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INCOME INEQUALITY IN FRANCE 1901–98

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FRANCE 1901–98

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ABSTRACT

Income Inequality in France 1901–98*

The objective of this research is to document and to explain trends in inequality in twentieth century France. Data from income tax returns (1915–98), wage tax returns (1919–98) and inheritance tax returns (1902–94), is used in order to compute fully homogeneous, yearly estimates of income inequality, wage inequality and wealth inequality. The main conclusion is that the decline in income inequality that took place during the first half of the twentieth century was mostly accidental. In France and possibly in a number of other developed countries as well wage inequality has actually been extremely stable in the long run, and the secular decline in income inequality is for the most part a capital income phenomenon. Holders of very large fortunes were severely hit by major shocks during the 1914–45 period, and were never able to fully recover from these shocks, probably because of the dynamic effects of progressive taxation on capital accumulation and pre-tax income inequality.

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NON-TECHNICAL SUMMARY

The objective of this research is to document and to explain trends in inequality in twentieth century France. Data from income tax returns (1915–98), wage tax returns (1919–98) and inheritance tax returns (1902–94), is used in order to construct fully homogeneous, yearly series of income inequality, wage inequality and wealth inequality. One advantage of these new series is that they allow for a very sharp decomposition between the trends in income inequality that are due to changes in wage distribution and those trends that are due to changes in capital income concentration. Existing series for other countries (including those for the US) do not allow for such a decomposition.

The main conclusion is that the decline in income inequality that took place during the first half of the twentieth century was mostly accidental. In France, wage inequality has actually been extremely stable in the long run. For instance, the top 1% wage share has always been fluctuating at around 6–7% of the total wage bill, from World War I until the 1990s. Long run stability also holds for the top 10% wage share, the 90–10 percentile ratio, etc. Fluctuations in wage inequality have been fairly large and numerous in the short and medium run, but all fluctuations cancelled out in the longer run. For instance, wage inequality narrowed substantially during both world wars, but it recovered fairly quickly afterwards: wage inequality was back to its 1913 level by the late 1920s, and it was back again to its 1938 level by the late 1940s and early 1950s.

In contrast to the long-run stability of top wage shares, top income shares did narrow substantially over the course of the twentieth century. For instance, the top 1% income share was about 20% of total income at the beginning of the twentieth century, and it is around 7–8% in the 1990s. This secular decline is for the most part a capital income phenomenon. During the 1914–45 period, holders of very large fortunes were hit by a number of major shocks: expropriation due to inflation, bankruptcies due to the Great Depression, physical destructions due to the wars, etc. The interesting point, however, is that top fortunes were never able to fully recover from these shocks: capital concentration, as well as very top income shares, never returned to their pre-1914 level. One potential explanation is the dynamic effect of progressive taxation on capital accumulation and future capital concentration. That is, the very large fortunes and the top capital incomes observed at the beginning of the twentieth century were accumulated in a world with virtually no tax (there was basically no progressive tax before 1914). During 1914–45, top tax rates reached very high levels, both for top incomes and for top estates. Simple simulations suggest that these dynamic effects of progressive taxation are sufficiently massive to explain why wealth and income concentration never returned to their pre-1914 level. The Paper also stresses that these French findings might be relevant for other countries as well.

1. Introduction

The primary objective of this research is to document trends in income inequality in France during the 20th century. Did income distribution become more unequal or more equal in France over the course of the 1901-1998 period? What are the specific periods when income inequality increased or declined, and which income deciles were most affected by these trends?

The second objective of this work is obviously to understand these facts. What are the economic mechanisms and processes that allow us to understand the way income inequality has evolved in France over the course of the 20th century? According to Kuznets' influential hypothesis (Kuznets (1955)), one should expect income inequality to decline spontaneously in advanced capitalist countries, as more and more workers join the high-paying sectors of the economy. Can this model account for what happened in France during the 1901-1998 period, or at least during the first half of the 20th century?

One advantage of looking at France is that French data sources allow for a very detailed analysis of inequality trends. In particular, I was able to construct fully homogeneous yearly series running from World War I until the late 1990s for both income inequality and wage inequality, which to my knowledge has been done in no other country. I can therefore distinguish in a very precise manner between the trends that are due to changes in the wage structure and those that are due to changes in the concentration of capital income. This allows me not only to better understand the French experience, but also to re-interpret the experience of other countries. The main conclusion is that the decline in income inequality that took place during the first half of the 20th century was mostly accidental. In France, and possibly in a number of other countries as well, wage inequality has actually been extremely stable in the long run, and the secular decline in income inequality is for the most part a capital income phenomenon: holders of very large fortunes were severely hit by major shocks during the 1914-1945 period, and they were never able to fully recover from these shocks,

probably because of the dynamic effects of progressive taxation on capital accumulation and pre-tax income inequality.

The rest of this paper is organized as follows. Section 2 describes my data sources and outlines my methodology. Section 3 presents the basic facts that characterize my income inequality series and that need to be explained. Section 4 attempts to account for these facts. In Section 5, I discuss whether my French conclusions can be applied to other developed countries, with special attention to the case of the United States. Section 6 concludes.

2. Data Sources

This work relies on three major types of data sources: data from income tax returns (1915-1998), data from wage tax returns (1919-1998), and data from the inheritance tax returns (1902-1994).

2.1. Income Tax Returns (1915-1998)

The most important data source is obviously the income tax. A general income tax was enacted in France in 1914, just a few weeks before the declaration of war. It was applied for the first time in 1915 (that is, the incomes of 1915 had to be declared by taxpayers at the beginning of 1916), and it was applied every year ever since. Most importantly, the French tax administration has been compiling every year since 1915 (including during World War II) summary statistics based upon the tabulation of all individual income tax returns. The raw materials produced by the tax administration have always had the same general form since 1915: the tabulations indicate the number of taxpayers and the amount of their taxable income as a function of a number of income brackets (the number of brackets is usually very large, especially at the top of the distribution). This basic table is available for each single year of the 1915-1998 period.[1]

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[1] The complete technical characteristics of these raw statistical materials, as well as the exact references of the statistical bulletins where this data was originally published by the French

One important limitation of these tables is that they only include those households whose income is high enough to be taxable under the general income tax system.[2] In France, less than 5% of the total number of households had to paid the income tax during the first few years of the income tax system, then the percentage of taxable households stabilized around 10-15% during the interwar period, and finally this percentage increased up to 50-60% during the postwar period (see Graph 1). What this means is that it is impossible to use this data in order to produce estimates of the entire income distribution, and that one needs to concentrate on top fractiles.

Insert Graph 1: The proportion of taxable households in France, 1915-1998

What I did with the raw data can be described as follows:[3]

(i) I used the basic tables produced by the tax administration in order to compute the Pareto coefficients associated to the top of the French income distribution for each single year of the 1915-1998 period. These structural parameters then allowed me to estimate for each single year of the 1915-1998 period the average incomes of the top 10% of the income distribution (i.e. the top decile, which I

Ministry of Finance, are given in the book from which this paper is extracted (see Piketty (2001, Appendix A)).

[2] For simplicity, I will always refer to tax units as "households" in the context of this paper. In actual fact, these are two different concepts: one non-married couple makes two tax units but one household, etc. All estimates reported here were computed in terms of tax units (that is, the "top decile income share" denotes the income share going to the top decile of the tax unit distribution of income per tax unit, the "top percentile income share" denotes the income share going to the top percentile of the tax unit distribution of income per tax unit, etc., with no adjustment for the varying size of these tax units), which in principle could bias the results in various ways. The key point however is that the French concept of a "tax unit" has not changed since 1914 (married couples and their dependent children never had the option to file separate returns, non-married couples never had the option to file joint returns, and multiple couples living in the same household never had the option to file joint returns); moreover, the average number of tax units per household has been fairly stable since 1915 (around 1.3), and the income profile of this ratio has been fairly stable since 1915 (at least as a first approximation).

[3] The methodology is fully described in the book (see Piketty (2001, Appendix B)). In particular, the book provides a detailed account of the many technical adjustments that were made in order to ensure that the concept of income used to estimate the top fractiles' average incomes (using tax returns) and the concept of income used to estimate the average income of the entire population (using national accounts) were as homogeneous as possible.

denote "P90-100"), the top 5% of the income distribution ("P95-100"}, the top 1% ("P99-100"), the top 1% (P99-100), the top 0,5% ("P99,5-100"), the top 0,1% ("P99,9-100") and the top 0,01% ("P99,99-100"), as well as the average incomes of the intermediate fractiles ("P90-95", i.e. the bottom half of the top decile, "P95-99", i.e. the next 4%, etc.) and the income thresholds corresponding to the 90th percentile, the 95th percentile, etc. ('P90", "P95", etc.) (for the years 1915-1918, due to the small number of taxable households (see Graph 1), I only estimated the incomes of fractiles P99-100 and above). The Pareto interpolation technique has been used by all researchers working with historical tax data,[4] and the estimates that I obtain for the French case appear to be as precise as those obtained in other countries (thanks to the very large number of income brackets used by the tax administration).[5]

(ii) I then used French national accounts in order to estimate the total and average income for the entire population, and I used these estimates to compute series for the share of fractile P90-100 in total income, the share of fractile P95-100 in total income, etc., and the share of fractile P99,99-100 in total income. This methodology (that is, using tax returns to compute the level of top incomes, and using national accounts to compute the average income denominator) is also standard in historical works on income inequality.[6] Note that the income concept that is used both for the numerator and the denominator is pre-tax, pre-deductions tax income. Note also that this kind of inequality measures does not give us any information about the evolution of inequality between the bottom deciles of the distribution and the middle ranks of the distribution (to some extent, wage data does give us that kind of information). Finally, note that we obtained average estimates of top income shares for the 1900-1910 period by using the rough estimates of the income distribution that were made by the French tax

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[4] See, e.g., Kuznets (1953) (who applies Pareto interpolation techniques to U.S. Income tax returns data over the 1913-1948 period) and Feenberg and Poterba (1993) (who apply Pareto interpolation techniques to U.S. income tax returns data over the 1950-1989 period).
[5] We used large micro-files of individual tax returns available for the 1980s-1990s in order to make sure that our interpolation technique was indeed very reliable (see Piketty (2001, Appendix B)).
[6] For instance, the same methodology was used by Kuznets (1953).

administration prior to World War I for revenue projection purposes (these 1900-1910 estimates were adjusted so as to make them as homogeneous as possible with our 1915-1998 series; they probably understate inequality a little bit).

The French tax administration also compiled "composition tables", i.e. tables indicating for each income bracket not only the number of taxpayers and the total amount of their taxable income but also the separate amounts for each type of income (wage income, capital income, self-employment income). Unfortunately, it is only since 1948 that the French tax administration started compiling these composition tables on a yearly basis: before 1948, composition tables are available only for the incomes of 1917, 1920, 1932, 1934, 1936-1937 and 1945-1946. I used all available composition tables in order to compute estimates of income composition by fractile (see below).

2.2. Wage Tax Returns (1919-1998)

One important feature of the income tax system that was enacted in France in 1914-1917 is that, in addition to the general income tax set up in 1914, it also included a number of taxes levied separately on each income type (these additional taxes were called "impots cedulaires", as opposed to the "impot general sur le revenu"; this dual income tax system was supposed to be a mixture of the German and British pre-war systems). In particular, there was a "wage tax", i.e. a progressive tax levied on individual wages, which was first applied in 1917. Individual wages were declared by employers, who had to fill wage tax returns indicating the annual amount of wages paid to each single employee. In 1919, the French tax administration started compiling summary statistics based on these wage tax returns. The basic statistical information is similar to that contained in the basic tables based on income tax returns: the wage tax tables indicate for a number of wage brackets the number of wage earners and the total amount of their wages. Unfortunately, only taxable wage earners were included in these tables (that is, only about 15-20% of the total

number of wage earners during the interwar period). Note however that this raw data covers all sectors and all occupations (including government employees), so that this data allows us to obtain very precise estimates of the top segments of the wage distribution.

The French tax administration stopped compiling these wage tax tables in 1939, so that these series only cover the 1919-1938 period. In 1947, the French statistical institute (INSEE) decided to use these wage tax returns to compile new series of statistical tables: INSEE compiled a first set of tables based on the 1947 wage tax returns, and then compiled yearly tables since 1950 (the wage tax was actually repealed in 1948, but employers still have to fill returns indicating all individual wages; but the tax administration has kept using these returns to make sure that income tax taxpayers report the right wages). The INSEE tables look very much like the tax administration tables of the interwar period (they indicate for each wage bracket the number of wage earners and the total amount of wages), with the important difference that they cover the entire wage distribution, and not only high wages.

I have used this raw data in pretty much the same way as the income tax data. Pareto interpolation techniques allowed me to compute the average wage of the top 10% of the wage distribution, the top 5%, the top 1%, etc. (fractiles were defined according to the total number of wage earners, taxable and non-taxable), and I have used independent estimates of the total wage bill (coming mostly from the national accounts) in order to compute top wage shares series.[7]

2.3. Inheritance Tax Returns (1902-1994)

A progressive inheritance tax was enacted in France in 1901, and it was applied every year ever since. Before 1901, the inheritance tax was purely proportional, so that the tax administration did not need to compute total estates, and did not bother ranking individual estates and compiling statistical tables. In 1901, the tax administration started using inheritance tax returns to compile tables indicating

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[7] All details are given in Piketty (2001, Appendix D).

the number of estates and the amount of these estates as a function of a number of estate brackets. These tables were compiled almost every year between 1902 and 1964 (with an interruption during World War I and the early 1920s); since 1964, similar tables have been compiled only in 1984 and in 1994.

I have also used this raw data in order to compute the average estate of the top 10% of the estate distribution, of the top 5%, of the top 1%, etc. (fractiles were defined according to the total number of decedents, taxable and non-taxable). I did not try to use these series in order to compute top estate shares series (the large number of non-taxable estates and the weakness of other sources on estates makes it difficult to construct a fully homogeneous denominator series).[8]

3. The Basic Facts

Consider first the evolution of the top decile income share (see Graph 2). The basic fact is that income inequality in France declined significantly over the course of the 20th century: according to my estimates, the share of total household income received by the top decile dropped from about 45% at the beginning of the 20th century to about 32-33% in the 1990s. I.e., the average income of the top 10% was about 4,5 times larger than the average income of the entire population at the beginning of the 20th century, and it was about 3,2-3,3 times larger than the average income of the entire population in the 1990s.

Next, one can see immediately from Graph 2 that this secular decline has been far from steady. The top decile income share dropped during World War I, and subsequently recovered during the 1920s and the first half of the 1930s: in 1935, i.e. at the height of the deflationary depression in France, the top decile income share was slightly below 47%.[9] The income share received by the top decile then started to fall very sharply in 1936, and even more so during World War II: the top decile income share dropped to an absolute minimum in 1944-1945 (about

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[8] I do give top estates shares series in my book (see Piketty (2001, Appendix J)), but these series are not fully homogeneous, and I do not use them in the context of this paper.

[9] According to our estimates, the top decile income share as never been as high as in 1935 during the entire century. Note however that our average estimates for the 1900-1910 decade probably understates inequality a little bit.

29-30%). As far as the postwar period is concerned, three sub-periods need to be distinguished: the top decile income share increased between 1945 (29-30%) and 1967-1968 (36-37%), then declined between 1967-1968 (36-37%) and 1982-1983 (30-31%), and finally increased somewhat since the early 1980s (30-31% in 1982-1983, 32-33% in the 1990s). Note however that most of the action took place before 1945: since World War II, income inequality in France appears to have been fluctuating around a constant mean value of about 32-33%. In other words, most of the secular decline occurred during a very specific time period. This definitely does not look like a gradual, Kuznets-type process.

Insert Graph 2: The top decile income share in France, 1900-1910 and 1919-1998

Moreover, and most importantly, my series show that the secular decline of the top decile income share is almost entirely due to very high incomes. The income share of fractile P90-95 has been extremely stable in the long-run: between 1900 and 1998, that share has always been fluctuating around a mean value of about 11-11,5% of total household income (which means that these households always get about 2,2-2,3 times the average income) (see Graph 3). The income share of fractile P95-99 has experienced a very modest secular decline, from about 15% of total household income at the beginning of the 20th century to about 13-13,5% during the 1990s, i.e. a drop of about 10% (see Graph 3).

In contrast, the top percentile income share has dropped by more than 50%: the share of total income received by the top 1% was about 20% at the beginning of the century, and it was only about 7-8% during the 1990s (see Graph 4). I.e., the average income of the top 1% was about 20 times larger than the average income of the entire population at the beginning of the 20th century, and it is about 7-8 times larger during the 1990s. Moreover, my series show very neatly that the higher you go within the top centile of the income distribution, the larger the secular decline. The most extreme case is that of the top 0,01%: their income share has dropped from about 3% at the beginning of the century to about 0,5-

0,6% since 1945 (see Graph 5). In fact, the average real income of the top 0,01% has not increased at all during the entire 20th century: it was about 8-9 millions 1998 French francs in 1900-1910, and it was around 7-8 millions 1998 French francs in 1990-1998; during the same time period, the average real income of the entire population, as well as the average real income of fractile P90-95, has been multiplied by about 4,5 (see Table 1). According to my series, almost 90% of the secular decline of the top decile income share is due to the top centile, and more than half of the top centile drop is due to the top 0,1% (see Table 2).

Insert Graph 3: The income shares of fractiles P90-95 and P95-99 in France, 1900-1910 and 1919-1998
Insert Graph 4: The top percentile income share in France, 1900-1910 and 1915-1998
Insert Graph 5: The top 0,01% income share in France, 1900-1910 and 1915-1998
Insert Table 1: Income growth in France between 1900-1910 and 1990-1998
Insert Table 2: Income shares in France, 1900-1910 and 1990-1998

  The timing of the fall of very top incomes is also very striking. Between 1945 and 1998, the income shares of the top 1% and the top 0,01% have been fairly stable (see Graphs 4 and 5). The fall took place exclusively during the 1914-1945 period, and especially during the 1930s and World War II. It is interesting to note that that the deflationary years of the Great Depression had a very different impact on moderately high incomes and on very top incomes. While the income shares of fractiles P90-95 and P95-99 (the "upper middle class") increased significantly during the early 1930s (see Graph 3), the income shares of fractiles P99-100 and P99,99-100 (the "very rich") fell sharply (see Graphs 4 and 5).

4. Accounting for the Facts

The key facts that need to be explained are the following: the secular decline in the top decile income share took place during a very specific time period (i.e. between 1914 and 1945, and mostly during the 1930s and World War II), and it is due for the most part to the sharp drop in the top percentile income share (and, to a large extent, to the very sharp drop in the top 0,1% and 0,01% income share). How can we account for these facts?

