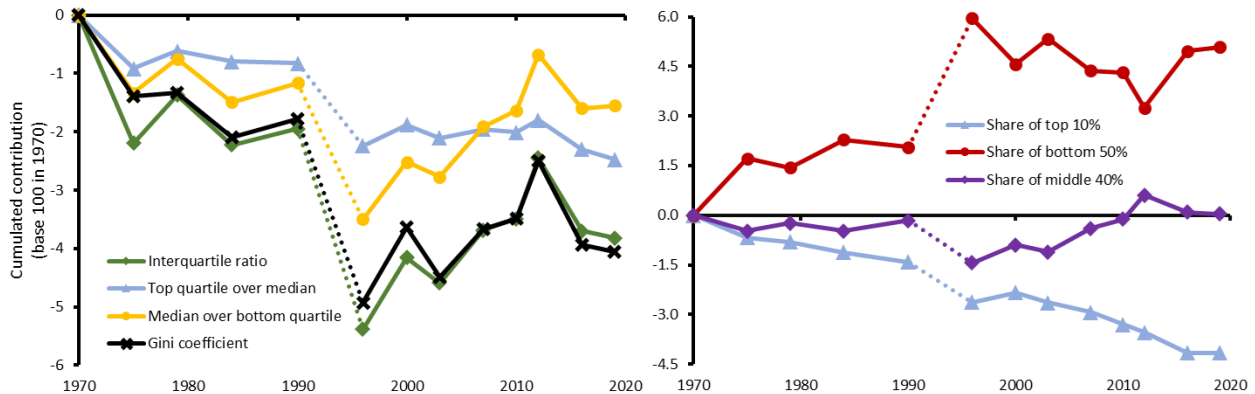
The reversal of redistributive trend of direct taxes 2003 and 2010 may be explain by several reforms. A 2005 reform of the personal income tax reduces the number of brackets and decrease the top marginal rate. A reform in 2007 set a ceiling of direct taxes (including

local and wealth taxes) at 60% of declared income, the ceiling was then decreased to 50% while the social contributions were added to the considered taxes. Last, a 2008 reform allowed variable-return capital income, notably dividends, to be taxed at a fixed rate (well below the top marginal rate of the income tax scale). These measures were partially withdrawn when the political majority changed in 2012.

### 3.4.2 Evolution of the impact of transfers on inequalities

Transfers are an important part of household income and matter a lot in terms of inequality. They mainly consist in minimum income benefits, family allowances and housing allowances. Over the whole period, two sub-periods may be observed, with opposite contributions of transfers on inequalities (Figure 11).

Figure 11: Evolution of the impact of transfers on inequality



From 1970 to the mid 1990's, transfers have contributed to a decrease in income inequality according to all indicators. This can be mainly attributed to the creation and the growth of housing allowances from 1971 onwards, and of the general minimum income benefit (RMI) in 1988; those transfers are means-tested and thus contribute to a reduction in inequality. During the period, this determinant continuously contributed to decrease the share of the top 10% and increase the share of the bottom 50%, with no substantial impact of the share of the middle 40%.

In the following decades (1996-2012), transfers tend to be less and less progressive as the income requirements of some family allowances are loosened. At the same time, the schedule of progressive transfers lags behind the growth of incomes, which yields an erosion of total allowances paid (IPP, 2023). Indeed, as of 2010, while transfers were distributed as progressively than in 1990, the benefits schedule was actually less progressive than in 1990: the gap is explained by the fact that pre-tax incomes were more unequal in 2010 than in 1990 (Eidelman, Langumier, and Vicard, 2012; Blasco and Picard, 2019).

This impacts particularly the bottom of the equivalized income distribution (decrease of the share of income captured by the bottom 50% between 1996 and 2012 due to the relative erosion) compared to the middle and upper middle classes (increase of the share of income captured by the middle 40% between 1996 and 2012 due to loosening of income requirements). This is highlighted by the fact that all inequality indicators increase steeply during from 1996 to 2012, with the exception of the ratio of the top quartile over the median.

