

# **Economics of Inequality**

*(Master PPD & APE, Paris School of Economics)*

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## **Lecture 5: The structure of inequality: labor income**

(Tuesday January 7<sup>th</sup> 2014)

*(check [on line](#) for updated versions)*

# Basic orders of magnitude about inequality

- Inequality of labor income is always much less than inequality of capital ownership
- Top 10% share: 20-30% for labor income, 50-90% for wealth
- Bottom 50% share: 20-30% for labor inc.; 5-10% for wealth
- Gini coefficients: 0,2-0,4 for labor income; 0,6-0,8 for wealth
- Gini coefficient = synthetic index going from 0 (perfect equality) to 1 (complete inequality)
- Pb: Gini coeff is so synthetic (it aggregates info from top decile shares, bottom decile shares, middle decile shares) that it is sometime difficult to understand where it comes from and to pinpoint data inconsistencies
  - it is better to use data on decile and percentile shares

**Table 7.1. Inequality of labor income across time and space**

Share of different groups in total labor income	<b>Low inequality</b> (≈ Scandinavia, 1970s-80s)	<b>Medium inequality</b> (≈ Europe 2010)	<b>High inequality</b> (≈ U.S. 2010)	<b>Very high inequality</b> (≈ U.S. 2030 ?)
<b>The top 10% "Upper class"</b>	20%	25%	35%	45%
<i>including: the top 1% ("dominant class")</i>	5%	7%	12%	17%
<i>including: the next 9% ("well-to-do class")</i>	15%	18%	23%	28%
<b>The middle 40% "Middle class"</b>	45%	45%	40%	35%
<b>The bottom 50% "Lower class"</b>	35%	30%	25%	20%
Corresponding Gini coefficient (synthetic inequality index)	0,19	0,26	0,36	0,46

In societies where labor income inequality is relatively low (such as in Scandinavian countries in the 1970s-1980s), the top 10% most well paid receive about 20% of total labor income, the bottom 50% least well paid about 35%, the middle 40% about 45%. The corresponding Gini Index (a synthetic inequality index going from 0 to 1) is equal to 0,19. See technical appendix.

**Table 7.2. Inequality of capital ownership across time and space**

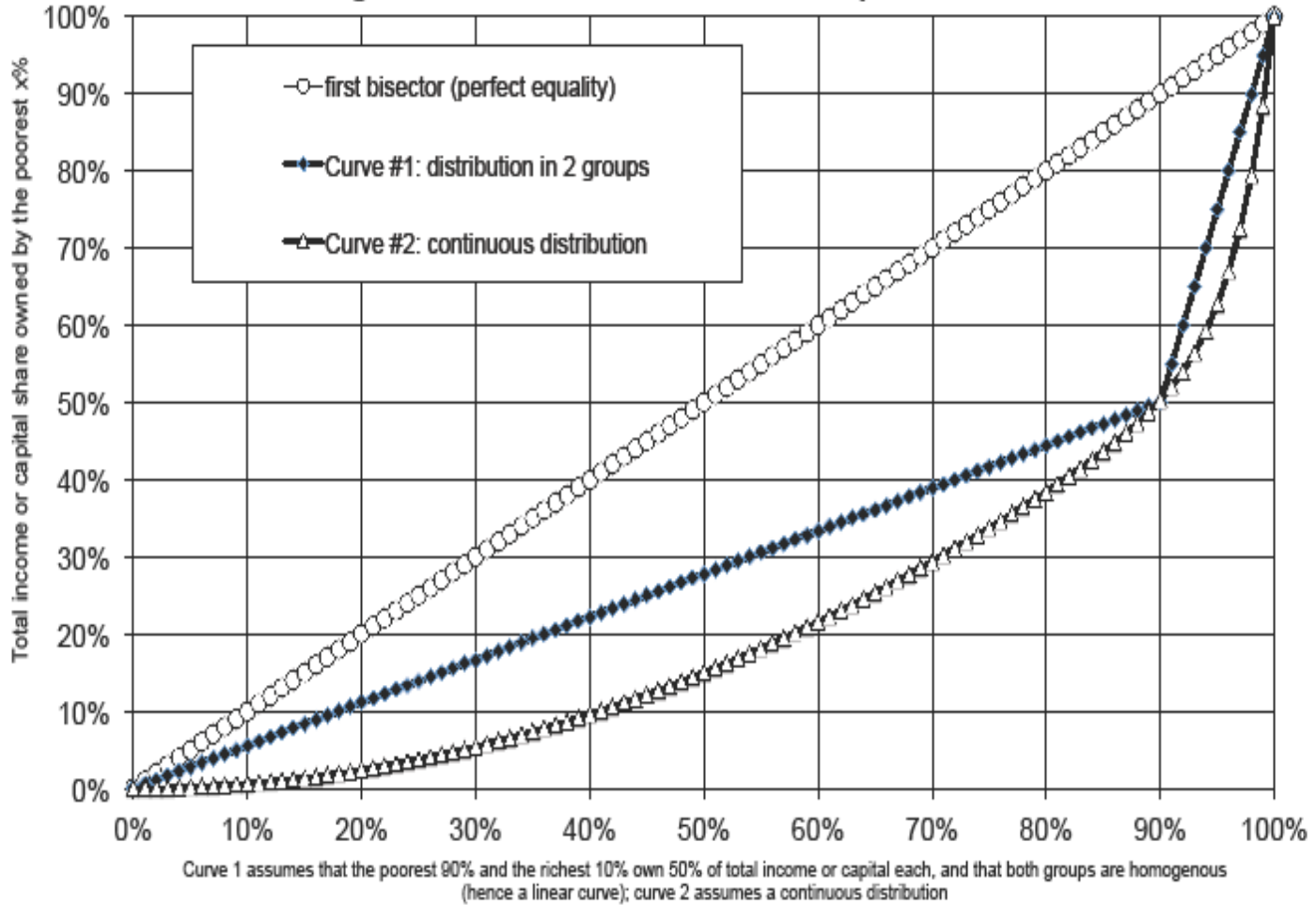
Share of different groups in total capital	Low inequality (never observed; ideal society?)	Medium inequality (≈ Scandinavia, 1970s-1980s)	Medium-high inequality (≈ Europe 2010)	High inequality (≈ U.S. 2010)	Very high inequality (≈ Europe 1910)
<b>The top 10% "Upper class"</b>	30%	50%	60%	70%	90%
<i>including: the top 1% ("dominant class")</i>	10%	20%	25%	35%	50%
<i>including: the next 9% ("well-to-do class")</i>	20%	30%	35%	35%	40%
<b>The middle 40% "Middle class"</b>	45%	40%	35%	25%	5%
<b>The bottom 50% "Lower class"</b>	25%	10%	5%	5%	5%
Corresponding Gini coefficient (synthetic inequality index)	0,33	0,58	0,67	0,73	0,85

In societies with "medium" inequality of capital ownership (such as Scandinavian countries in the 1970s-1980s), the top 10% richest in wealth own about 50% of aggregate wealth, the bottom 50% poorest about 10%, and the middle 40% own 40%. The corresponding Gini coefficient is equal to 0,58. See technical appendix.