4.1. Income Composition Patterns

One first needs to be aware of the very large differences in income composition that have always characterized the various fractiles of the top decile.

Graph 6 shows how the pattern of income composition looked like in 1998. As one would expect, the share of wage income declines continuously from fractile P90-95 to fractile P99,99-100, while the share of capital income (dividends, interest and rents) rises continuously from fractile P90-95 to fractile P99,99-100. The shape of the self-employment income share is intermediate between the wage share and the capital share: it rises until fractile P99,5-99,9, and declines afterwards. The point is that these variations in income composition within the top decile are truly enormous: whereas the households of fractile P90-95 almost do not get any capital or self-employment income (90% of their income is made of wages), the households of fractile P99,99-100 rely for the most part on their capital and self-employment income (more than 60% of their income is made of capital income, and an extra 20% is made of self-employment income). Tax returns also distinguish between rents, dividend and interest income, and one always observes that capital income is mostly made of dividends at the very top of the income distribution (the share of interest and rents in total income is basically flat within the top decile, and the share of interest and rents in total capital income is steeply downward-sloping).

Insert Graph 6: The income composition of the top decile in France in 1998

These composition patterns suggest that the secular decline of income inequality is primarily a capital income phenomenon. That is, the fractiles relying mostly on wage income did not experience any significant decline (or experienced a very limited decline), whereas the fractiles relying mostly on their capital income did experience major shocks between 1914 and 1945 (wars, inflation, depression).

In order to test for the consistency of this explanation, I used all composition tables produced by the French tax administration in order to estimate how the income composition pattern depicted on Graph 6 has changed over the course of the 20th century. The basic finding is that the general pattern did not change very much. In particular, the capital share has always been a steeply rising function of the income level: capital income has always played a negligible role at the level of fractile P90-95, and conversely wage income has always played a negligible role at the level of fractile P99,99-100. Moreover, the only significant changes in the composition pattern of the top decile seem perfectly consistent with the capital income explanation of the inequality facts.

First, it is likely that the very top incomes relied even more heavily on capital income at the eve of World War I or in the 1920s than they did in 1998. For instance, Graph 7 shows that the capital share was around 60% at the level of fractile P99,99-100 in 1932 (i.e. approximately the same level as in 1998), in spite of the fact that 1932 was a very bad year for capital income, and especially for dividends (the Great Depression induced a substantial fall in business profits). The capital share at the level of fractile P99,99-100 was probably around 70-80%

(at least) at the eve of World War I and in the late 1920s.[10] This is consistent with the idea of decline of top capital incomes.[11]

  Next, and most importantly, one observes that the capital share at the level of fractile P99,99-100 was as small as 15% in 1945, and that the incomes of the top 0,01% were mostly made of self-employment income (more than 70% of total income) during that year (cf. Graph 8). This is the only instance during the entire century when capital income is not the dominant source of income for very top incomes: capital income quickly became more important than self-employment income during the late 1940s and early 1950s.[12] The sharp contrast between the composition patterns of 1932 and 1945 (see Graphs 7 and 8) clearly shows that the huge drop in top income shares in total income observed during that period (see Graph 5) was to a large extent due to the fall of top capital incomes. The fact that the capital share is particularly low at the end of World War II is also consistent with macroeconomic data. Available series on factor shares do indeed show that the capital share in French corporate value-added has never been as low in 1944-1945 (see Graph 9). French GDP has never been as low as in 1944-1945 (fights between the Germans and the Allies took place over significant portions of the French territory after D-Day, and firms are completely disorganized), and the big wage push implemented by the provisional government implied that there was almost nothing left for profits.

Insert Graph 7: The income composition of the top decile in France in 1932
Insert Graph 8: The income composition of the top decile in France in 1945
Insert Graph 9: Factor shares in the French corporate sector, 1913 and 1919-1998

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[10] Unfortunately, the fact that composition tables were compiled by the French tax administration only in 1917, 1920, 1932, 1934, 1936-1937, 1945-1946, and then annually since 1948, makes it difficult to be more specific (1917 and 1920 were also pretty bad years for capital income, and the capital share for top incomes had approximately the same level as in 1932).
[11] Note also that there were many more unincorporated large firms in the interwar than in the 1990s, which explains why the share of self-employment income for top incomes was larger in the interwar (including in the 1930s, in spite of the recession).
[12] Note however that it took several decades for the capital share to return to the levels observed in the 1930s: the capital share for fractile P99,99-100 was around 35% in the 1950s, 40-45% in the 1960s-1970s, and 50-60% in the 1980s-1990s.

The composition patterns derived from tax returns also allow me to account for the sharp divergence between moderately high incomes and very top incomes observed during the 1930s. Given that fractiles P90-95 and P95-99 mostly rely on wages, one should indeed expect these fractiles to benefit from the deflationary depression: real wages did increase during the Great Depression (thanks to the nominal rigidity of wages), at a time when real output was falling. Moreover, the high-wage employees (and especially the government employees) of fractiles P90-95 and P95-99 were not exposed to unemployment as much as low-wage workers (such as low-skill manufacturing or rural workers). Conversely, given that fractile P99-100 and P99,99-100 mostly rely on business profits, one should indeed expect these fractiles to loose from the recession. The process is reversed in 1936, when the Front Populaire decides to devalue the French franc and to put an end to the deflationary strategy: the high-wage employees of fractiles P90-95 and P95-99 start to loose ground (inflation pushes their real wages down), while the fall of the profit holders of fractiles P99-100 and P99,99-100 is temporarily halted. This again exemplifies why one needs to distinguish between the different sub-fractiles of the top decile in order to be able to properly account for the inequality facts.

4.2. The Long-Run Stability of Wage Inequality

Before I further explore the reasons why capital owners never managed to fully recover from the 1914-1945 shocks, it is important to make sure that the capital income view of the inequality facts is the right one. That is, I need to make sure that wage inequality did not play any significant role in the secular decline of the top decile income share.

My wage series do indeed show that wage inequality in 20th century France has been extremely stable in the long run. The share of the total wage bill received by the top decile of the wage distribution has always been fluctuating around a mean value of about 25-26% (see Graph 10); the share of the total wage bill

received by the top 5% of the wage distribution has always been fluctuating around a mean value of about 17-18% (see Graph 11); and the share of the total wage bill received by the top 1% of the wage distribution has always been fluctuating around a mean value of about 6-7% (see Graph 12).

Insert Graph 10: The top decile wage share in France, 1919-1938, 1947 and 1950-1998

Insert Graph 11: The top 5% wage share in France, 1919-1938, 1947 and 1950-1998

Insert Graph 12: The top percentile wage share in France, 1919-1938, 1947 and 1950-1998

Note that the wage shares of the top decile, top 5% and top percentile were substantially below their secular mean in 1919 (when my series start) and during the early 1920s. But there is ample occupational and sector-specific evidence showing that this was not a "normal" situation. The wage structure did narrow substantially during World War I in France (low-wage workers enjoyed nominal pay increases that were significantly higher than those obtained by high-wage workers), and one can estimate that the top decile, top 5% and top percentile wage shares were at the eve of World War I very close to their secular mean.[13]

More generally, the fact that wage inequality has been extremely stable in the long run does not mean that the French history of wage inequality was smooth and steady during each single decade of the 20th century. Both World Wars led to very significant compressions of the wage structure. But the point is that, after each World War, the wage share received by high-wage workers quickly recovered its pre-war level. My wage series also confirm that the deflationary depression of the early 1930s led to a widening of wage inequality: high-wage workers benefit from the nominal rigidity of their wages and from the fact that they are not exposed to unemployment as much as low-wage workers. In the same way as with my income series, this process ends in 1936, when the Front

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[13] See Piketty (2001, chapter 3).

Populaire decides to put an end to the deflationary strategy. The 1967-1968 and 1982-1983 turning points are also very visible in my wage series: wage dispersion significantly increased between 1950 and 1967-1968, and the sharp increases in the minimum wage implemented in the summer of 1968 and during the 1970s led to sharp decline in wage inequality until 1982-1983, after which the newly elected socialist government decided to freeze the minimum wage (wage dispersion has increased somewhat since then). In other words, wage inequality in 20th century France has been going up and down for all sorts of reasons in the short and medium run, but the point is it has always reverted back to its secular mean. No long run trend can be detected in my series.

The contrast between the long-run evolution of the share of total income received by the top percentile of the income distribution (Graph 4) and the long-run evolution of the share of the total wage bill received by the top percentile of the wage distribution (Graph 12) is particularly striking. While the top percentile income share has declined sharply from about 20% at the beginning of the century to about 7-8% in the 1990s, the top percentile wage share has always been fluctuating around 6-7%.

These wage inequality estimates confirm that the capital income interpretation of the inequality facts was the right one: the secular decline in the top percentile income share is solely due to the sharp drop in the level of the top capital incomes received by the affluent; had this level remained constant (relative to the average income), there would have been no secular decline in the top percentile income share.[14]

Another advantage of looking at wages is that we do have data on the entire distribution, and not only on the average and on the top decile. For the postwar period, one can see by looking at the P90/(average wage), P50/(average wage) and P10/(average wage) ratios that the entire distribution of wages has been

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[14] Strictly speaking, this is more than the data can actually say: depending on the trends in family structure and correlations between the various types of incomes, a given trend in wage inequality can translate into various trends in income inequality. But the gap between graph 4 and graph 12 just seems to big to be undone by that kind of bias. Moreover, note that the correlation of wages between spouses has probably been trending upwards during the 20th century (as a consequence of the upward trend in female participation), so that a stable level of wage concentration should actually give rise to an increasing level of income concentration (everything else equal).

extremely stable in the long run, and not only the top decile, top 5% and top centile share (see Graph 13). If one looks at a more volatile ratio such as P90/P10, one can again notice that wage inequality did experience important fluctuations in the short and medium run: the P90/P10 rose sharply between 1950 and 1968, then declined sharply between 1968 and 1982-1983, and finally rose somewhat since 1982-1983 (see Graph 14). But the point is that is that these short and medium run fluctuations cancel out in the longer run: the P90/P10 ratio is virtually the same in 1950 and in 1998, just as the top decile, the top 5% and the top centile wage share. The same phenomenon seems to have been happening during the first half of the 20th century. Available wage tax returns data only allows us to estimate P10 for the 1950-1998 period, but available occupational and sector-specific data suggests that the P10/(average wage) ratio was already around 45-50% in 1900 and 1930, and that the P90/P10 ratio was also very close to the ratios obtained for the 1950-1998 period.[15]

From an economic viewpoint, the only reasonable way to explain the long run stability of wage inequality in France is to assume the demand and the supply of skills have followed each other closely in the long run: the demand for skills did increase enormously in 20th century France, but the point is that the supply of skills managed to increase approximately with the same proportions, so that the entire wage distribution was drawn upwards, with no major change in the inequality of wages. It is also possible that the long run stability of wage inequality reflect the long run stability of social norms regarding wage inequality in 20th century France. In any case, whatever the exact explanation might be, the point is that this long run stability of wage inequality implies that the secular decline in income inequality is a capital income phenomenon.

Insert Graph 13: The ratios between P10, P50, P90 and the average wage in France, 1950-1998

Insert Graph 14: The P90/P10 ratio of the wage distribution in France, 1950-1998

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[15] These estimates for 1900 and 1930 were computed by using wages of rural domestic workers and low-skill agricultural workers as proxies for P10 (all references are given in Piketty (2001, chapter 3)).

4.4. The Robustness of Wealth Leveling

As was already noted above, the fact that capital owners did experience major shocks during the 1914-1945 period (and especially during the 1930s and World War II) seems consistent with the general economic history of France during that period. In a sense, what happened during the 1914-1945 period is just the normal consequence of an extraordinary recession. Capital income always tends to be pro-cyclical, and it is natural to expect capital owners to suffer a lot from the Great Depression and to be at their secular low in 1944-1945, at a time when the French GNP has never been as low.

  In fact, what really needs to be explained is why capital owners never managed to fully recover from the shocks of the 1914-1945 period.

  One explanation would simply be that capital owners were confronted during the 1914-1945 to major shocks to their capital holdings (and not only to their capital income), and that it takes a very long time to reconstitute the level of fortunes and capital income that capitalists enjoyed before these shocks.

  First, one must bear in mind that inflation did act as a very powerful capital tax. The French CPI was multiplied by a factor of more than 100 between 1913 and 1950, which means that bondholders were fully expropriated by inflation. The same process applied, in a less extreme way, to real estate owners. Rent control was very severe during both World Wars, and the real value of rents was divided by 10 between 1913 and 1950.

  Next, the "recession" induced by the depression of the 1930s and by World War II was not a "normal" recession: many firms went bankrupt and disappeared during that time (much more than during a "normal" recession). Bankrupts were particularly numerous in the manufacturing and in the banking sectors. Large fortunes always rely much more heavily on shares than on bonds and real estate, and the impact of the bankrupts of the 1930s and of World War II on large fortunes was probably even larger than the impact of inflation.

Note also that the physical destructions induced by both World Wars were truly enormous in France: according to the best available estimates, about 1/3 of the private capital stock was destroyed during WWI, and about 2/3 of the private capital stock was destroyed during WWII.[16] Finally, it is important to recall that a very broad nationalization policy was applied by the French government in 1945, and that the nationalization process often looked like straight expropriation: prices for shares were often set at an arbitrary low level, so as to punish the "capitalists" (who were often accused of "collaboration" with the Vichy government).

In other words, there are good reasons to believe that the accumulation process for large capital holdings was to a large extent set back to zero (or very close to zero) in 1945. This interpretation is consistent with the composition patterns described in Section 4.1 above: in 1945, the top 0,01% was mostly made up of new entrepreneurs, simply because the old capitalists had disappeared.

But such an explanation cannot be the all story. More than 50 years have elapsed since 1945, and it would seem that this is a sufficiently long time period for capitalists to recover from the 1914-1945 shocks (at least partly). The point is that the top 0,01% income share did not rise at all during the 1945-1998 period (see Graph 5). Apparently, something important has changed over the course of the 20th century: it just seems impossible to accumulate individual fortunes as large as those that were accumulated in the past.

Note also that the decline of top capital incomes is the consequence of a decreased concentration of capital income and not of a decline in the share of capital income in the economy as a whole. According to national accounts, the share of capital income in aggregate household income is approximately the same at the end of the 20th century than what it was at the beginning of the 20th century.[17]

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[16] All references are given in Piketty (2001, chapter 2).

[17] Although it took only a few years for the capital share in corporate value-added to recover from the 1944-1945 secular low (see Graph 9 above), it is only in the 1980s-1990s that the capital share in aggregate household income reached the levels observed in the interwar and at the eve of World War I. This is due to a mixture of two factors: (i) retained earnings were very high during

One could obviously wonder whether the decline of top capital incomes could simply be the consequence of fiscal manipulation and tax evasion. I have performed two kinds of checks in order to make sure that fiscal manipulation and tax evasion can only be a small part of the story (at most), and that the observed trends do indeed describe a real economic phenomenon.

First, the observed trends simply seem too massive to be explained by fiscal manipulation and tax evasion. If one adjusts the capital income figures reported in tax returns so as to match the capital income estimates coming from national accounts, then the trends are still very massive.[18] Moreover, all available information suggests that tax evasion in France has never been as high as in the interwar period (when the tax administration had much less investigation power than it had since 1945), i.e. at the time when reported incomes at the very top of the distribution were much higher than what they were in the 1990s. In other words, tax evasion seems to amplify the trends rather than to reduce them.

Next, I have used inheritance tax returns data in order to test whether the leveling of fortunes was a real phenomenon. The results are pretty spectacular (see Graphs 15 to 17). Whereas the average real estate left by the fractile P90-95 of the estate distribution has been multiplied by about 3,2 between 1900-1910 and the 1990s, the average real estate left by the fractile P99,99-100 of the estate distribution is nearly 4 times smaller during the 1990s than what it was in 1900-1910. The decline in capital concentration seems truly astonishing. Inheritance tax returns are obviously subject to fiscal manipulation and tax evasion, but the trends are so enormous that these explanations can only be a very small part of the story. Moreover, in the same way as for income tax returns,

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the reconstruction period in France (1950s-1960s), and profits were low during the 1970s; (ii) several decades were needed for the real value of rents to recover from the 1913-1950 inflation.

[18] A significant fraction of total capital income (as measured by national accounts) is non-taxable in the 1980s-1990s (the non-taxable fraction of capital income was much smaller in the interwar). But non-taxable capital income mostly takes the form of interest income or dividends credited on savings accounts or life insurance funds, and these forms of income are not very important for top capital incomes, which rely mostly on dividends received directly. Note also that French shareholders need to report dividends on their tax returns to benefit from the corporate tax credit (there was no such incentive in the interwar, when dividends were always taxed twice). Capital gains were not taxable until the 1980s-1990s in France, and they were excluded from our analysis for the entire period (capital gains make an income supplement of about 15% for fractile P99,99-100 in the 1990s, so this omission cannot bias my conclusions).

tax evasion was probably larger at the beginning of the 20th century and during the interwar period than later in the century.

Insert Graph 15: Average estate left by the fractile P90-95, 1902-1994

Insert Graph 16: Average estate left by the fractile P99,99-100, 1902-1994

Insert Graph 17: Ratio between average estates left by fractiles P99,99-100 and P90-95, 1902-1994

4.4. The Role of Progressive Taxation

How then can we account for the fact that very large fortunes never recovered from the 1914-1945 shocks, while smaller fortunes did recover? The most natural and plausible candidate for an explanation seems to be the creation and the development of the progressive income tax (and of the progressive inheritance tax). The very large fortunes that generate the top 0,01% incomes observed at the beginning of the 20th century were accumulated during the 19th century, at a time where progressive taxes did not exist and capitalists cold use almost 100% of their pre-tax income to consume and to accumulate. The conditions faced by 20th century capitalists to recover from the shocks incurred during the 1914-1945 period were substantially different. As one can see from Graph 18, the top marginal rate of the income tax reached very high levels during the interwar period in France, and it was very high after 1945. These very high marginal rates applied only to a very small fraction of incomes, but the point is that is they were to a large extent designed to hit the incomes of the top 0,1% and 0,01% of the income distribution, i.e. the incomes that depend primarily on capital income and capital accumulation. Effective average tax rates have always been fairly moderate at the level of fractile P90-95: less than 1% during the interwar period, and between 5% and 10% since World War II (see Graph 19). In contrast, effective average tax rates borne by fractile P99,99-100 went above 30% during the interwar period, and stabilized around 40-50% since World War II (see Graph 20). It is therefore not surprising if progressive taxation had a substantial impact

on capital accumulation at the very top and a negligible impact for smaller fortunes.