This can also be seen in Table 3 presenting the distribution per decile of transfers' correction for each subperiods. The transfers' drop between 1996-2000 (relatively to growing earning income during this expansion period) is particularly pronounced for the bottom of the distribution.

Table 3: Transfers correction by decile

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
1970-1975	-3	2	22	85	82	-137	-576	-993	-1261	-579
1975-1979	205	69	-11	4	1	58	127	142	123	7
1979-1984	278	255	189	152	73	-3	-42	-89	-147	-426
1984-1990	-267	-228	-48	104	167	186	235	271	415	169
1996-2000	-529	-550	-326	-213	-123	-59	3	10	37	85
2000-2003	569	358	204	156	167	208	152	88	-43	-205
2003-2007	-508	-349	-84	97	211	345	395	324	336	28
2007-2010	-316	-37	95	184	248	272	268	319	261	-111
2010-2012	-775	-407	-61	51	182	231	276	284	297	-13
2012-2016	696	560	412	346	282	243	160	86	28	-75
2016-2019	98	34	67	68	31	56	15	13	-33	-53

From 2003 to 2012, under successive right-wing governments, there was a correction in incomes due to changes in transfers that continuously favored the highest incomes (with the exception of the top decile, with virtually no correction), from negative corrections for the first deciles to positive corrections for the top deciles. The following period, from 2012 to 2016 with the return of a left-wing government, saw a complete reversal of this trend, notably in relation to the means-testing of family allowances in 2015.

## 4 Conclusion

This paper analyzed the evolution of income inequality in France between 1970 and 2019 in sub-periods according to economic cycles. We measured the respective contributions of changes in household structure, occupations, wages, pensions, taxes and transfers to the evolution of income inequality using a semi-parametric decomposition approach.

The results show a strong contribution of labor income and the pension system to the decline in inequality at the beginning of the period, before a neutralization and even a reversal of the effect (albeit minor for pensions) at the end of the period. Taxes and social benefits globally reduce inequality over the period, with an opposite trend at the beginning of the twenty-first century, particularly from 2003 to 2012.

The changes in household compositions and male occupations had a smaller contribution at each period, but a very persistent contribution which accumulated in a non-negligible inequality increase over the past fifty years. The strong increase in female employment did not lead to a decrease in household income inequality, and in some sub-periods it even increased, probably because of homogamy.

There are several elements that deserve further study, in order to understand the effects of public policies in more detail. In particular, changes in labor income are considered here as a single determinant, whereas they depend on multiple phenomena, including policies affecting wage negotiations in firms and minimum wage policies. This would merit a specific analysis

measuring the effect of wages close to the minimum wage, which our method allows because we model the whole distribution of counterfactual incomes.

Another extension would be to analyze the question of working hours, and particularly part-time work, which is more frequent among women, but potentially with a differential effect according to social category, and thus a possible impact on inequalities in household income.

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## A Residue analysis

First of all, a very high degree of homogeneity between specifications in terms of residues should be noted (see Table 4): it does not appear that one order adjusts the transition from the initial to the final period better than another. The differences are less negligible between the different income correction methodologies. In most cases, the lowest residues are obtained *via* the method used in our central specification.

Table 4: Residues of the decompositions, % of the indicator initial value

	Inter- quartile ratio	Top quartile ov. median	Median ov. bottom quartile	Gini coef- ficient	Share of the top 10%	Share of the bottom 50%	Share of the middle 40%
1970-1975	4.80	1.64	3.36	1.94	0.81	3.15	1.16
1975-1979	0.68	1.24	0.55	0.04	0.19	2.41	1.43
1979-1984	0.66	0.16	0.55	2.13	2.85	2.71	0.44
1984-1990	3.24	2.34	1.12	2.69	1.52	2.45	0.30
1996-2000	0.05	0.78	0.86	1.38	3.46	0.96	1.79
2000-2003	0.86	0.25	0.72	0.74	0.34	0.75	0.18
2003-2007	2.05	0.86	1.42	0.53	0.56	0.62	0.71
2007-2010	0.47	0.13	0.40	1.32	2.08	0.96	0.87
2010-2012	1.67	0.82	1.05	1.30	0.69	1.61	1.33
2012-2016	0.18	0.29	0.10	1.05	1.22	0.35	0.63
2016-2019	0.94	0.54	0.52	2.07	1.93	2.46	0.04

Scope: Metropolitan France, households excluding collective housing, 1970-2019.  
Source: ERF-ERFS, Insee.