- Reminder about Gini coefficients
- $G = 2 \times$  area between first diagonal and Lorenz curve (see graph)
- Exemple with finite number of income or wealth groups (in practice, distributions are better approximated as continuous distributions):
- $p_1, \dots, p_n =$  percentiles
- $s_0, s_1, \dots, s_n =$  corresponding shares in total income or wealth
- I.e.  $s_0 =$  share owned by individuals below percentile  $p_1$ ,  $s_1 =$  share owned by individuals between percentiles  $p_1$  and  $p_2$ , ...,  $s_n =$  share owned by individuals above percentile  $p_n$ .
- By definition,  $\sum_{0 \leq i \leq n} s_i = 1$ .
- *Exemple 1.* Assume  $n=1$ ,  $p_1=0,9$ ,  $s_0=0,5$ ,  $s_1=0,5$ . I.e. the bottom 90% and the top 10% both own 50% of total income (or wealth), and both groups are supposed to be homogenous.
- *Exemple 2.* Assume  $n=2$ ,  $p_1=0,5$ ,  $p_2=0,9$ ,  $s_0=0,2$ ,  $s_1=0,3$ ,  $s_2=0,5$ . I.e. the bottom 50% owns 20% of total, the next 40% own 30%, and the top 10% own 50%.

Figure S7.1. Gini-Lorenz curves examples



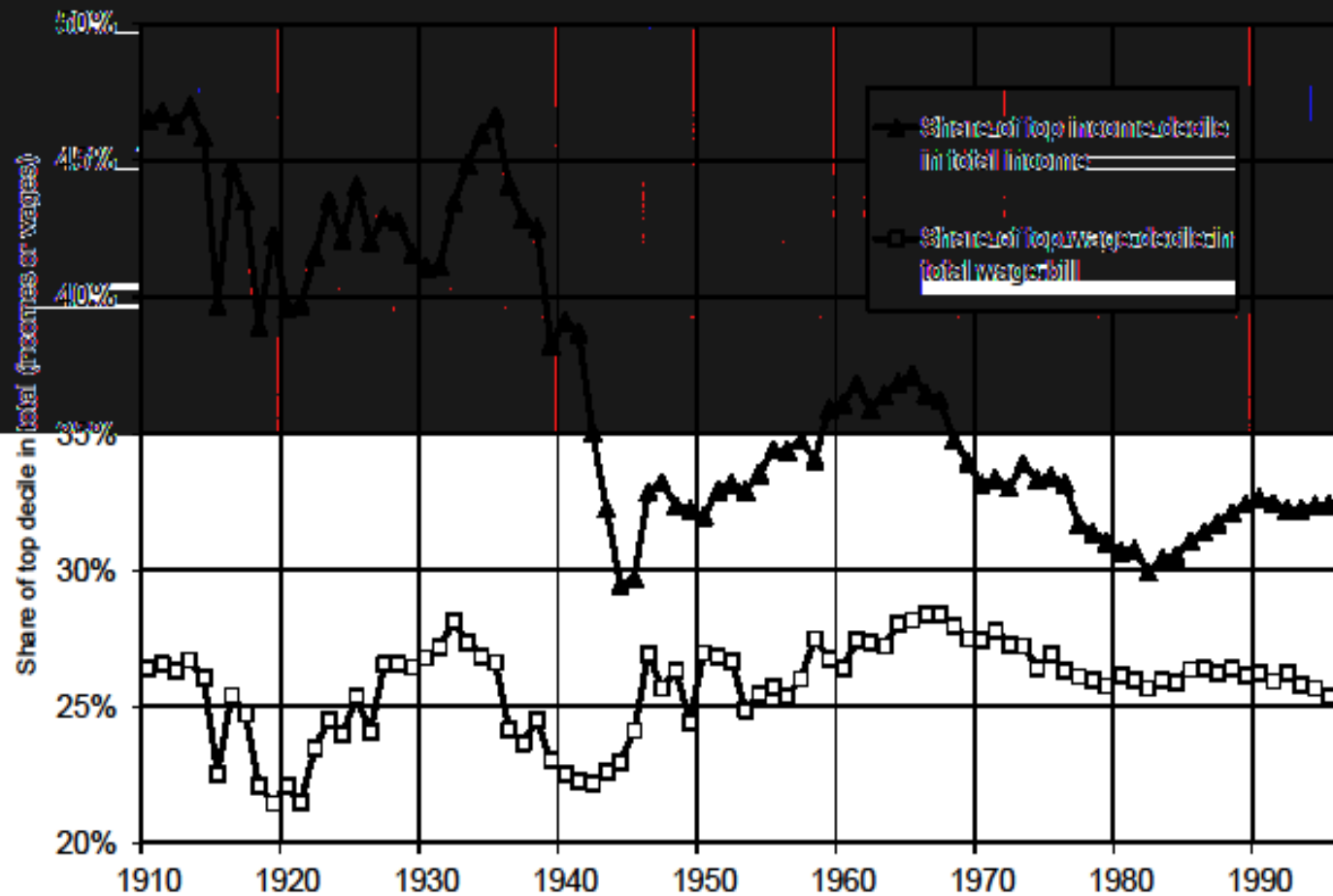
- With two groups, one can show that  $G = s_1 + p_1 - 1$   
(simple triangle area computation)
- I.e. if the top 10% owns 20% of the total, then  $G=0,2+0,9-1=0,1$ .
- If the top 10% owns 50% of the total, then  $G=0,5+0,9-1=0,4$ .
- If the top 10% owns 90% of the total, then  $G=0,9+0,9-1=0,8$ .
- If  $s_1 = 1 - p_1$  (the top group owns exactly as much as its share in population), then by definition we have complete equality:  $G = 0$ .
- If  $p_1 \rightarrow 1$  and  $s_1 \rightarrow 1$  (the top group is infinitely small and owns almost everything), then  $G \rightarrow 1$ .
- With  $n+1$  groups, one can show that:  $G = 1 - p_1 s_0 - [ \sum_{1 \leq i \leq n-1} (p_{i+1} - p_i)(2s_0 + 2s_1 + \dots + 2s_{i-1} + s_i) ] - (1-p_n)(1+s_0+\dots+s_{n-1})$
- With imperfect survey data at the top, one can also use the following formula:  $G = G^* (1-S) + S$  with  $S$  = share owned by very top group and  $G^*$  = Gini coefficient for the rest of the population
- See [F. Alvareto, A note on the relationship between top income shares and Gini coefficients, Economics letters 2011](#)