Insert Graph 18: The top marginal tax rate in France, 1915-1998
Insert Graph 19: The average income tax rates of fractiles P90-95, P95-99 and P99-100 in France, 1915-1998
Insert Graph 20: The average income tax rates of fractiles P99-99,5, P99,5-99,9, P99,9-99,99 and P99,99-100 in France, 1915-1998

Needless to say, these numbers are not sufficient to prove in a rigorous way that the dynamic effects of progressive taxation on capital accumulation and pre-tax income inequality have the "right" quantitative magnitude to account for the observed facts. One would need to know more about the savings rates of capitalists, how their accumulation strategies have changed since 1945, etc. Note however that the orders of magnitude do not seem unrealistic, especially if one assumes that the owners of large fortunes, whose pre-tax incomes and lifestyles were already severely hit by the 1914-1945 shocks, were not willing to reduce their consumption down to very low levels and to increase their savings so as to counteract the rise in tax rates.

In fact, in the most standard economic models of capital accumulation, the behavioral response tends to amplify (and not to counteract) the rise in tax rates. That is, a rise in tax rates imposed on very top incomes leads wealthy taxpayers to increase their consumption and to reduce their savings. In the Barro-Becker dynastic model of capital accumulation, this behavioral effect is so large that very large fortunes completely disappear in the long run. Progressive taxation leads to truncated wealth distribution in the long run, in the sense that there is nobody above the top marginal rate threshold. This does not mean however that progressive taxation leads to lower aggregate capital accumulation. In the standard dynastic model, one can show moderately rich dynasties accumulate more in order to compensate for the desaccumulation of the very wealthy, so that progressive taxation has no effect at all on the long run aggregate capital stock.

The long run distribution of wealth is truncated at the top, but average wealth is unchanged. Although this theoretical result is pretty simple (see the appendix for a formal statement and a proof), it might have been overlooked by the literature on capital taxation: economists usually restrict their attention to the case of proportional capital taxation, i.e. the case where all agents reduce their savings, which leads them to emphasize the efficiency cost of capital taxation and to the usual zero-optimal-capital-tax result.[19] The picture looks completely different with progressive taxation. Progressive taxation limits the concentration of wealth, at no efficiency cost.[20]

The dynastic model and the theoretical prediction according to which large fortunes completely disappear in the long run are probably too extreme. In less extreme and more realistic models of capital accumulation, the impact of progressive taxation is less massive (large fortunes do not completely disappear). But the impact is still very substantial. Table 3 indicates how fast a capitalist will destroy his capital stock in case he keeps the same consumption level after progressive taxation is introduced. In the absence of taxation (say, before World War I), the capital stock of a capitalist consuming each year the full return to his capital stock is stationary. But if an effective tax rate of 30% is suddenly introduced (say, in the interwar period), and if this capitalist keeps consuming the full before-tax return to his capital stock, then he will need to consume some his capital stock each year: 18% of the initial capital stock is destroyed after 10 years, 42% after 20 years, etc., and there is no capital left after 35 years. This cumulative process would take place at an even faster pace in case of higher returns and/or higher tax rates (see Table 3). Although this mechanism is pretty trivial, I believe that this process did contribute to amplify the shocks incurred by capital owners during the 1914-1945 period.

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[19] This is a very standard result in the literature. For a recent statement, see e.g. Mankiw (2000).

[20] A complete analysis of the costs and benefits of progressive capital taxation is far beyond the scope of this paper. For instance, one would also need to take into account the potential efficiency costs associated to the transition path towards the truncated wealth distribution, the potential efficiency benefits associated to wealth deconcentration (with credit constraints, excessive wealth concentration entails efficiency costs), etc.

Insert Table 3 : The Impact of Progressive Taxation on Capital Accumulation, I

Consider now the case of a capitalist (or a would-be capitalist) in 1945, and assume that this capitalist is ready to devote a large fraction of his income to capital accumulation. How much can he accumulate in 50 years? The point is that progressive taxation drastically reduces the size of fortunes that one can accumulate, including for capitalists adopting relatively low living standards (see Table 4). For instance, with a 5% before-tax return and for a consumption level equals to 40% of the before-tax return to the initial capital stock, one can accumulate in 50 years a fortune that is about 5 times as large with a 0% tax rate than with a 50% tax rate. That is, the initial capital stock is multiplied by 7,3 after 50 years in the absence of taxation, while the initial capital stock is multiplied by only 1,5 with a tax rate of 50%. This tax rate of 50% corresponds approximately to the average effective tax rates faced by fractile P99,99-100 in France since World War II (see Graph 20 above), and the factor of 5 corresponds approximately to the secular decline in the income share of fractile P99,99-100 (see Graph 5 above).

Insert Table 4 : The Impact of Progressive Taxation on Capital Accumulation, II

Note also that these simple simulations do not take into account the impact of the progressive inheritance tax. During the 19th century, the inheritance tax was strictly proportional in France, and the tax rate was 1%. A progressive inheritance tax was introduced in 1901, but tax rates remained fairly moderate until World War I: at the eve of the war, top tax rates did not exceed 5%. In the same way as with the progressive income tax, the top rates of the progressive inheritance tax suddenly reached non-trivial levels in the aftermath of World War I. One can compute that the effective tax rate faced by fractile P99,99-100 of the estate distribution was about 20-25% during the interwar period (or even 30-35% during the early 1920s), 30-35% during the 1950s, 15-20% during the 1960s-1970s and again 30-35% during the 1980s-1990s. Note however that the long run impact of

the progressive inheritance tax on capital accumulation, though very important, has probably been less drastic than the impact of the progressive income tax. Because the income tax applies every year and has cumulative effects, an effective income tax rate of 50% can reduce by a factor of 5 the size of fortunes that one can accumulate in 50 years. In contrast, assuming the inheritance tax is paid once every 50 years (on average), an effective inheritance tax rate of 50% reduces by a factor of 2 the size of fortunes that one can accumulate in 50 years.

Finally, it is worth emphasizing that it is not that easy to find convincing explanations (other than the introduction of progressive taxation) that can account for the non-recovery of large fortunes. That is, I recognize that I am unable to prove that no other mechanism played an important role, but I stress that it is not obvious what these hypothetical alternative mechanisms might be. In particular, explanations based on changes in before-tax returns to capital do not seem to work. All capital holders should have been hit by a reduction in before-tax asset returns. The point is that very large fortunes were unable to recover from the 1914-1945 shocks, while fortunes that were slightly smaller did recover perfectly well. One needs an explanation that applies only to very large fortunes and not to smaller fortunes, and progressive taxation looks like an obvious candidate.

5. How Specific is the French Experience?

Available historical series on income inequality in other European countries and in the U.S. are too scarce and incomplete to draw definite conclusions about the differences and similarities between the French experience and other developed countries' experiences.

Existing European series are particularly fragile. For most European countries (and in particular for Germany and for the U.K.), we only have a couple of very heterogeneous estimates of income inequality covering only a small number of

years over the course of the 20th century.[21] Note however there are two key points on which all existing estimates seem to be consistent with my French findings. First, the secular decline in the top decile income share seems to have occurred in all European countries during a very specific time period, i.e. between 1914 and 1945 (and especially during the 1930s and World War II). Next, the strong 1914-1945 decline in the top decile share seems to be due for the most part to the top percentile share.[22] Existing estimates also suggest that countries with larger war destructions experienced a larger decline of their top centile income share (for instance, total decline was apparently larger in Germany than in the UK), which again is consistent with my explanation. This would seem to imply that the 1914-1945 inequality decline was in all European countries an accidental, capital-income phenomenon. Needless to say, one would need to construct the same detailed series as my French series in order to clarify this point.

   The U.S. case is particularly interesting, both because available series are less scarce than for European countries and because several authors have argued that the decline of income inequality observed during the first half of the 20th century was the outcome of a general, spontaneous process of inequality compression (and not an accidental phenomenon). Existing series, however, do not support such an "optimistic" conclusion.

   First, note that Kuznets' series are actually very much in line with my French findings. Kuznets (1953) used U.S. tax returns statistics to construct annual 1913-1948 top income shares series, and these series constitute the most valuable source of information on U.S. inequality dynamics during the first half of the 20th century. If one looks carefully at Kuznets' series, one can see the significant decline in the top decile income share that took place over the 1913-1948 period is almost entirely due to the very sharp decline of the top percentile income share. The top percentile income share dropped from about 14-15% in

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[21] For a recent survey on historical works on inequality in European countries, see Morrisson (2000).

[22] Existing series do not usually offer a complete decomposition of the top decile income share (see the estimates reported by Morrisson (2000)). But whenever such decompositions are available, top fractiles income shares account for a disproportionate share of the top decile share.

1913-1914 to about 8-9% in 1947-1948, but the income shares of fractiles P90-95 and P95-99 were almost the same in 1913-1914 and in 1947-1948.[23] Note that the total decline of the top percentile income share, though very significant, is smaller than what we found in France (where the top percentile income share dropped from about 20% at the eve of World War I to about 7-8% right after World War II). This is consistent with the capital-income explanation: World Wars induced a much more severe shock on capital holders in France than in the U.S. (unlike the depression of the 1930s, which was more severe in the U.S.). Note also that Kuznets' series confirm that the inequality decline was not a linear, continuous process: the top percentile income share dropped during World War I, recovered during the 1920s, and dropped again during the Great Depression and World War II. Unfortunately, Kuznets did not attempt to go beyond the top percentile (nor did he give systematic estimates of income composition for the various fractiles). Moreover, nobody seems to have tried to replicate and extend Kuznets' estimates (the raw tax returns data of the 1913-1948 period has almost never been used by economists since the time of Kuznets).[24] It is therefore impossible to undertake the same kind of test than what we did for France.

It is interesting to note that Kuznets, in his 1955 article, started by proposing an interpretation of his 1953 series that was very much in line with my proposed interpretation. Kuznets emphasized the shocks incurred by capital owners during the 1914-1945 period, and he mentioned explicitly the dynamic impact of progressive taxation on capital accumulation and income inequality. But, by the end of his article (which was also his presidential address to the AEA), Kuznets formulated a completely different theory. Kuznets argued that there could well exist an endogenous mechanism forcing inequality to decline in advanced capitalist countries: in a two-sector model of economic development, one should indeed observe inequality to rise when only a small fraction of the population benefits from the incomes generated by the high-productivity sector, and to decline when most workers join the high-productivity sector. Kuznets had

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[23] See Kuznets (1953, table 118, pp.596-602).
[24] For instance, Williamson and Lindert (1980) simply use the Kuznets series and do no attempt to go back to the original statistical material. See also Lindert (2000).

basically no empirical evidence to support this theory: "this is perhaps 5% empirical information and 95% speculation, some of it possibly tainted by wishful thinking".[25] Although this optimistic theory quickly became very popular, it is important to recall that the theory of the "Kuznets' curve" is not supported by Kuznets' series.

  Several authors have argued since the time of Kuznets that U.S. wage inequality declined significantly during the 1900-1950 period (which would suggest that what happened was not just an accidental capital-income phenomenon). The problem is that this conjecture relies exclusively on occupational wage data (such as occupational pay ratios) and sector-specific data (see e.g. Williamson and Lindert (1980), Goldin and Margo (1992) and Goldin and Katz (1999)). To my knowledge, there does not exist any U.S. wage inequality series expressed in terms of fractiles prior to 1940 (in particular, there exists no series on top fractiles wage shares). This is problematic because inequality measures such as occupational pay ratios are severely biased (especially if one looks at long-run trends). For instance, given the continuous rise in the numerical importance of high-skill jobs, it is natural to expect ratios such as (high-skill wages)/(low-skill wages) to decline continuously over time, even if wage inequality (measured in terms of fractiles of the whole distribution) does not change at all. In France, the ratio between the average wage of managers and the average wage of production workers has dropped by almost 40% between the early 1950s and the late 1990s (see Graph 21), even though wage inequality (measured both in terms of top fractiles wage shares and in terms of P90/P10-type ratios) was exactly the same in the early 1950s and in the late 1990s (see Graphs 10 to 14). Existing series show that a similar decline in occupational pay ratios also occurred in France during the 1900-1950 period. When U.S. authors show that such occupational pay ratios have declined during the first half of the 20th century, it is therefore extremely difficult to conclude that wage inequality really dropped over this period (apart from the short run war

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[25] See Kuznets (1955, p.26).

episodes of inequality compression, which one also observes in France and in other countries).

Insert Graph 21: The ratio between the average wage of managers and the average wage of production workers in France, 1951-1998

  This is not meant to say that wage inequality did not decline significantly in the U.S. during the 1900-1950 period: my point is simply is that this still needs to be established. It could well be that U.S. wage inequality was indeed substantially less stable than French wage inequality in the long run, e.g. because the U.S. labor market experienced much larger demographic and/or technological shocks, or because social norms regarding wage inequality have been more volatile in the U.S. (or both). Note also there exists one well-established divergence between U.S. inequality dynamics and French inequality dynamics. Top income shares have been increasing sharply in the U.S. since the 1970s, [26] while my series show they have been pretty flat in France.[27] The very steep rise in top incomes observed in the U.S. since the 1970s seems to be due to a large extent to the large increases in high-skill wages and executive compensation. The large decline in top tax rates observed in the U.S. since the 1970s also provides a test for my theory of progressive taxation and capital accumulation. One should expect the decline in top tax rates to facilitate the accumulation of very large fortunes and the resurgence of very large capital incomes during the next few decades. These issues would deserve more attention in future research.

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[26]   According to the most recent estimates, the rise in U.S. income inequality that took place since the 1970s was apparently sufficiently massive to undo most (or all) of the previous decline. The Feenberg-Poterba (1993, 2000) series suggest that the top centile income share was relatively stable from the late 1940s until the late 1970s, and then that it went up from about 8-9% in the late 1970s to about 14-15% in the late 1990s. Note however that the Kuznets 1913-1948 series and the Feenberg-Poterba 1950-1995 series are not fully homogeneous, so that one would need to go back to the raw tax returns data in order to reach strong conclusions.

[27] Existing evidence suggests that top income shares have also been pretty flat in other European countries since the 1970s (except in the U.K., where the observed trends seem to be intermediate between those of Continental Europe and those of the U.S.).

6. Concluding Comments

In this paper, I have presented new inequality series on France during the 20th century. The main conclusion is that the decline in income inequality that took place during the first half of the 20th century was mostly accidental. In France, and probably in a number of other developed countries as well, wage inequality has actually been extremely stable in the long run, and the secular decline in income inequality is for the most part a capital income phenomenon: holders of very large fortunes were severely hit by major shocks during the 1914-1945 period, and they were never able to fully recover from these shocks, probably because of the dynamic effects of progressive taxation on capital accumulation and pre-tax income inequality.

More research is needed is order to better understand the determinants of long run inequality dynamics. First, it would be very useful to construct similar inequality series for other countries. The raw statistical materials that I have used to construct my French series are to some extent available in other countries, and these materials have been under-used by economists so far.

Next, the dynamic interplay between progressive taxation, capital accumulation and income inequality would need to be analyzed more carefully, both from an empirical and theoretical standpoint. Although my interpretation of the basic facts presented in this paper seems reasonable to me, I emphasize that I cannot prove that this is the right interpretation. I very much hope that my empirical findings will contribute to stimulate future research in this area.

<u>Appendix : Progressive Taxation with Dynastic Capital Accumulation</u>

I consider an infinite-horizon, discrete-time economy with a continuum [0;1] of dynasties. All dynasties maximize a standard dynastic utility function:

$$U_t = \sum_{t \geq 0} U(c_t)/(1+\theta)^t$$
$$(U'(c)>0, \ U''(c)<0)$$

All dynasties supply exactly one unit of (homogeneous) labor each period. Output per labor unit is given by a standard production function $f(k_t)$ ($f'(k)>0$, $f''(k)<0$), where k_t is the average capital stock per capita of the economy at period t. Markets for labor and capital are assumed to be fully competitive, so that the interest rate r_t and wage rate v_t are always equal to the marginal products of capital and labor:

$$r_t = f'(k_t)$$
$$v_t = f(k_t) - r_t k_t$$

For simplicity, I assume a two-point distribution of wealth. Dynasties can be of one of two types: either they own a large capital stock k_t^A, or they own a low capital stock k_t^B ($k_t^A > k_t^B$). The proportion of high-wealth dynasties is equal to λ (and the proportion of low-wealth dynasties is equal to $1-\lambda$), so that the average capital stock in the economy k_t is given by:

$$k_t = \lambda k_t^A + (1-\lambda)k_t^B$$

In such a dynastic capital accumulation model, it is well-known that the long-run steady-state interest rate r* and the long-run average capital stock k* are uniquely determined by the utility function and the technology (irrespective of initial conditions): in stead-state, r* is necessarily equal to θ, and k* must be such that $f'(k^*)=r^*=\theta$ (if the interest rate is above the rate of time preference, then

agents choose to accumulate capital indefinitely, and this cannot be a steady-state; conversely, if the interest rate is below the rate of time preference, agents desaccumulate capital indefinitely and this cannot be a steady-state either). This does not mean however that convergence in individual wealth levels occurs in a such a model: in fact, any wealth distribution such that the average wealth is equal to k* (the "golden rule" capital stock) can be a long-run steady-state.

Proposition 1. In the absence of taxation taxation, all long-run steady-state wealth distributions (k^A_∞, k^B_∞) $(k^A_\infty > k^B_\infty)$ are characterized by the following condition:

(i) $\lambda k^A_\infty + (1-\lambda)k^B_\infty = k^*$ (with k* such that $f'(k^*)=r^*=\theta$)

Consider now the effects of progressive taxation. Assume that individual capital stocks are taxed each period at a marginal tax rate $\tau>0$ above some capital stock threshold k_τ .[28] I.e., the tax is equal to 0 if $k<k_\tau$, and the tax is equal to $\tau(k-k_\tau)$ if $k>k_\tau$. Further assume that the threshold k_τ is larger than the "golden rule" capital stock k* (defined by $f'(k^*)= r^*=\theta$). One can easily show that the only long run effect of this progressive capital tax is to truncate the distribution of wealth. That is, the long run distribution of wealth must be such that $k^A_\infty < k_\tau$, but long run average wealth is unchanged (it is still equal to the "golden rule" level k*). Note that this truncation result holds no matter how small the tax rate τ : τ just needs to be strictly positive (say, $\tau = 0,0001\%$), and one gets the result according to which individual wealth levels above the threshold k_τ must completely disappear in the long run. This illustrates how extreme the dynastic model really is.