We find differences between the periods and indicators. With the exception of 1970-1975 and 1984-1990, the residues are particularly low for the interquartile ratio, which is also a good indicator of inequality in the middle of the distribution and is studied in greater detail in the paper. Ratios between the median and quartiles show similar or even better decomposition accuracies, and allow us to qualify the results concerning interquartile ratios on the origin of effects, rather in the upper or lower half of incomes.

For the decomposition between the share of income captured by different household categories (the richest 10%, the poorest 50% and the middle 40%), we observe a clear temporal

caesura: residuals are much weaker after 1996 than before 1990, which is probably due to a more precise data base (cf. supra).

## **B Robustness of the determinants' contributions to inequality**

The contribution of household composition appears fairly stable between specifications, with the exception of the relative order with the step modifying occupational categories (independently of the relative position with the other stages). While the contributions of family compositions are always to the rise in inequalities (see below), three periods (1970-1975, 1975-1979 and 2012-2016) stand out for a trend reversal when the correction step for the proportions of occupational categories is carried out before the correction step for family compositions. A likely hypothesis is that the evolution of family compositions (mainly the greater proportion of singles, including single mothers) is asymmetrical between the different occupational categories, and that therefore the occupational categories' step captures part of the family composition contribution when implemented before.

However, this does not present a major problem of interpretation, as the effect of occupational categories is clearly greater than that of compositions, and the inversion only slightly modifies the measured contribution of occupational categories. From this point of view, it should be noted that, somewhat counter-intuitively, the increase in the number of retirees (for both men and women) does not seem to have a significant impact on the evolution of inequalities, whatever the methodology or the order of the steps. In particular, reversing the adjustment steps for pensioner shares and pensions does not alter the lack of effect of pensioner share on the evolution of inequalities.

As regards the effect of other occupational categories, the results are very stable for men from 1984 onwards. For the period 1975-1984, the effects are very close to zero for all methods and all orders, with the exception of the order where the change in men's occupational

categories is made after those of women and family composition, but before all other changes: the contribution then becomes inequality increasing. However, the great stability of a null result for other orders (notably when the change in men's occupational category is measured after that of women, but either before that of family composition or after that of income) reinforces the credibility of the null result. For the period 1970-1975, the order is very stable and positive when the change in occupational category is made before the change in income, but cancels out when income is corrected beforehand.

The same effect of the inversion of orders between categories and incomes is observed for women occupational status over the 1979-1984 period. Furthermore, we observe an inversion in the direction of the effect over the 2007-2010 period, depending on whether we first modify the occupational category of women or men, but this inversion occurs between very low values in absolute terms and so the interpretation tends towards an absence of effect. For the rest, results are very stable between specifications.

Concerning earned income, reversing the order of the steps does not change the estimated values, for all periods. With regard to methodology, the results are also stable overall, even if some deviations appear. For the period 1975-1979, the results of the additive alternative diverge, but those of the intra-category alternative remain close to the central methodology. For the period 1979-1984, the two alternatives diverge from the central methodology at the lower end of the distribution. Caution should therefore be exercised when interpreting the results relating to income variations for this 1979-1984 period.

With regard to changes in pension amounts, the results are large and stable for the 1970s, 1980s and 1990s. After 2000, the results remain very stable to changes in the order of the steps, but deviations by the intra-category alternative can be observed. Overall, despite these differences, the alternatives converge to result that the influence of retirement pensions was much weaker after 2000 than before.

The measurement of the contribution of taxes is very stable to changes in the order of steps and methodology, with the exception of deviations from the intra-category alternative for the

periods 2000-2003 and 2007-2010. Deviations from this same intra-category alternative are found for the contributions of social benefits in these same periods, as well as in 1984-1990 and 2010-2012. For the rest, the results of the different methodologies are consistent, as are the results of the different orders between steps.



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