# Basic facts about the historical evolution of inequality

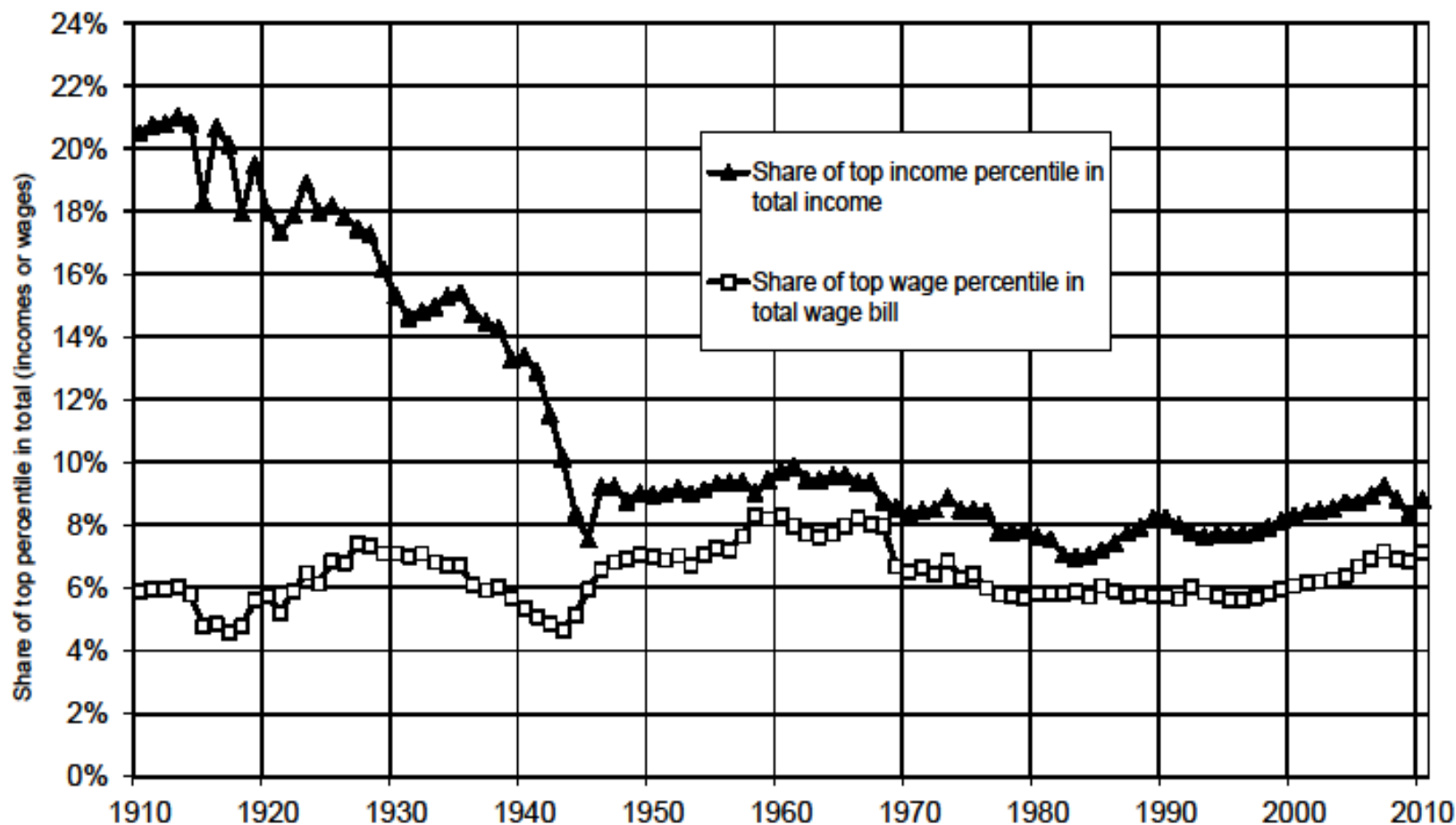
- France (& Europe, Japan): inequality of labor income has been relatively flat in the long-run; 20<sup>c</sup> decline in total inequality comes mostly from compression of inequality in capital ownership
- US: inequality in capital ownership has never been as large as in 19<sup>c</sup> Europe (see next lecture); but inequality of labor income has grown to unprecedented levels in recent decades; **why?**