Proposition 2. With progressive capital taxation at rate $\tau>0$ levied on capital stocks above some threshold k_τ (with $k_\tau > k^*$), then all long-run steady-state wealth distributions (k^A_∞, k^B_∞) $(k^A_\infty > k^B_\infty)$ are characterized by the following two conditions:

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[28] A similar result applies if one replaces the progressive capital tax by a progressive tax on capital income.

(ii) $\lambda k^A_\infty + (1-\lambda)k^B_\infty = k^*$ (with k^* such that $f'(k^*)=r^*=\theta$)

(iii) $k^B_\infty < k^A_\infty < k_T$

Proof : In steady-state, after-tax interest rates faced by both types of dynasties must be equal to the rate of time preference. This implies that both types of dynasties must be in the same tax bracket in the long run: either $k^B_\infty < k^A_\infty < k_T$, or $k_T < k^B_\infty < k^A_\infty$. Assume that $k_T < k^B_\infty < k^A_\infty$, and note k_∞ the average long run capital stock ($k_\infty = \lambda k^A_\infty + (1-\lambda)k^B_\infty$). The long run before-tax interest rate r_∞ is given by $r_\infty = f'(k_\infty)$, and the long run after-tax interest rate $(1-\tau)r_\infty$ faced by both types of dynasties is such that $(1-\tau)r_\infty = \theta$. But $k_T > k^*$ implies that $k_\infty > k^*$, which in turn implies that $r_\infty = f'(k_\infty) < r^* = f'(k^*) = \theta$, which leads to a contradiction. Therefore $k^B_\infty < k^A_\infty < k_T$. This implies that the tax does not bind in the long run and that $r_\infty = \theta$ and $k_\infty = k^*$, in the same way as in the absence of tax. CQFD.

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Graph 1 : The proportion of taxable households in France, 1915-1998

Proportion of taxable households (%)
(proportion of households who are subject to the income tax)
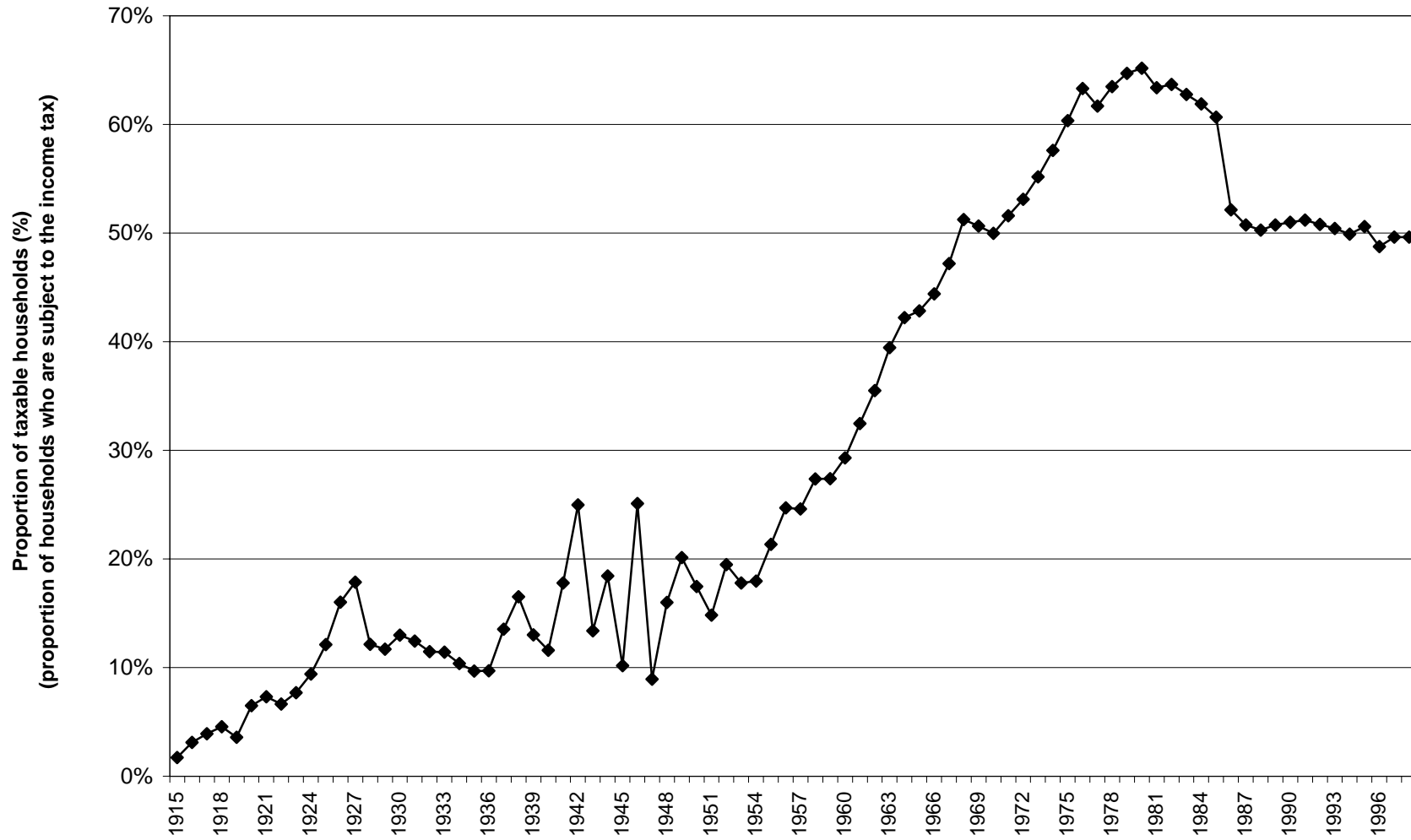
Source: Author's computations based on income tax returns

Graph 2 : The top decile income share in France, 1900-1910 and 1919-1998
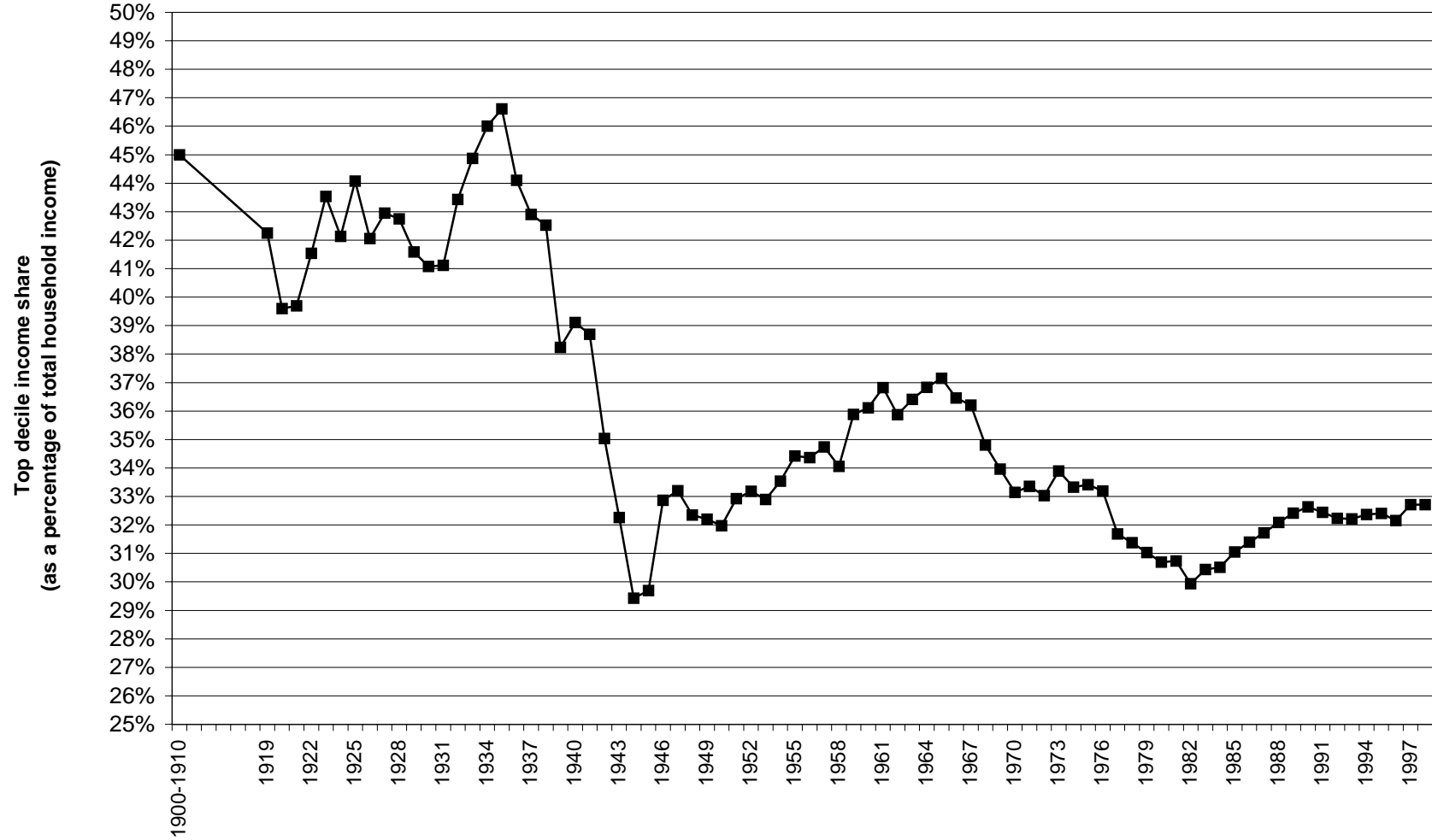
Source: Author's computations based on income tax returns
(see table A1, col. P90-100 for the corresponding series)

Graph 3: The income share of fractiles P90-95 and P95-99 in France, 1900-1910 and 1919-1998
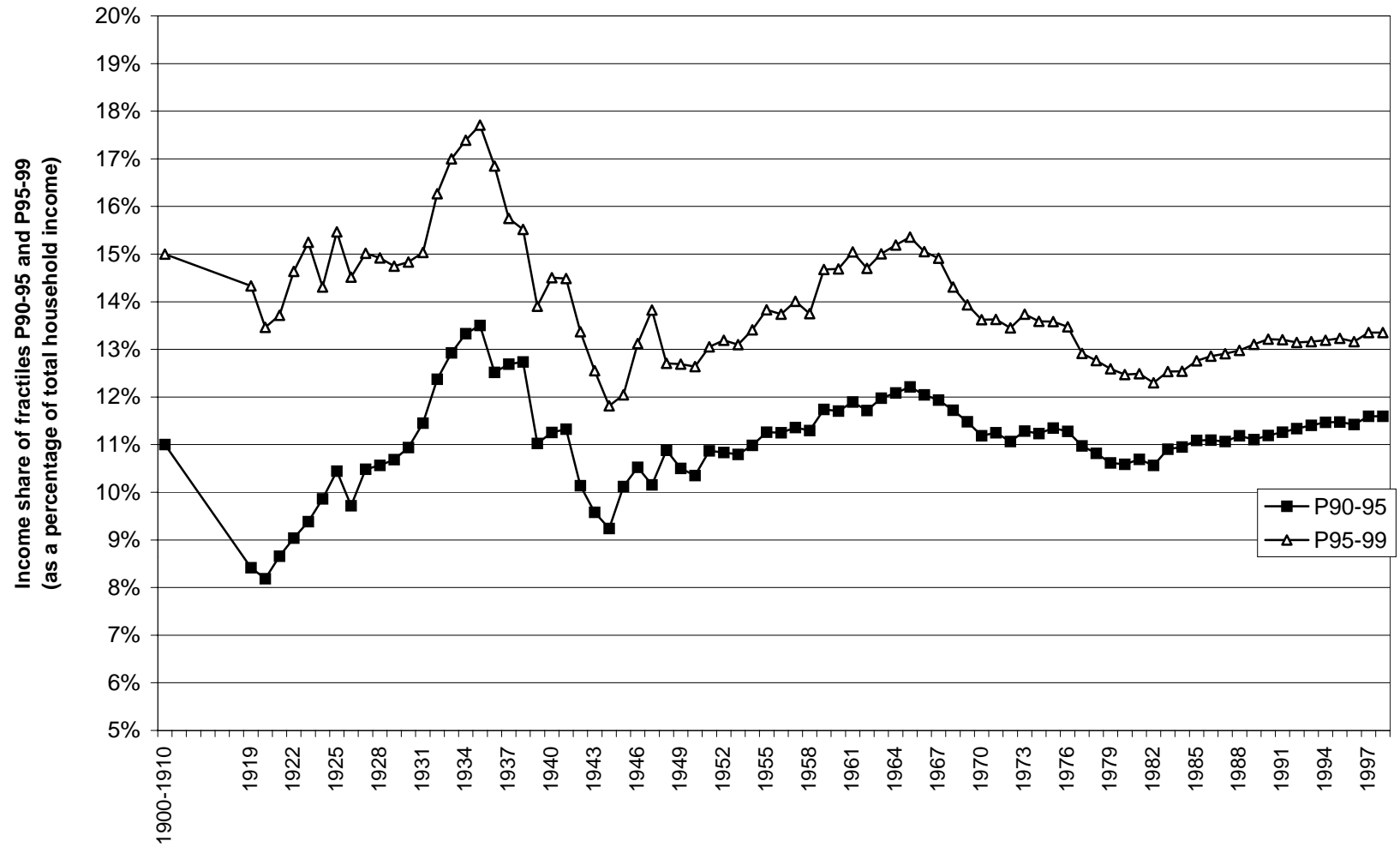
Source: Author's computations based on income tax returns
(see table A2, col. P90-95 and P95-99 for the corresponding series)

Graph 4: The top percentile income share in France, 1900-1910 and 1915-1998
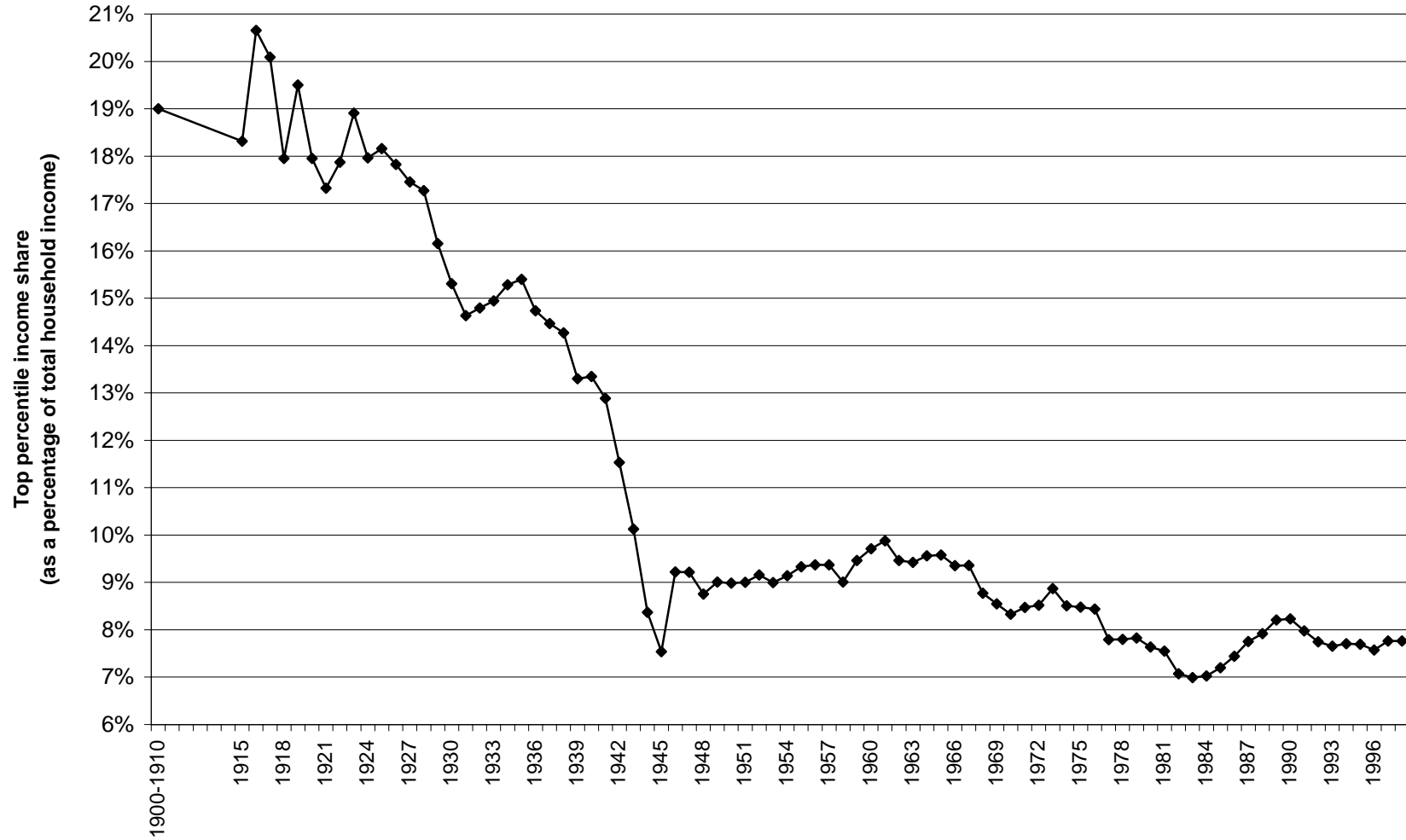
Source: Author's computationa based on income tax returns (see table A1, col. P99-100 for the corresponding series)

Graph 5: The top 0,01% income share in France, 1900-1910 and 1915-1998
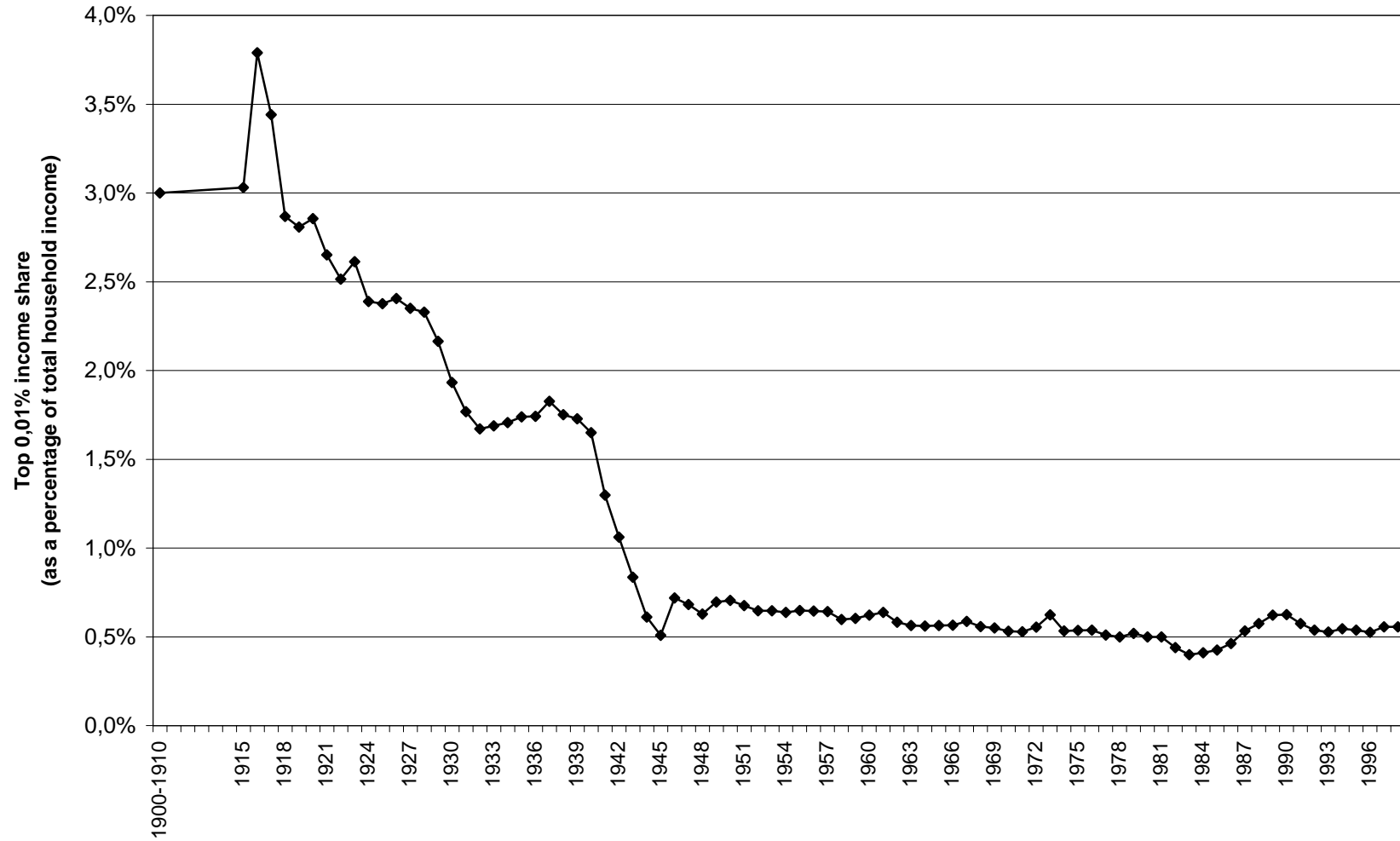
Top 0,01% income share (as a percentage of total household income)

Graph 6 : The income composition of the top decile in France in 1998
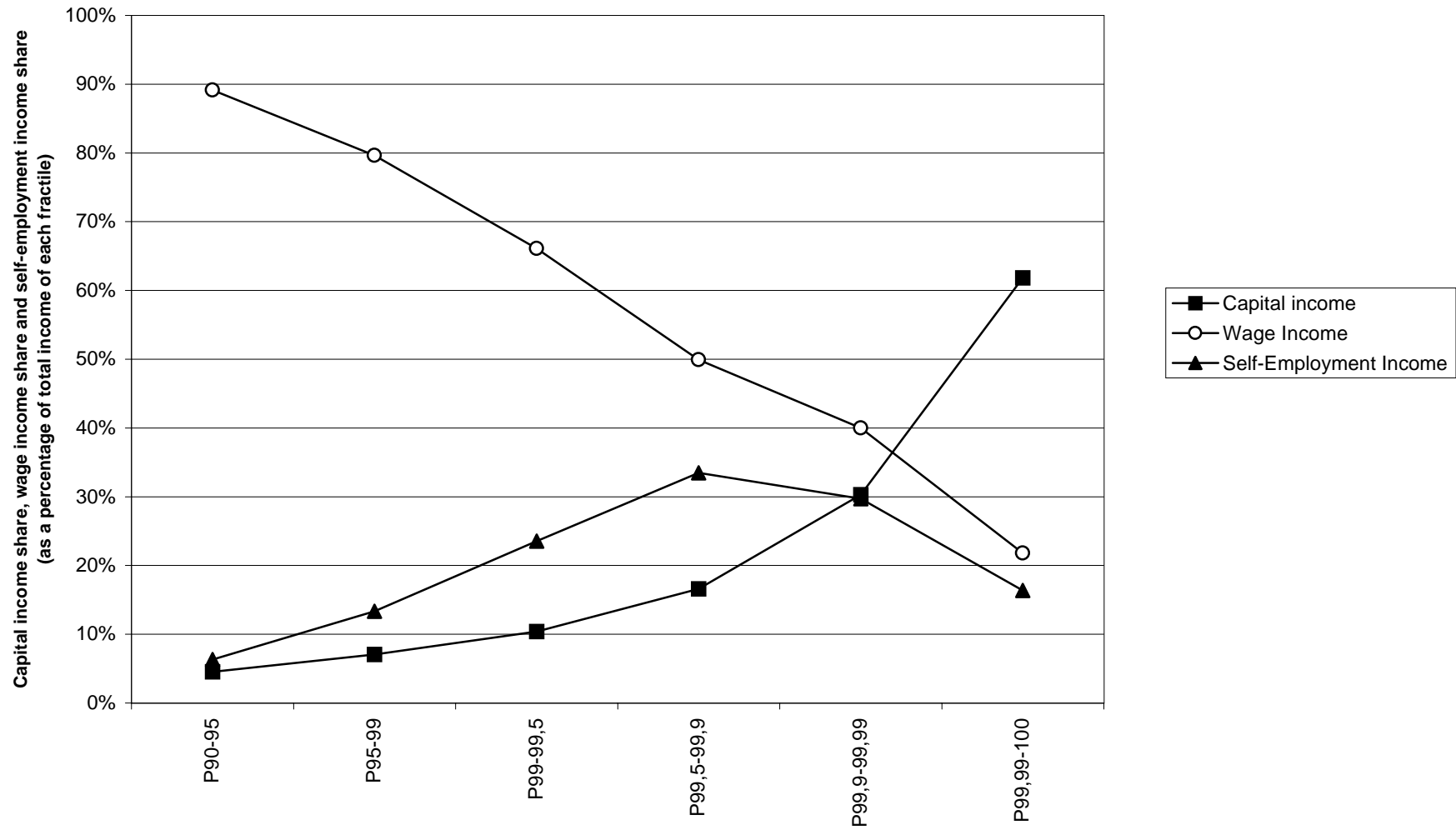
Source: Author's computations based on income tax returns

Graph 7 : The income composition of the top decile in France in 1932
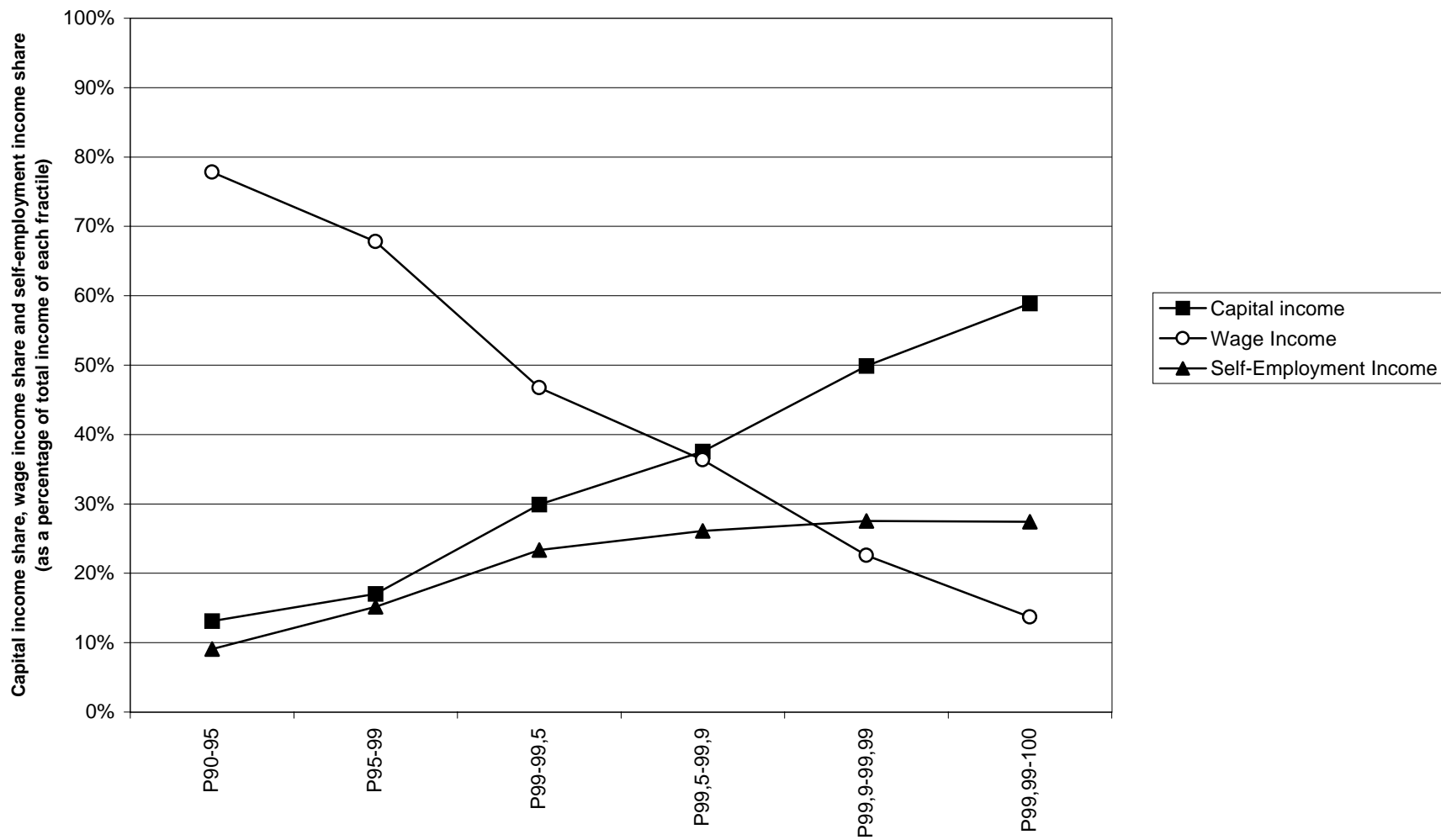
Source: Author's computations based on income tax returns

Graph 8 : The income composition of the top decile in France in 1945
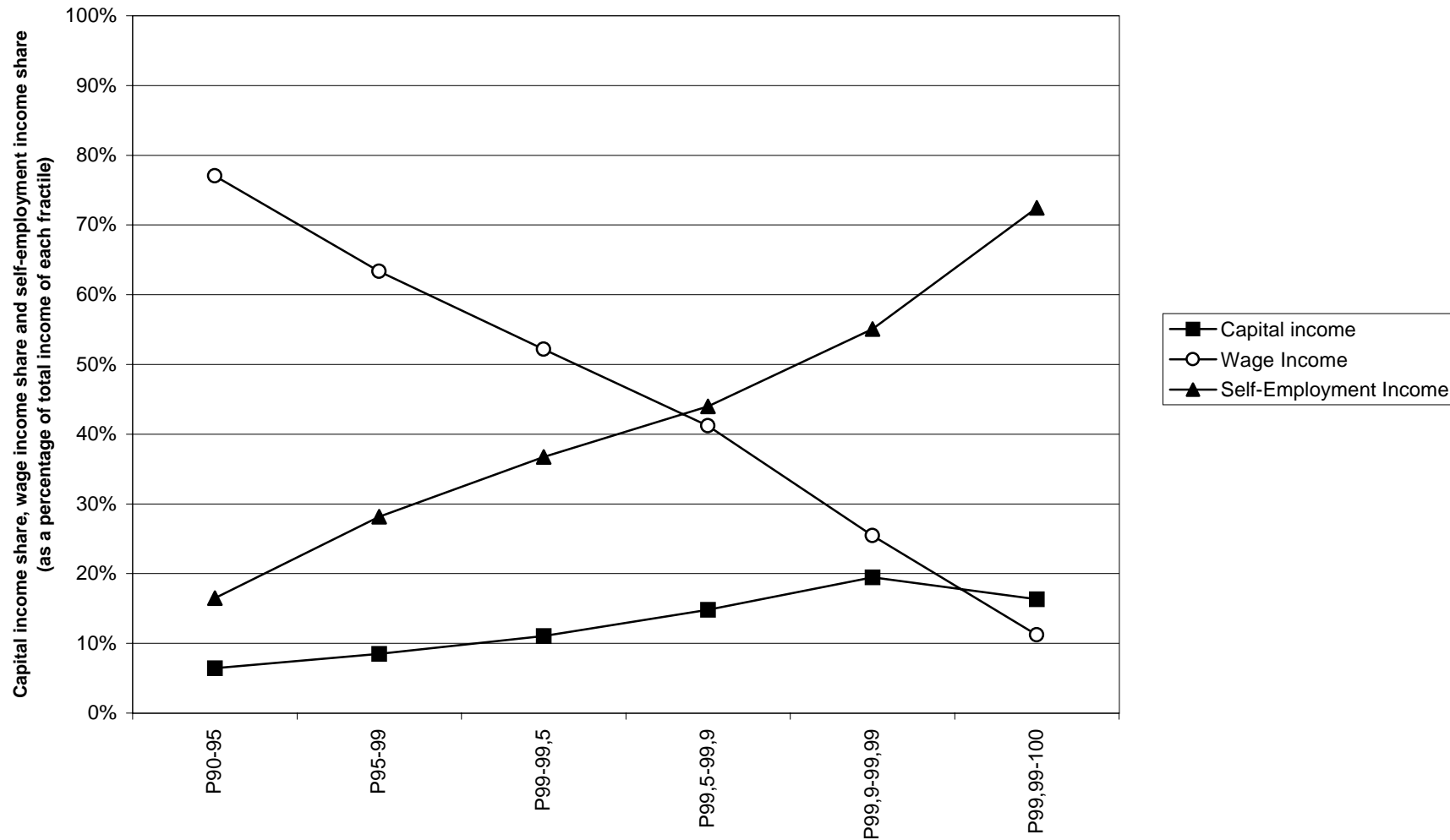
Source: Author's computations based on income tax returns

Graph 9 : Factor shares in the French corporate sector, 1913 and 1919-1998
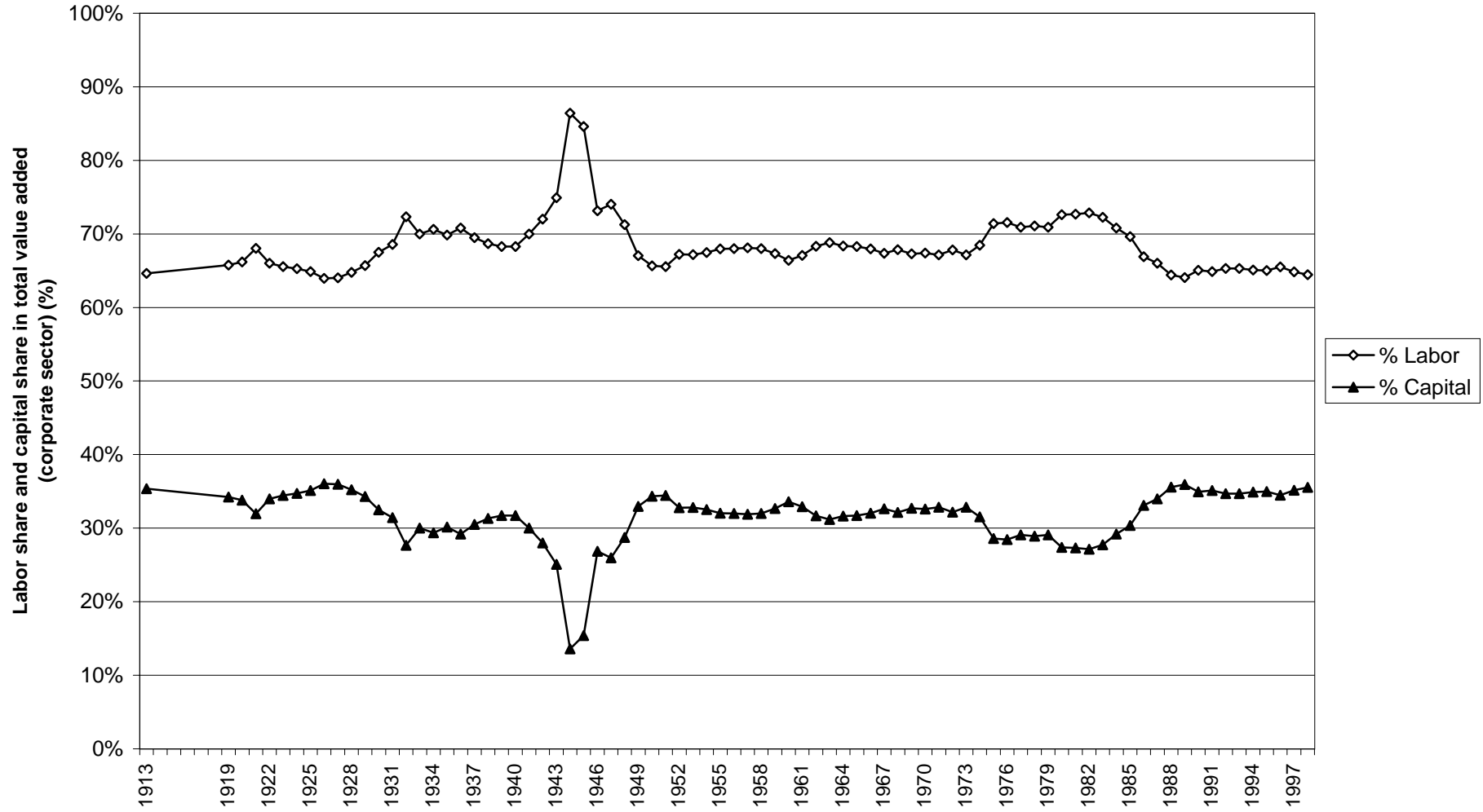
Source: Author's computations based on national accounts