Figure 8.1. Income inequality in France, 1910-2010



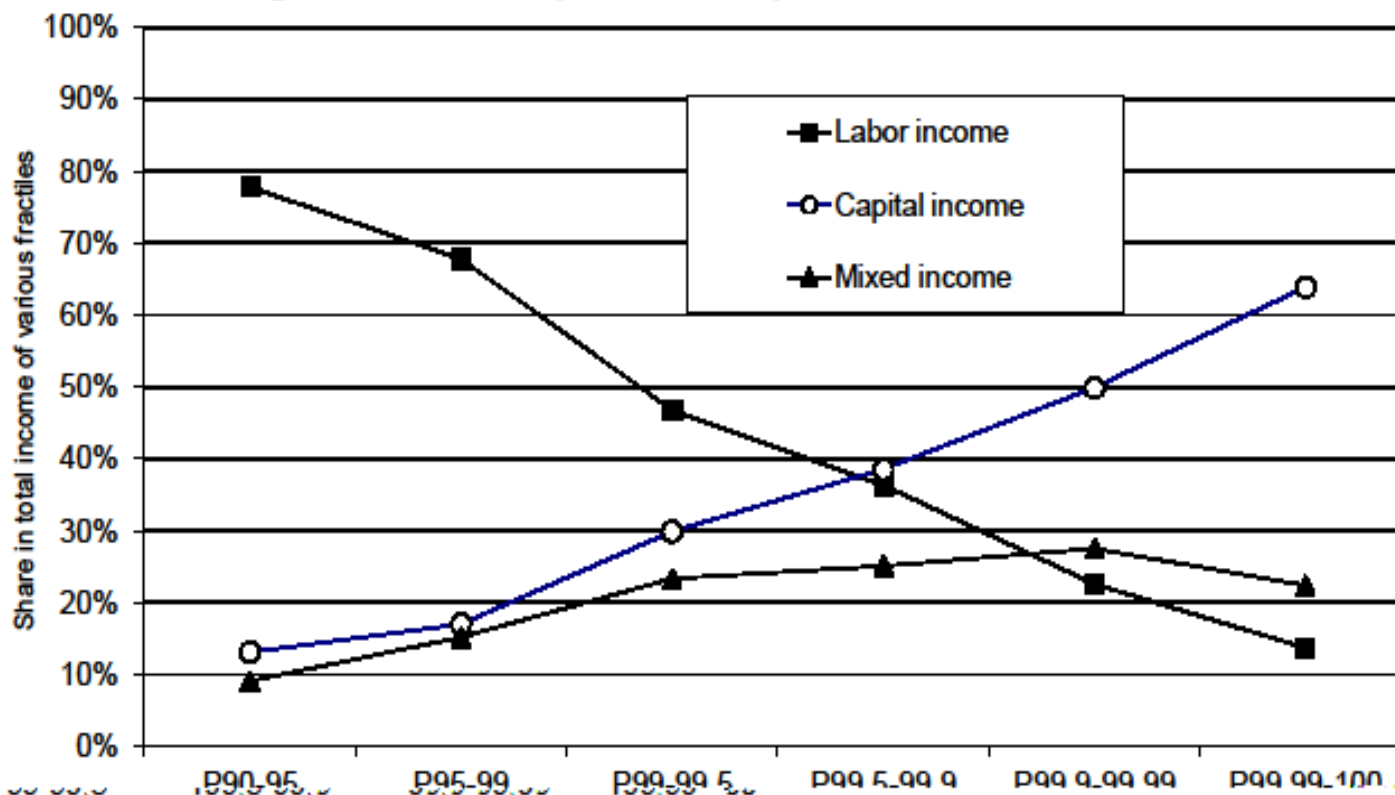
Inequality of total income (labor and capital) has dropped in France during the 20th century, while wage inequality has remained the same. Sources and series: see [niketty\\_nse\\_enf\\_fr/capital21c](#)

Figure 8.2. The fall of rentiers in France, 1910-2010



The fall in the top percentile share (the top 1% highest incomes) in France between 1914 and 1945 is due to the fall of top capital incomes. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

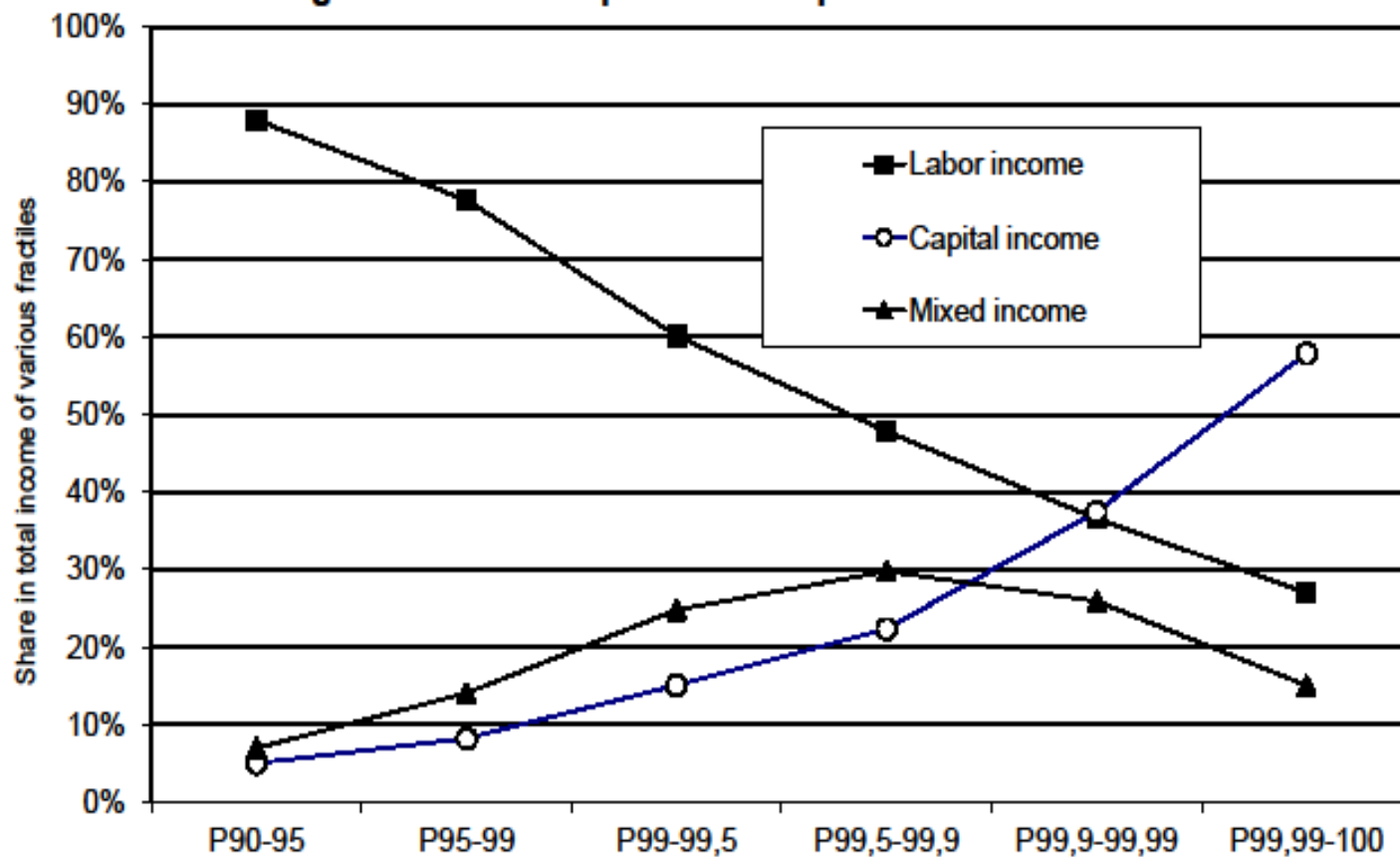
**Figure 8.3. The composition of top incomes in France in 1932**



important as one goes up within the top decile of total income. Notes: (i) "P90-95" includes individuals between the next 4%, "P99-99.5" the next 0.5%, etc. (ii) Labor income: wages, bonuses, pensions. Capital income: self-employment income. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