Graph 10 : The top decile wage share in France, 1919-1938, 1947 and 1950-1998
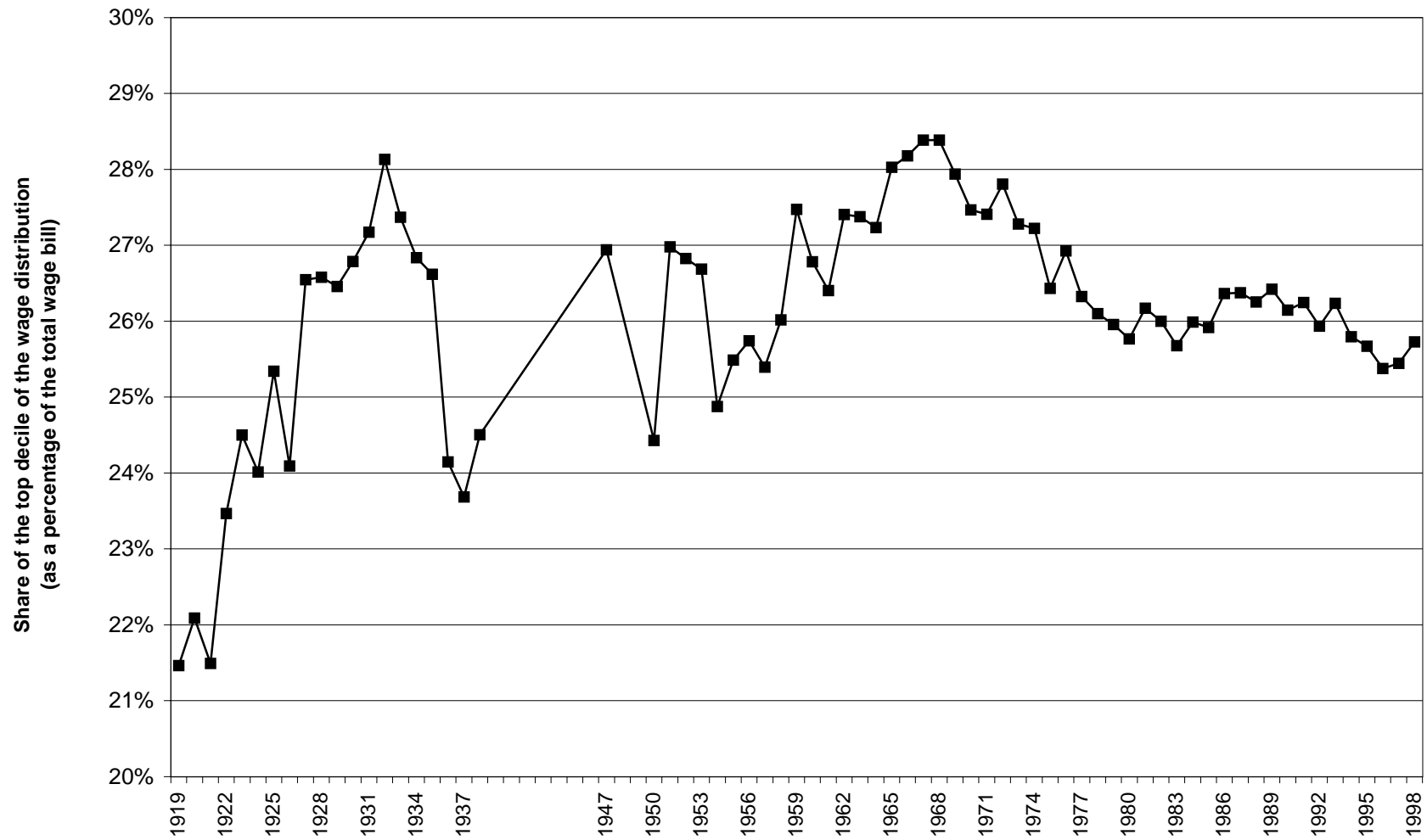
Source: Author's computations based on wage tax returns

Graph 11 : The top 5% wage share in France, 1919-1938, 1947 and 1950-1998
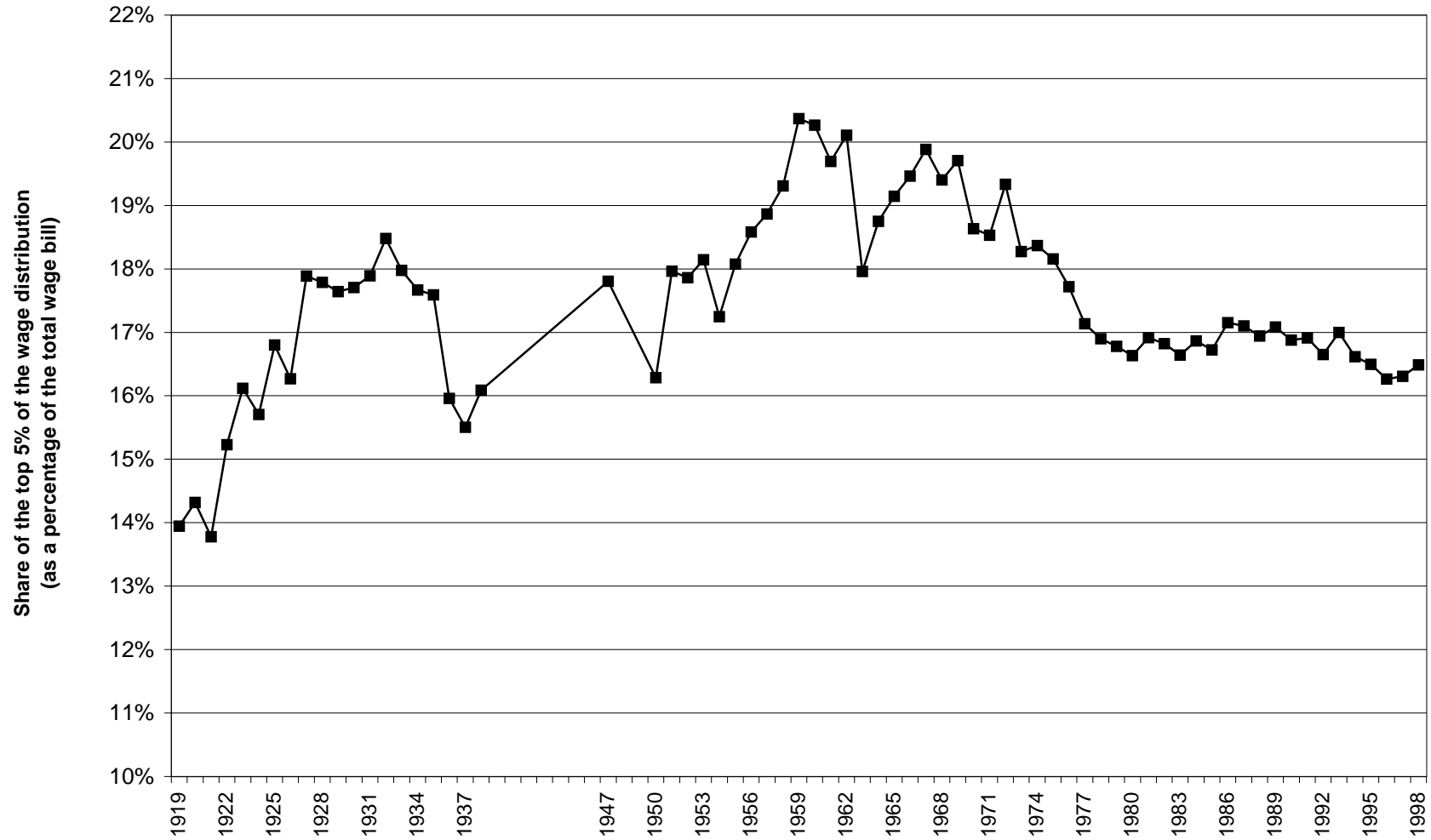
Source: Author's computations based on wage tax returns

**Graph 12 : The top centile wage share in France,
1919-1938, 1947 and 1950-1998**

Share of the top centile of the wage distribution
(as a percentage of the total wage bill)
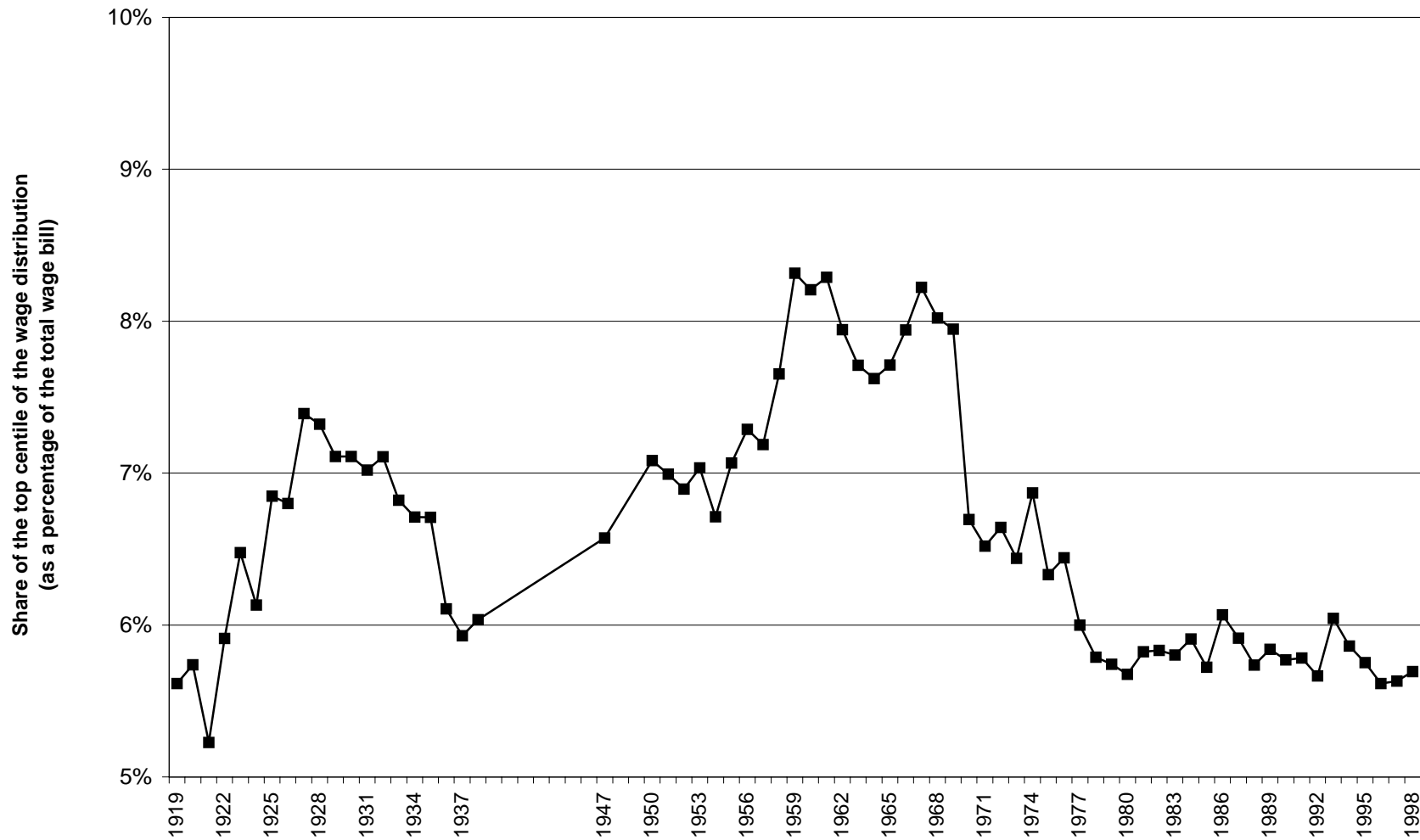
Graph 13 : The ratios between P10, P50 and P90 and the average wage in France, 1950-1998

Legend:
- P10/(average wage)
- P50/(average wage)
- P90/(average wage)

Y-axis: Ratios between the percentiles P10, P50 and P90 of the wage distribution and the average wage
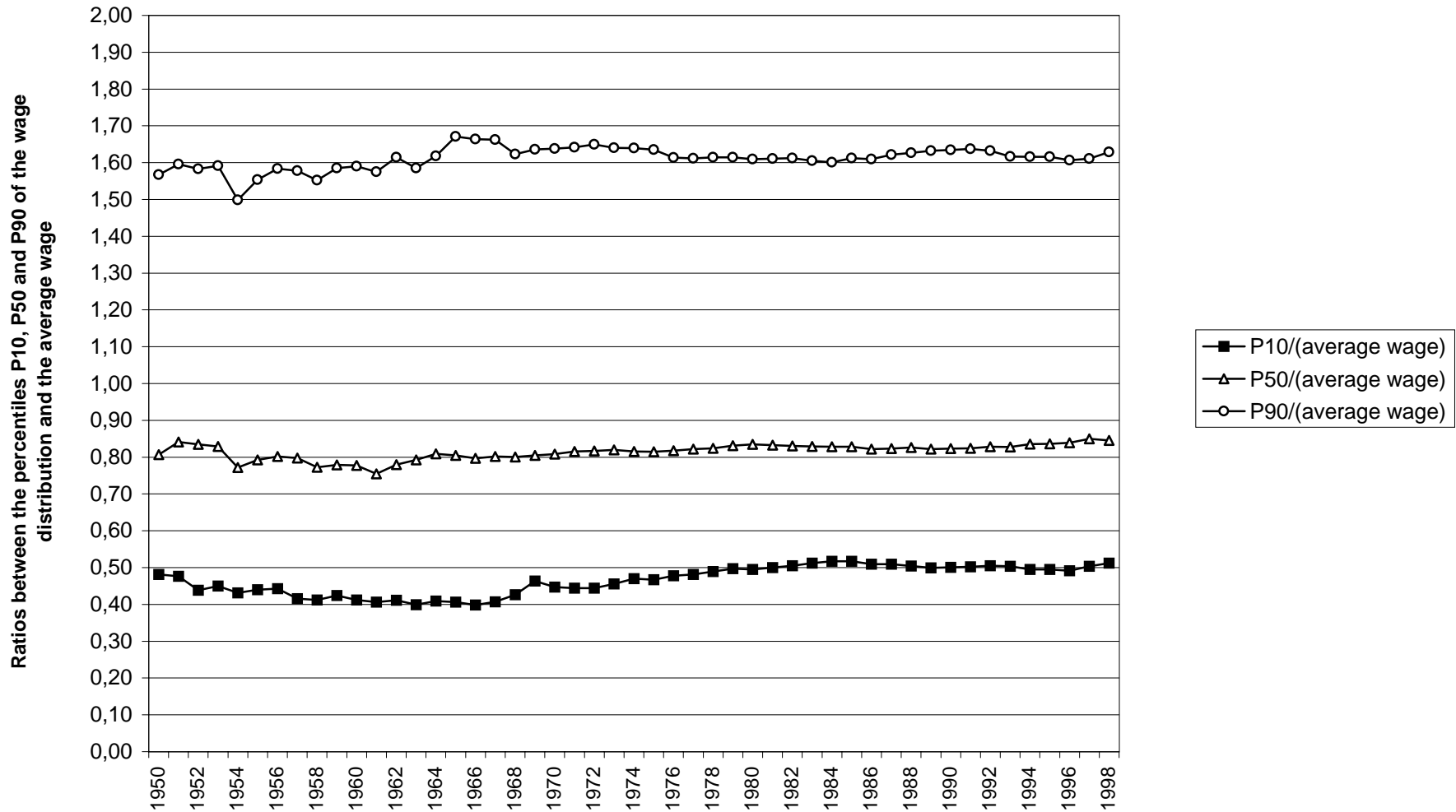
Source: Author's computations based on wage tax returns

Graph 14 : The P90/P10 ratio of the wage distribution in France, 1950-1998

Source: Author's computation based on wage tax returns

Graph 15: The average estate left by the fractile P90-95 in France, 1902-1994

Average estate left by the fractile P90-95 of the estate distribution (1998 French francs)
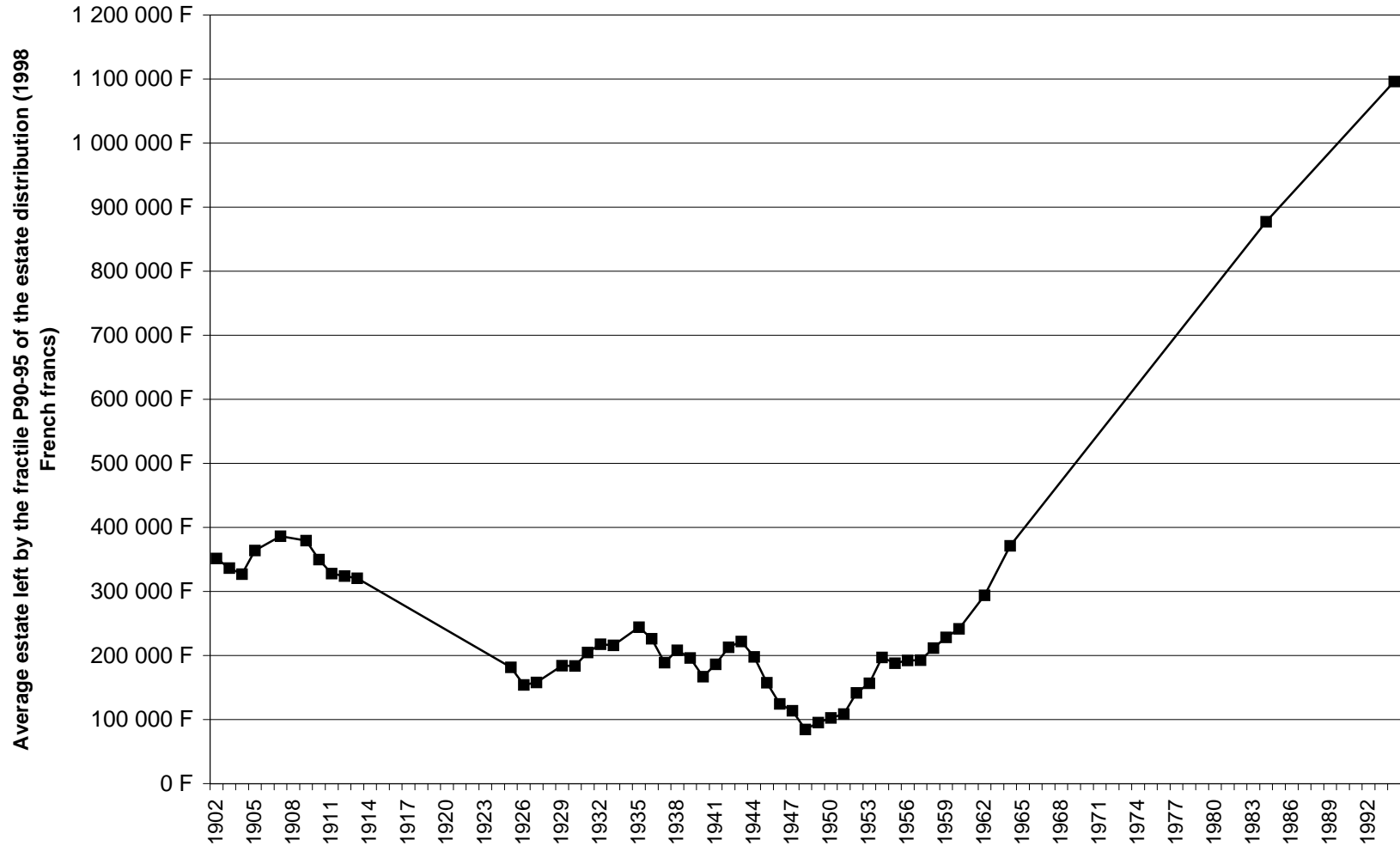
Source: Author's computations based on inheritance tax returns

Graph 16: The average estate left by the fractile P99,99-100 in France, 1902-1994
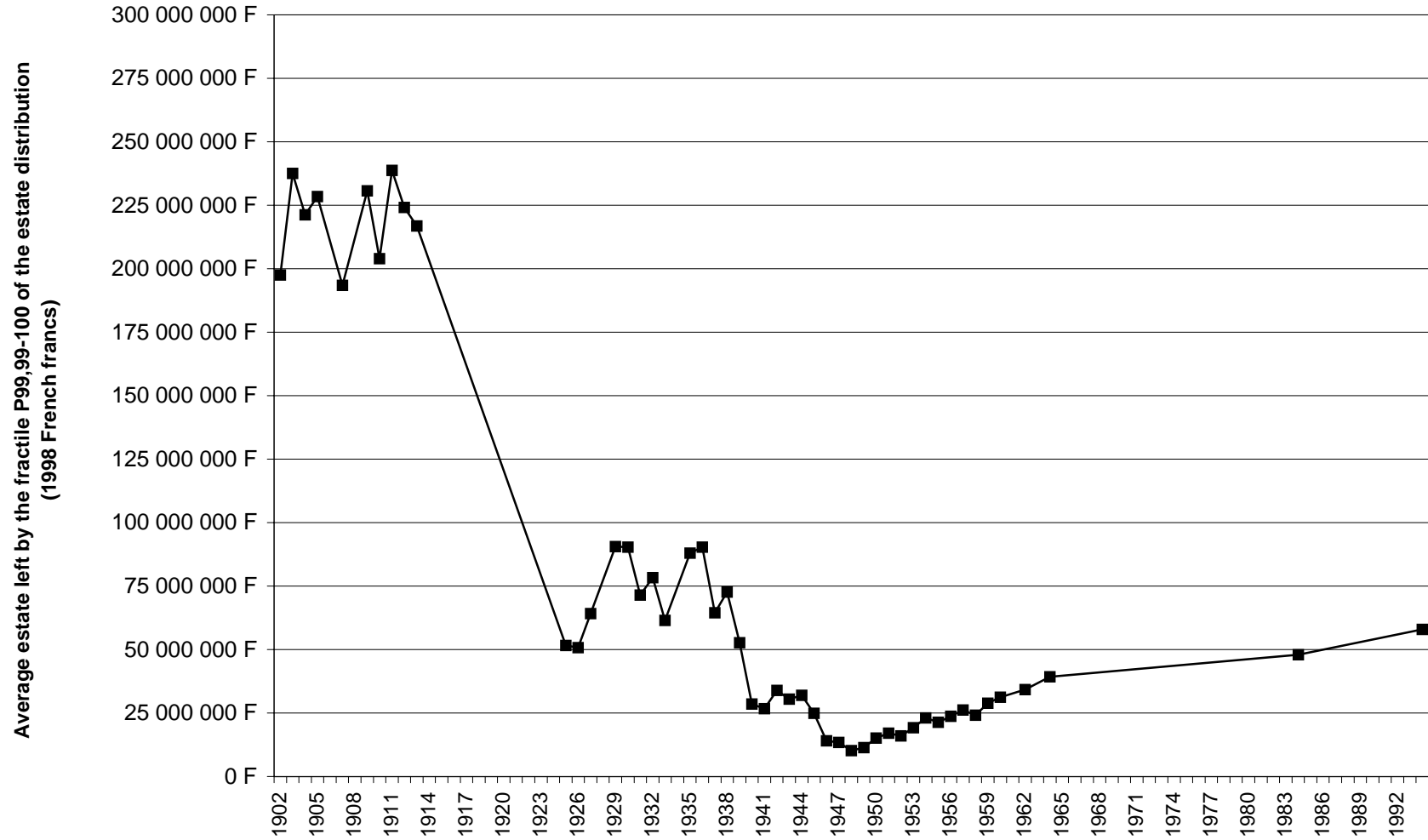
Source: Author's computations based on inheritance tax returns

Graph 17: The ratio between the average estates left by fractiles P99,99-100 and P90-95 in France, 1902-1994
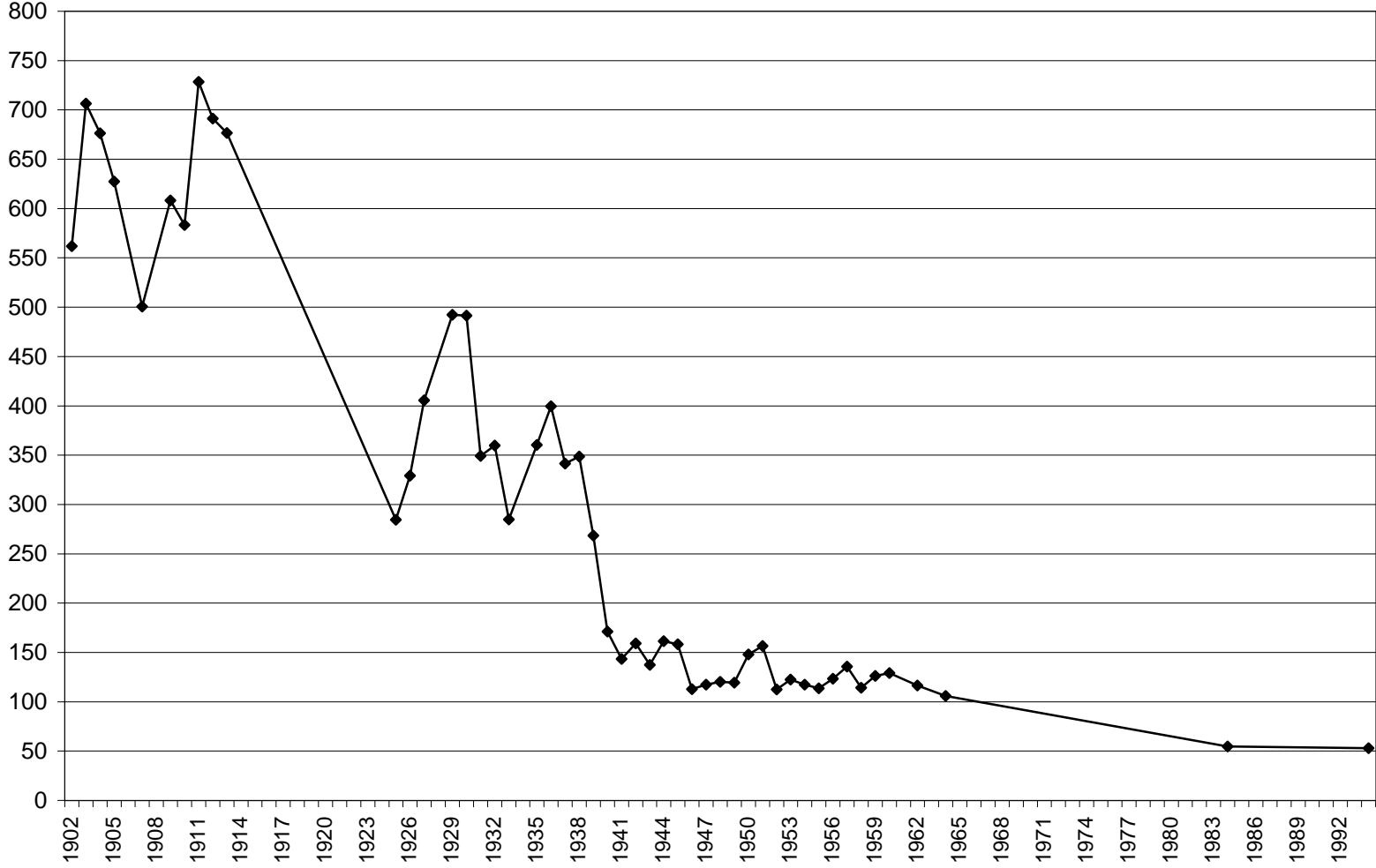
Graph 18: The top marginal income tax rate in France, 1915-1998
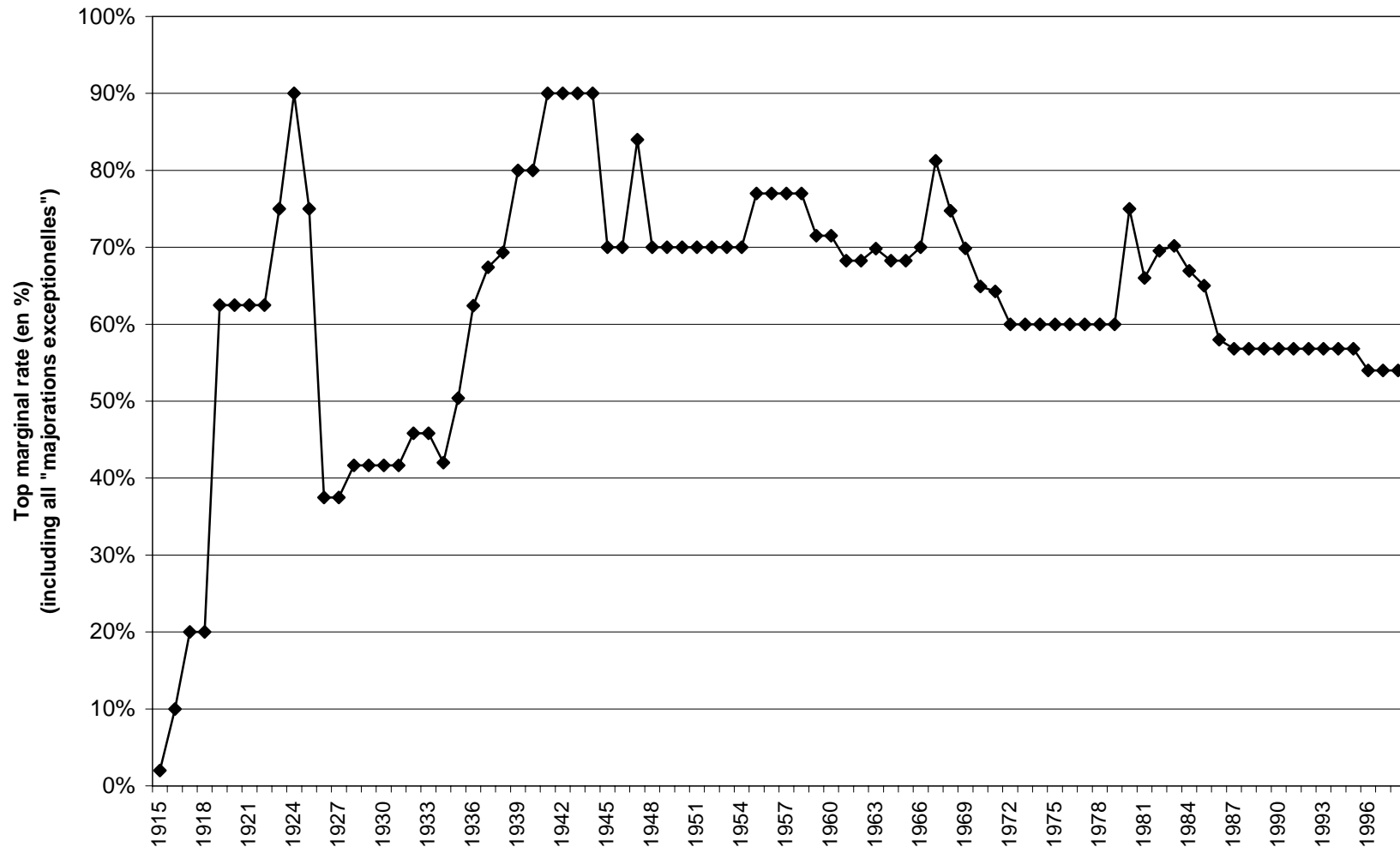
Source: Tax law

Graph 19 : The average income tax rates of fractiles P90-95, P95-99 and P99-100 in France, 1915-1998
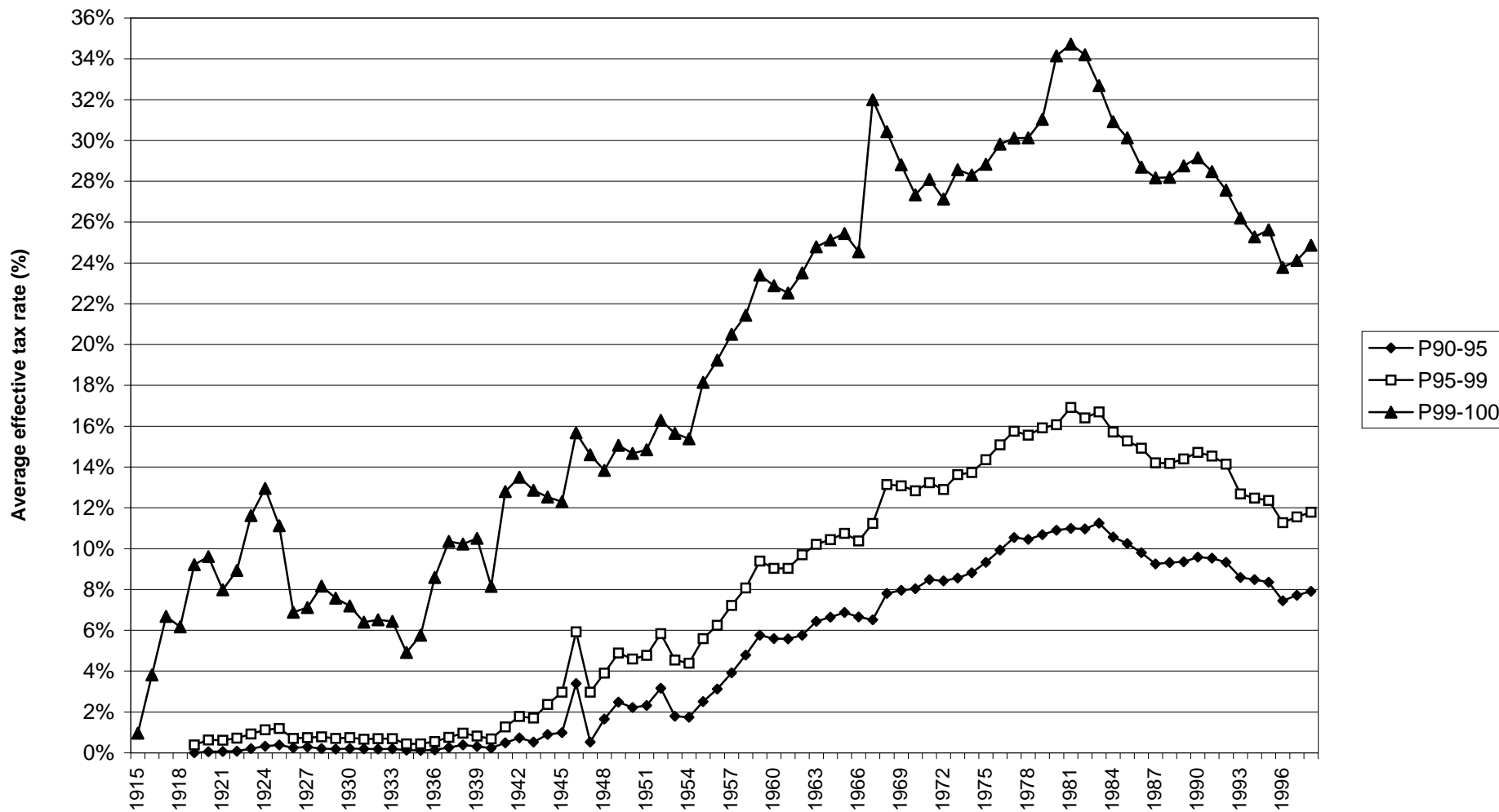
Source: Author's computations based on income tax returns