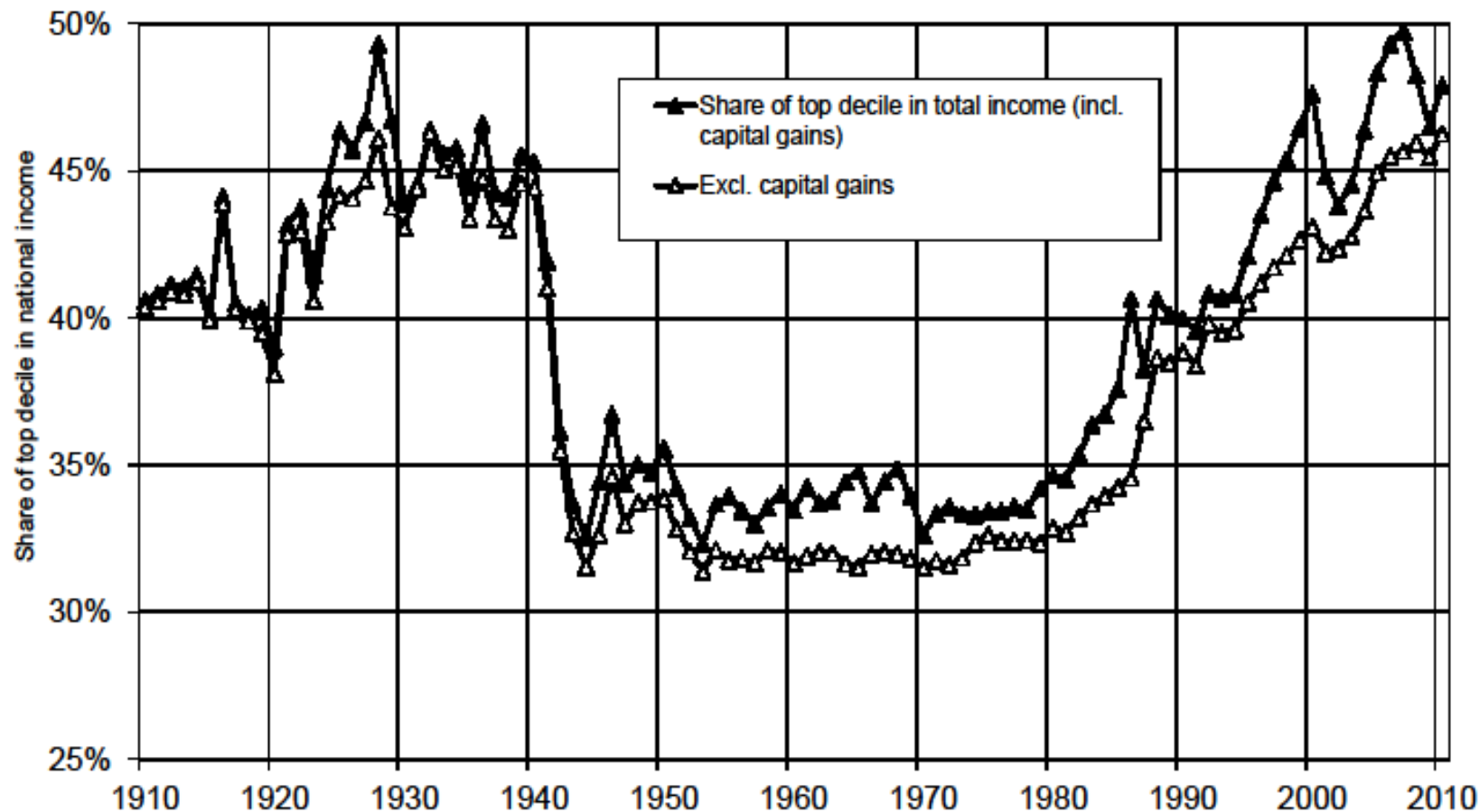
Labor income becomes less and less important as one goes up within the top decile of total income. Notes: (i) "P90-95" includes individuals between percentiles 90 to 95, "P95-99" includes the next 4%, "P99-99.5" the next 0.5%, etc. (ii) Labor income: wages, bonuses, pensions. Capital income: dividends, interest, rent. Mixed income: self-employment income. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

**Figure 8.4. The composition of top incomes in France in 2005**



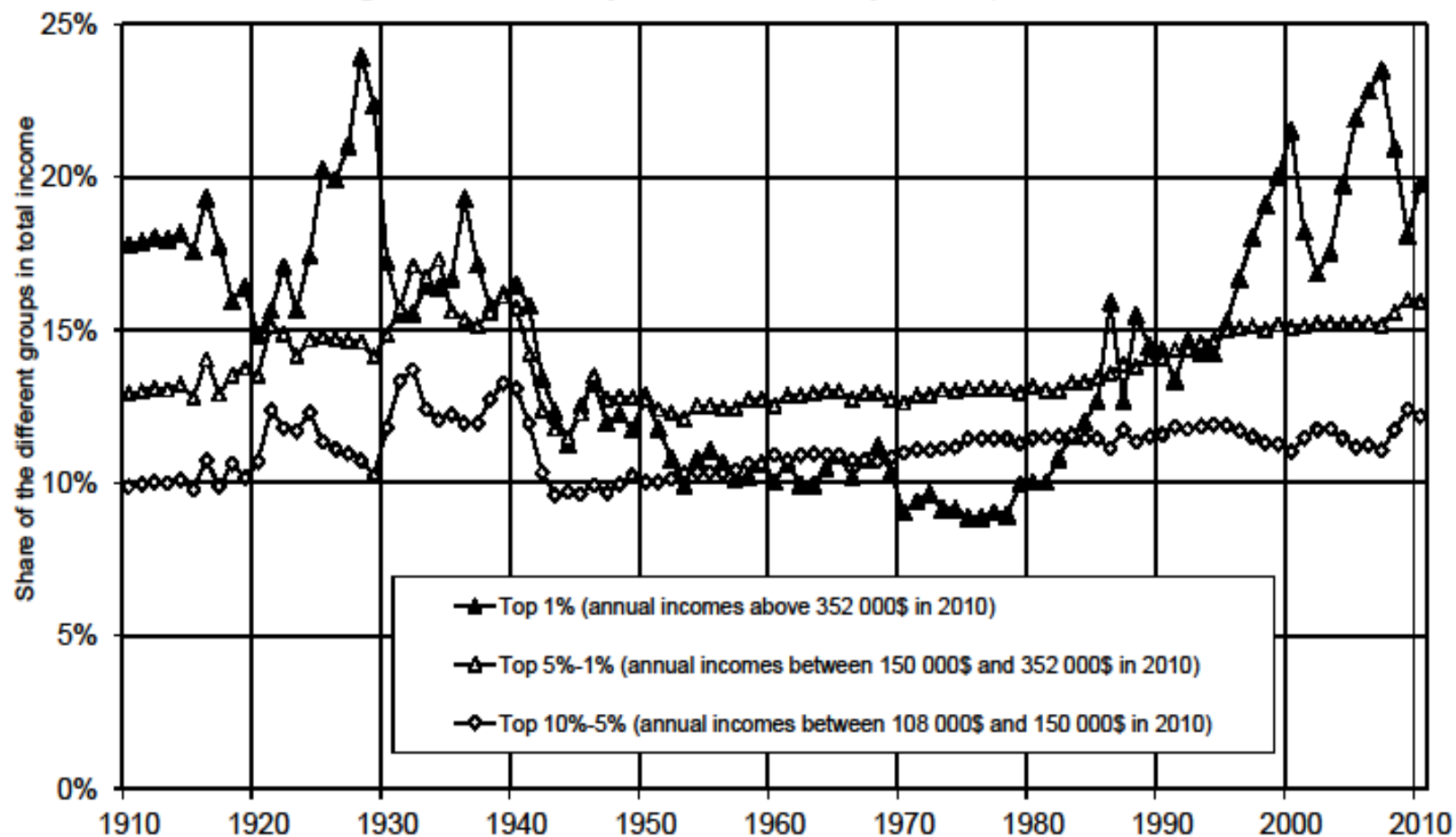
Capital income becomes dominant at the level of the top 0,1% in France in 2005, as opposed to the top 0,5% in 1932. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