Graph 20 : The average income tax rates of fractiles P99-99,5, P99,5-99,9, P99,9-99,99 and P99,99-100 in France, 1915-1998
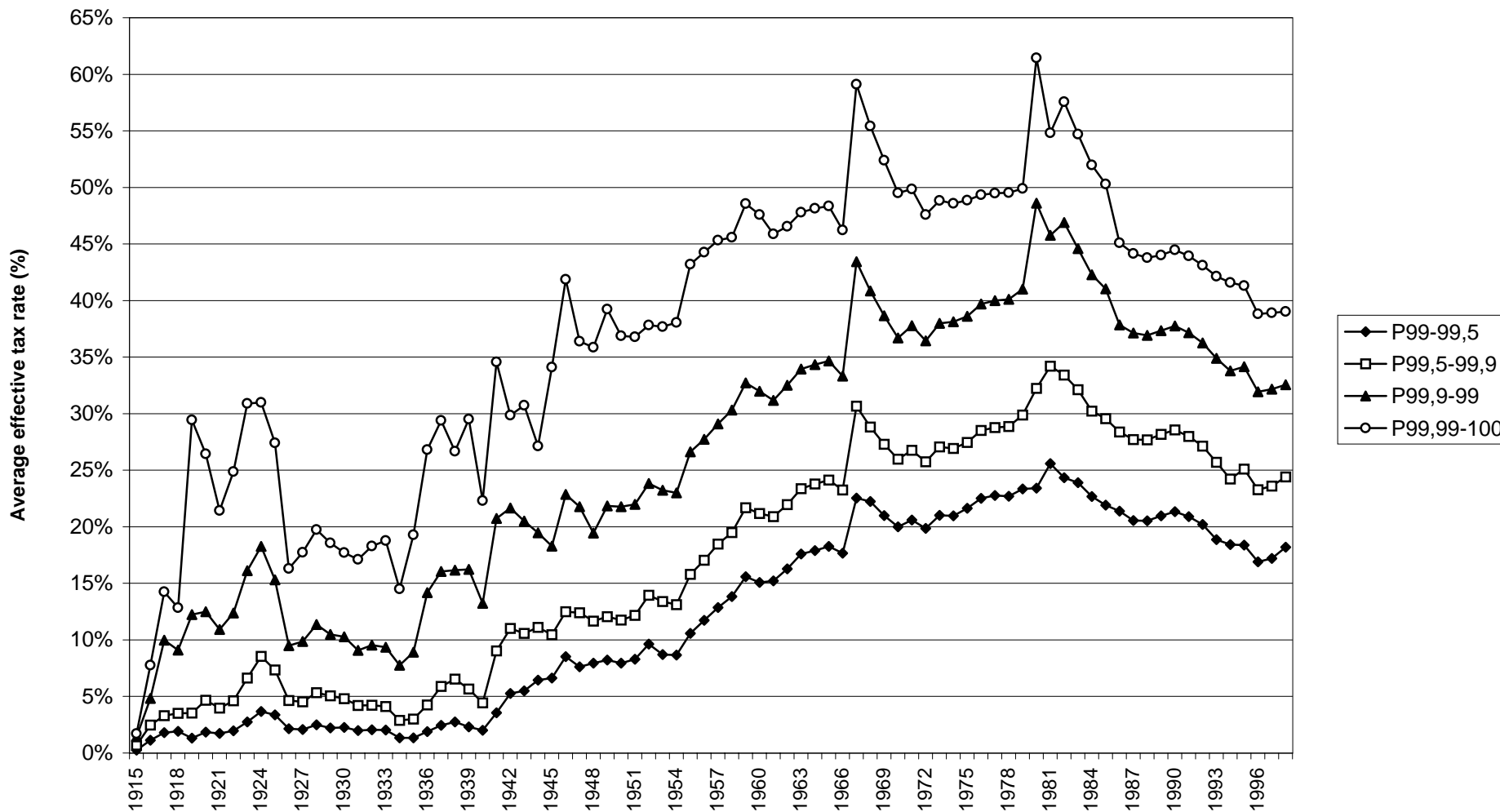
Source: Author's computations based on income tax returns

Graph 21 : The ratio between the average wage of managers ("cadres superieurs") and the average wage of production workers ("ouvriers") in France, 1951-1998

Table 1 : Income growth in France between 1900-1910 and 1990-1998			
Fractiles	Average income 1900-1910 (1998 French francs)	Average income 1990-1998 (1998 French francs)	Ratio (1990-1998)/(1900-1910)
P0-100	28 848	129 481	**4,49**
P90-100	129 815	419 933	**3,23**
P95-100	196 165	544 245	**2,77**
P99-100	548 107	1 008 882	**1,84**
P99,5-100	865 432	1 337 182	**1,55**
P99,9-100	2 307 820	2 594 619	**1,12**
P99,99-100	8 654 324	7 176 416	**0,83**
Fractiles	Average income 1900-1910 (1998 French francs)	Average income 1990-1998 (1998 French francs)	Ratio (1990-1998)/(1900-1910)
P0-90	17 629	97 208	**5,51**
P90-95	63 465	295 621	**4,66**
P95-99	108 179	428 085	**3,96**
P99-99,5	230 782	680 582	**2,95**
P99,5-99,9	504 836	1 022 822	**2,03**
P99,9-99,99	1 602 653	2 085 531	**1,30**
P99,99-100	8 654 324	7 176 416	**0,83**

Table 2 : Income shares in France, 1900-1910 and 1990-1998				
	Income share (%)		Difference	Difference	Share of total decline
Fractiles	1900-1910	1990-1998	(points)	(%)	corresponding to each fractile
P90-100	45,0	32,4	-12,6	**-27,9**	**100,0**
P95-100	34,0	21,0	-13,0	**-38,2**	103,3
P99-100	19,0	7,8	-11,2	**-59,0**	89,2
P99,5-100	15,0	5,2	-9,8	**-65,6**	78,3
P99,9-100	8,0	2,0	-6,0	**-75,0**	47,7
P99,99-100	3,0	0,6	-2,4	**-81,5**	19,5
	Income share (%)		Difference	Difference	Share of total decline
Fractiles	1900-1910	1990-1998	(points)	(%)	corresponding to each fractile
P90-95	11,0	11,4	0,4	**3,8**	-3,3
P95-99	15,0	13,2	-1,8	**-11,8**	14,1
P99-99,5	4,0	2,6	-1,4	**-34,3**	10,9
P99,5-99,9	7,0	3,2	-3,8	**-54,9**	30,6
P99,9-99,99	5,0	1,4	-3,6	**-71,0**	28,3
P99,99-100	3,0	0,6	-2,4	**-81,5**	19,5

	r=5%, t=30%	r=5%, t=50%		r=10%, t=30%	r=10%, t=50%
Table 3 : The impact of progressive taxation on capital accumulation, I					
	r=5%, t=30%	r=5%, t=50%		r=10%, t=30%	r=10%, t=50%
n = 5	8%	13%		17%	28%
n = 10	18%	28%		41%	63%
n = 15	29%	45%		75%	
n = 20	42%	64%			
n = 25	58%	85%			
n = 30	77%				
…					
	n* = 35	n* = 28		n* = 18	n* = 14

Note : This table reads as follows: assume that a capitalist's consumption level is equal to the full return (say, r=5%) to his capital stock, so that his capital stock is stationary in the absence of taxation; if he does not change his consumption level, and if he faces an effective tax rate of t=30% on his income, then 8% of his capital stock will be destroyed after n=5 years, 18% of his capital stock will be destroyed after n=10 years, etc., and he has no capital left after n*=35 years. The corresponding formulas are given by $x_n = t[(1+(1-t)r)n-1]/(1-t)$ and $n^* = \log(1+(1-t)/t)/\log(1+(1-t)r)$.

	r=5%, t=0%	r=5%, t=30%	r=5%, t=50%	r=10%, t=0%	r=10%, t=30%	r=10%, t=50%
c=100%	1,0	0,0	0,0	1,0	0,0	0,0
c=80%	3,1	0,3	0,0	24,3	0,0	0,0
c=60%	5,2	1,7	0,5	47,6	5,1	0,0
c=40%	7,3	3,0	1,5	70,8	13,2	3,1
c=20%	9,4	4,3	2,5	94,1	21,3	7,3
c=0%	11,5	5,6	3,4	117,4	29,5	11,5

Table 4 : The impact of progressive taxation on capital accumulation, II

Note: This table reads as follows: assume that a capitalist's consumption level is equal to a fixed fraction c (say, c=20%) of the full return r (say, r=5%) to his capital stock; in the absence of taxation (t=0%), his capital stock will be multiplied by 9,4 after 50 years; with an effective tax rate t=50%, his capital stock will be multiplied by 2,5 after 50 years (I assume that the capitalist keeps the same absolute consumption level during 50 years). The corresponding formula is given by:

$x_n = c/(1-t) + [1+(1-t)r]^n \times [1-c/(1-t)]$.

Table A1 : Top Income Shares in France, 1900-1910 and 1915-1998 (I)						
	P90-100	P95-100	P99-100	P99,5-100	P99,9-100	P99,99-100
1900-1910	45,00	34,00	19,00	15,00	8,00	3,00
1915			18,31	14,49	7,90	3,03
1916			20,65	16,52	9,39	3,79
1917			20,09	16,05	8,89	3,44
1918			17,95	14,28	7,67	2,87
1919	42,25	33,84	19,50	15,36	8,26	2,81
1920	39,59	31,41	17,95	14,12	7,63	2,86
1921	39,70	31,04	17,32	13,49	7,23	2,65
1922	41,54	32,50	17,87	13,84	7,26	2,51
1923	43,54	34,15	18,91	14,68	7,61	2,61
1924	42,14	32,27	17,96	13,91	7,05	2,39
1925	44,07	33,63	18,16	14,00	7,07	2,38
1926	42,06	32,34	17,82	13,73	6,98	2,41
1927	42,95	32,47	17,45	13,43	6,87	2,35
1928	42,75	32,19	17,27	13,24	6,77	2,33
1929	41,59	30,90	16,15	12,39	6,25	2,16
1930	41,08	30,14	15,31	11,59	5,79	1,93
1931	41,12	29,67	14,63	10,95	5,37	1,77
1932	43,44	31,06	14,80	10,89	5,22	1,67
1933	44,87	31,95	14,95	10,92	5,20	1,69
1934	46,01	32,68	15,28	11,17	5,31	1,71
1935	46,61	33,10	15,40	11,21	5,31	1,74
1936	44,10	31,58	14,74	10,77	5,17	1,74
1937	42,90	30,21	14,46	10,67	5,24	1,83
1938	42,52	29,79	14,27	10,49	5,05	1,75
1939	38,24	27,21	13,30	9,98	4,99	1,73
1940	39,11	27,85	13,35	9,89	4,90	1,65
1941	38,70	27,37	12,88	9,33	4,27	1,30
1942	35,04	24,90	11,53	8,26	3,64	1,06
1943	32,26	22,68	10,13	7,13	3,01	0,84
1944	29,42	20,18	8,37	5,75	2,32	0,61
1945	29,70	19,58	7,54	5,04	1,96	0,51
1946	32,87	22,34	9,22	6,35	2,61	0,72
1947	33,20	23,05	9,22	6,31	2,59	0,68
1948	32,35	21,46	8,75	6,00	2,43	0,63
1949	32,20	21,70	9,01	6,25	2,61	0,70
1950	31,97	21,62	8,98	6,23	2,60	0,70
1951	32,93	22,06	9,00	6,19	2,55	0,68
1952	33,19	22,35	9,16	6,27	2,53	0,65
1953	32,89	22,10	9,00	6,13	2,48	0,65
1954	33,53	22,55	9,14	6,20	2,45	0,64
1955	34,42	23,16	9,33	6,30	2,48	0,65
1956	34,36	23,11	9,37	6,29	2,46	0,65
1957	34,74	23,38	9,37	6,28	2,44	0,64
1958	34,05	22,76	9,01	6,02	2,34	0,60
1959	35,88	24,14	9,46	6,27	2,37	0,60
1960	36,11	24,40	9,71	6,48	2,45	0,62
1961	36,82	24,92	9,88	6,57	2,48	0,64
1962	35,88	24,16	9,46	6,25	2,34	0,58
1963	36,41	24,43	9,43	6,19	2,29	0,56
1964	36,84	24,75	9,56	6,28	2,30	0,56
1965	37,15	24,94	9,58	6,27	2,30	0,56
1966	36,46	24,41	9,36	6,14	2,26	0,57
1967	36,21	24,27	9,36	6,16	2,29	0,59
1968	34,80	23,08	8,77	5,76	2,15	0,56
1969	33,96	22,48	8,55	5,61	2,09	0,55
1970	33,14	21,95	8,33	5,45	2,02	0,53
1971	33,35	22,10	8,47	5,57	2,07	0,53
1972	33,03	21,97	8,52	5,63	2,11	0,55
1973	33,90	22,61	8,87	5,90	2,26	0,62
1974	33,33	22,09	8,50	5,60	2,09	0,53
1975	33,41	22,06	8,48	5,56	2,08	0,54
1976	33,19	21,91	8,44	5,53	2,08	0,54
1977	31,68	20,71	7,79	5,11	1,94	0,51
1978	31,38	20,56	7,80	5,11	1,93	0,50
1979	31,03	20,42	7,82	5,15	1,97	0,52
1980	30,69	20,11	7,63	5,01	1,91	0,50
1981	30,73	20,04	7,55	4,95	1,89	0,50
1982	29,93	19,37	7,07	4,61	1,72	0,44
1983	30,43	19,53	6,99	4,51	1,63	0,40
1984	30,52	19,57	7,03	4,51	1,65	0,41
1985	31,05	19,96	7,20	4,66	1,70	0,43
1986	31,39	20,30	7,44	4,85	1,81	0,46
1987	31,73	20,66	7,75	5,13	1,98	0,53
1988	32,09	20,90	7,92	5,28	2,06	0,57
1989	32,42	21,31	8,21	5,51	2,20	0,62
1990	32,64	21,45	8,23	5,52	2,20	0,62
1991	32,44	21,18	7,97	5,30	2,07	0,57
1992	32,23	20,90	7,75	5,12	1,97	0,54
1993	32,22	20,81	7,65	5,05	1,94	0,53
1994	32,37	20,90	7,71	5,10	1,98	0,55
1995	32,41	20,93	7,70	5,08	1,96	0,54
1996	32,16	20,74	7,57	4,99	1,92	0,53
1997	32,71	21,12	7,76	5,14	2,00	0,56
1998	32,71	21,12	7,76	5,14	2,00	0,56

	P90-95	P95-99	P99-99,5	P99,5-99,9	P99,9-99	P99,99-100
Table A2 : Top Income Shares in France, 1900-1910 and 1915-1998 (II)						
1900-1910	11,00	15,00	4,00	7,00	5,00	3,00
1915			3,82	6,59	4,87	3,03
1916			4,14	7,13	5,60	3,79
1917			4,04	7,16	5,45	3,44
1918			3,68	6,60	4,80	2,87
1919	8,41	14,33	4,15	7,10	5,45	2,81
1920	8,18	13,46	3,83	6,49	4,77	2,86
1921	8,66	13,72	3,83	6,26	4,58	2,65
1922	9,04	14,63	4,03	6,58	4,74	2,51
1923	9,38	15,25	4,22	7,08	4,99	2,61
1924	9,86	14,31	4,05	6,86	4,66	2,39
1925	10,44	15,47	4,16	6,93	4,69	2,38
1926	9,72	14,52	4,09	6,75	4,58	2,41
1927	10,48	15,02	4,02	6,56	4,52	2,35
1928	10,56	14,92	4,03	6,47	4,44	2,33
1929	10,69	14,75	3,77	6,13	4,09	2,16
1930	10,94	14,83	3,72	5,80	3,86	1,93
1931	11,45	15,04	3,69	5,57	3,61	1,77
1932	12,38	16,26	3,90	5,68	3,54	1,67
1933	12,92	17,00	4,02	5,72	3,51	1,69
1934	13,33	17,39	4,12	5,86	3,60	1,71
1935	13,50	17,71	4,19	5,90	3,57	1,74
1936	12,51	16,85	3,97	5,60	3,43	1,74
1937	12,69	15,75	3,79	5,44	3,41	1,83
1938	12,73	15,52	3,78	5,44	3,30	1,75
1939	11,03	13,91	3,32	4,99	3,26	1,73
1940	11,25	14,51	3,45	5,00	3,25	1,65
1941	11,32	14,49	3,55	5,06	2,97	1,30
1942	10,14	13,37	3,27	4,62	2,58	1,06
1943	9,58	12,55	3,00	4,12	2,18	0,84
1944	9,24	11,81	2,62	3,43	1,71	0,61
1945	10,12	12,04	2,50	3,08	1,45	0,51
1946	10,52	13,12	2,88	3,73	1,90	0,72
1947	10,16	13,83	2,91	3,72	1,91	0,68
1948	10,88	12,71	2,76	3,57	1,80	0,63
1949	10,50	12,69	2,76	3,64	1,91	0,70
1950	10,35	12,64	2,76	3,62	1,90	0,70
1951	10,87	13,05	2,82	3,63	1,88	0,68
1952	10,84	13,19	2,89	3,74	1,88	0,65
1953	10,80	13,10	2,86	3,65	1,83	0,65
1954	10,99	13,41	2,94	3,75	1,81	0,64
1955	11,26	13,83	3,02	3,82	1,83	0,65
1956	11,25	13,74	3,08	3,83	1,81	0,65
1957	11,36	14,01	3,09	3,84	1,80	0,64
1958	11,29	13,75	2,99	3,68	1,74	0,60
1959	11,74	14,68	3,19	3,90	1,77	0,60
1960	11,71	14,69	3,23	4,03	1,83	0,62
1961	11,90	15,05	3,31	4,09	1,84	0,64
1962	11,71	14,70	3,21	3,92	1,76	0,58
1963	11,98	15,00	3,24	3,90	1,73	0,56
1964	12,09	15,19	3,28	3,97	1,74	0,56
1965	12,21	15,36	3,31	3,97	1,74	0,56
1966	12,04	15,05	3,22	3,88	1,70	0,57
1967	11,93	14,92	3,20	3,86	1,70	0,59
1968	11,72	14,31	3,02	3,60	1,60	0,56
1969	11,48	13,94	2,94	3,52	1,54	0,55
1970	11,19	13,63	2,87	3,44	1,49	0,53
1971	11,25	13,63	2,90	3,50	1,54	0,53
1972	11,06	13,45	2,89	3,51	1,56	0,55
1973	11,29	13,74	2,98	3,64	1,63	0,62
1974	11,23	13,59	2,90	3,51	1,55	0,53
1975	11,35	13,59	2,92	3,48	1,54	0,54
1976	11,28	13,47	2,91	3,45	1,54	0,54
1977	10,97	12,92	2,68	3,17	1,43	0,51
1978	10,82	12,77	2,69	3,18	1,43	0,50
1979	10,62	12,59	2,67	3,18	1,45	0,52
1980	10,59	12,47	2,62	3,11	1,41	0,50
1981	10,69	12,49	2,61	3,06	1,39	0,50
1982	10,56	12,30	2,46	2,89	1,28	0,44
1983	10,91	12,53	2,49	2,88	1,23	0,40
1984	10,95	12,54	2,51	2,87	1,24	0,41
1985	11,09	12,76	2,54	2,95	1,28	0,43
1986	11,10	12,86	2,59	3,04	1,34	0,46
1987	11,07	12,91	2,62	3,15	1,44	0,53
1988	11,19	12,98	2,64	3,21	1,49	0,57
1989	11,11	13,10	2,70	3,31	1,57	0,62
1990	11,19	13,22	2,71	3,32	1,57	0,62
1991	11,26	13,20	2,67	3,23	1,50	0,57
1992	11,33	13,15	2,63	3,15	1,43	0,54
1993	11,40	13,16	2,60	3,11	1,41	0,53
1994	11,47	13,19	2,60	3,13	1,43	0,55
1995	11,48	13,23	2,61	3,13	1,42	0,54
1996	11,42	13,16	2,58	3,08	1,39	0,53
1997	11,60	13,35	2,62	3,15	1,44	0,56
1998	11,60	13,35	2,62	3,15	1,44	0,56