Figure 8.5. Income inequality in the United States, 1910-2010



The top decile income share rose from less than 35% of total income in the 1970s to almost 50% in the 2000s-2010s. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

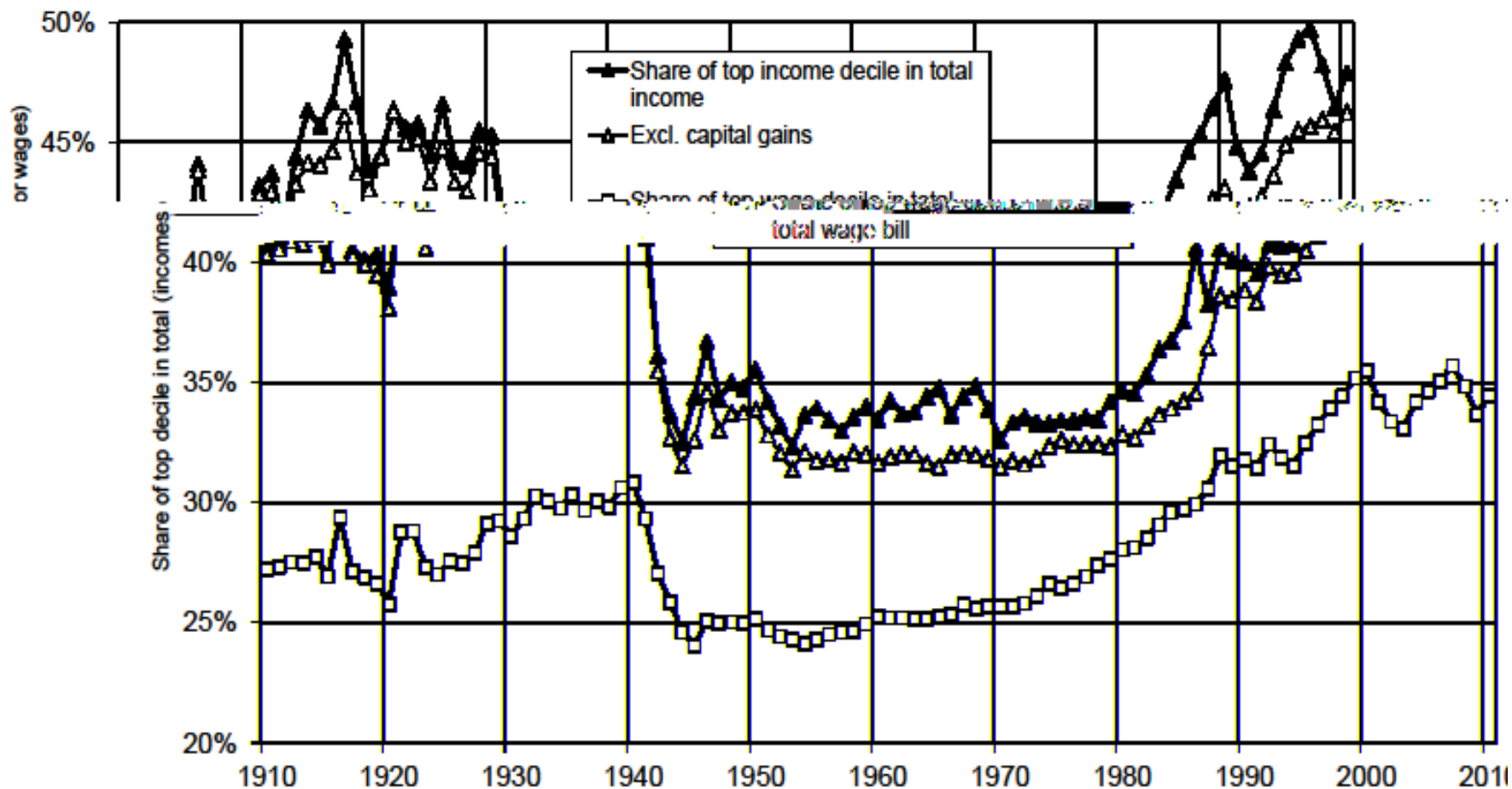
Figure 8.6. Decomposition of the top decile, U.S. 1910-2010



The rise of the top decile income share since the 1970s is mostly due to the top percentile.

Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

**Figure 8.7. High incomes and high wages in the U.S. 1910-2010**

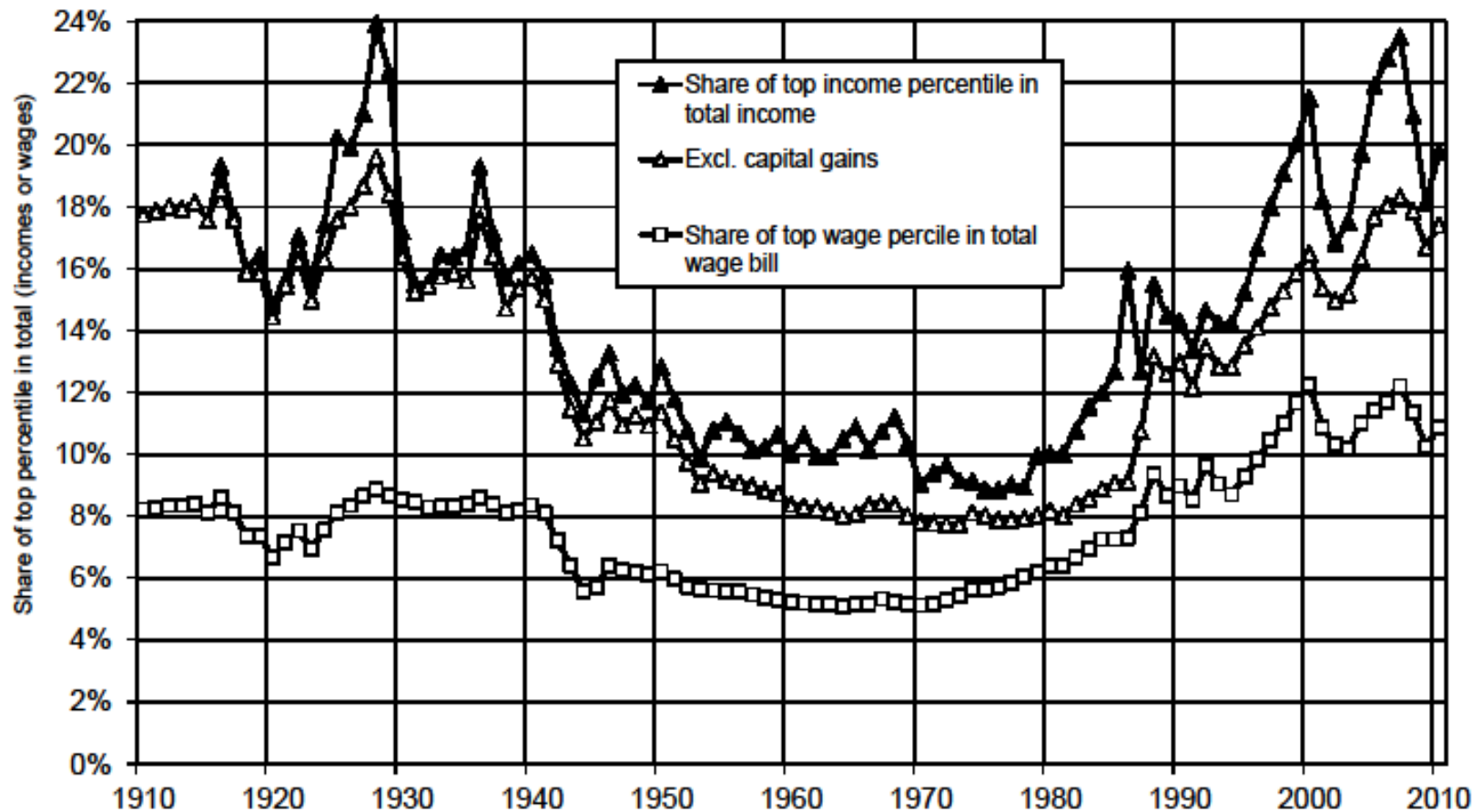


The rise of income inequality since the 1970s is largely due to the rise of wage inequality.

Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).



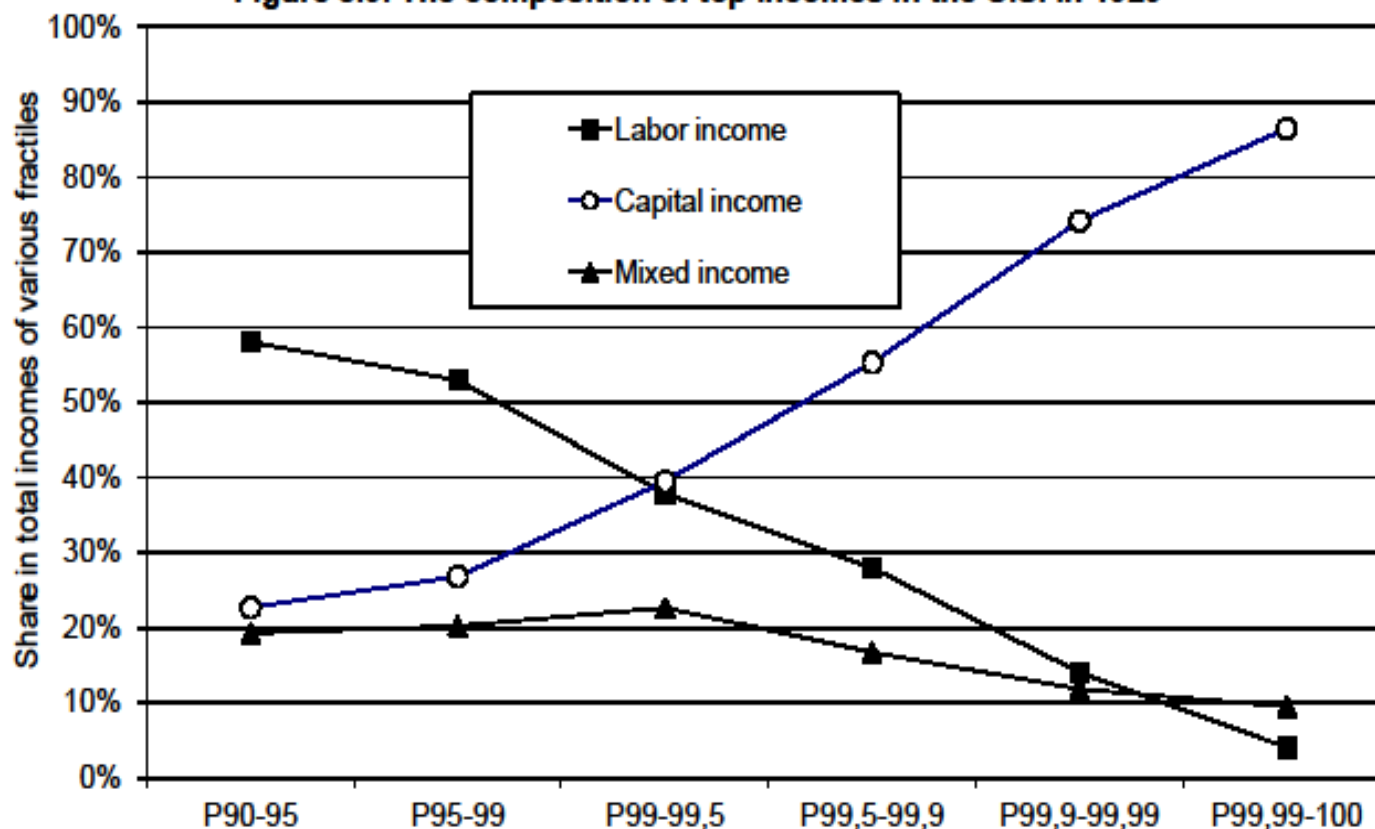
**Figure 8.8. The transformation of the top 1% in the United States**



The rise in the top 1% highest incomes since the 1970s is largely due to the rise in the top 1% highest wages.

Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

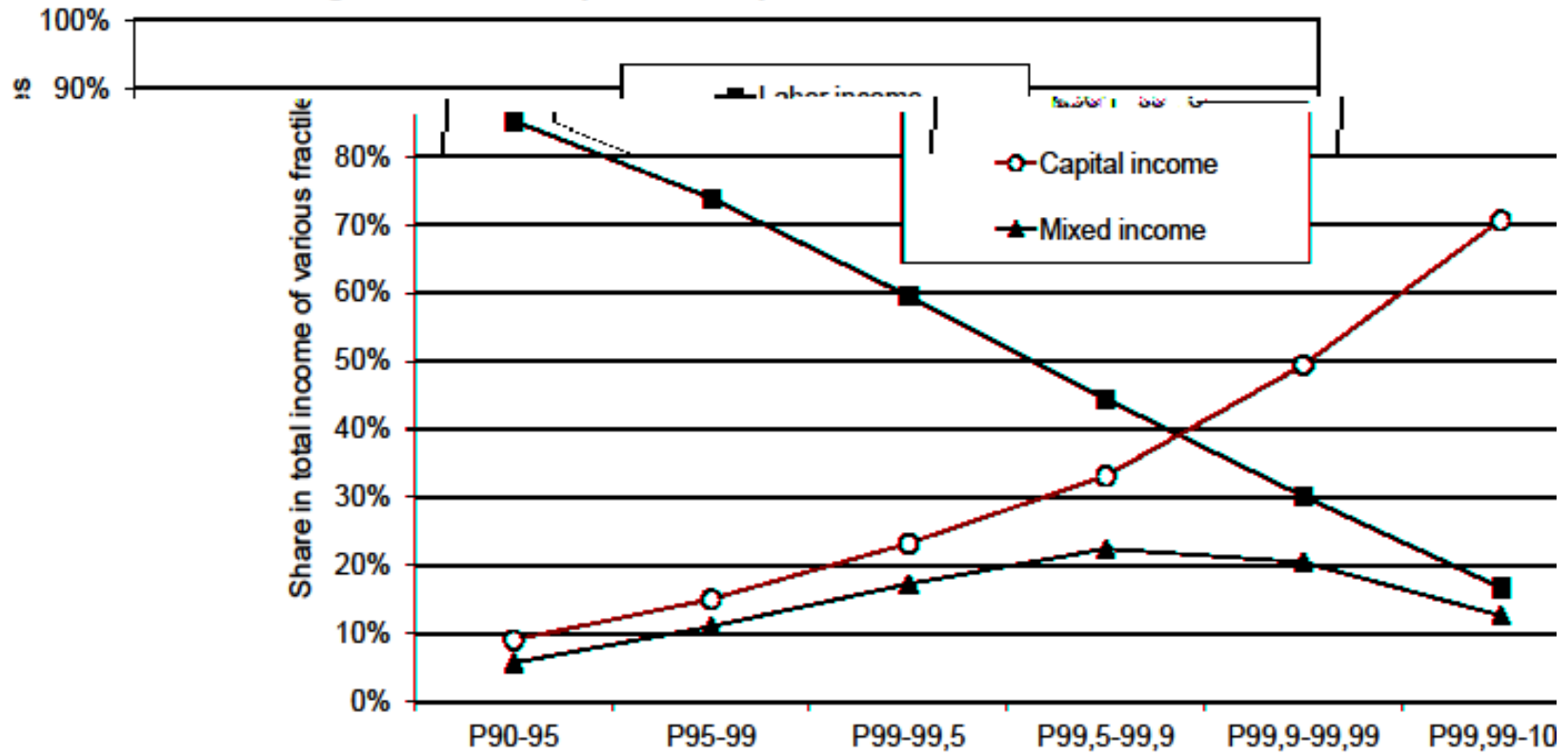
**Figure 8.9. The composition of top incomes in the U.S. in 1929**



Labor income becomes less and less important as one moves up within the top income decile.

Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c)

Figure 8.10. The composition of top incomes in the U.S., 2007



Capital income becomes dominant at the level of top 0,1% in 2007, as opposed to the top 1% in 1929. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

# The determinants of labor income inequality

- The main story: the race between education (skill supply) and technology (skill demand)
- Assume  $Y = F(L_s, L_u)$  (or  $Y = F(K, L_s, L_u)$ )  
with  $L_s$  = high-skill labor,  $L_u$  = low-skill labor
- Assume technical change is skill-biased, i.e. high skills are more and more useful over time, so that the demand for high-skill labor  $L_s \uparrow$  over time  
(say,  $F(L_s, L_u) = L_s^\alpha L_u^{1-\alpha}$ , with  $\alpha \uparrow$  over time)
- If the skill supply  $L_s$  is fixed, then the relative wage of high-skill labor  $w_s/w_u$  (skill premium) will  $\uparrow$  over time
- The only way to counteract rising wage inequality is the rise of skill supply  $L_s$  through increased education investment: the race between education and technology

- See [Goldin-Katz 2010](#), « The Race Between Education and Technology: The Evolution of US Education Wage Differentials, 1890-2005 »
  - They compare for each decade the growth rate of skills (college educated workers) and the change in skill premium, and they find a systematic negative correlation
  - Starting in the 1980s-90s, the growth rate of skills has been reduced (still  $>0$ , but less than in previous decades), thereby leading to rising skill premium and rising wage inequality
- the right way to reduce US wage inequality is massive investment in skills and increased access to higher education (big debate on university tuitions in the US)

- Other implication of the « race btw education and technology » story: in France, wage inequality has remained stable in the long run because the all skill levels have increased roughly at the same rate as that required by technical change; the right policy to reduce inequality is again education; see works by Maurin, Grenet etc.
- According to this theory, the explanation for higher wage inequality in the US is higher skill inequality; is that right?
- According to recent PISA report, inequality in educational achievement among 15-yr-old (math tests) is as large in France as in the US...
- But it is possible that inequality in access to higher education is even larger in the US than in France: average parental income of Harvard students = top 2% of US distribution; average parental income of Sciences Po students = top 10% of French distribution

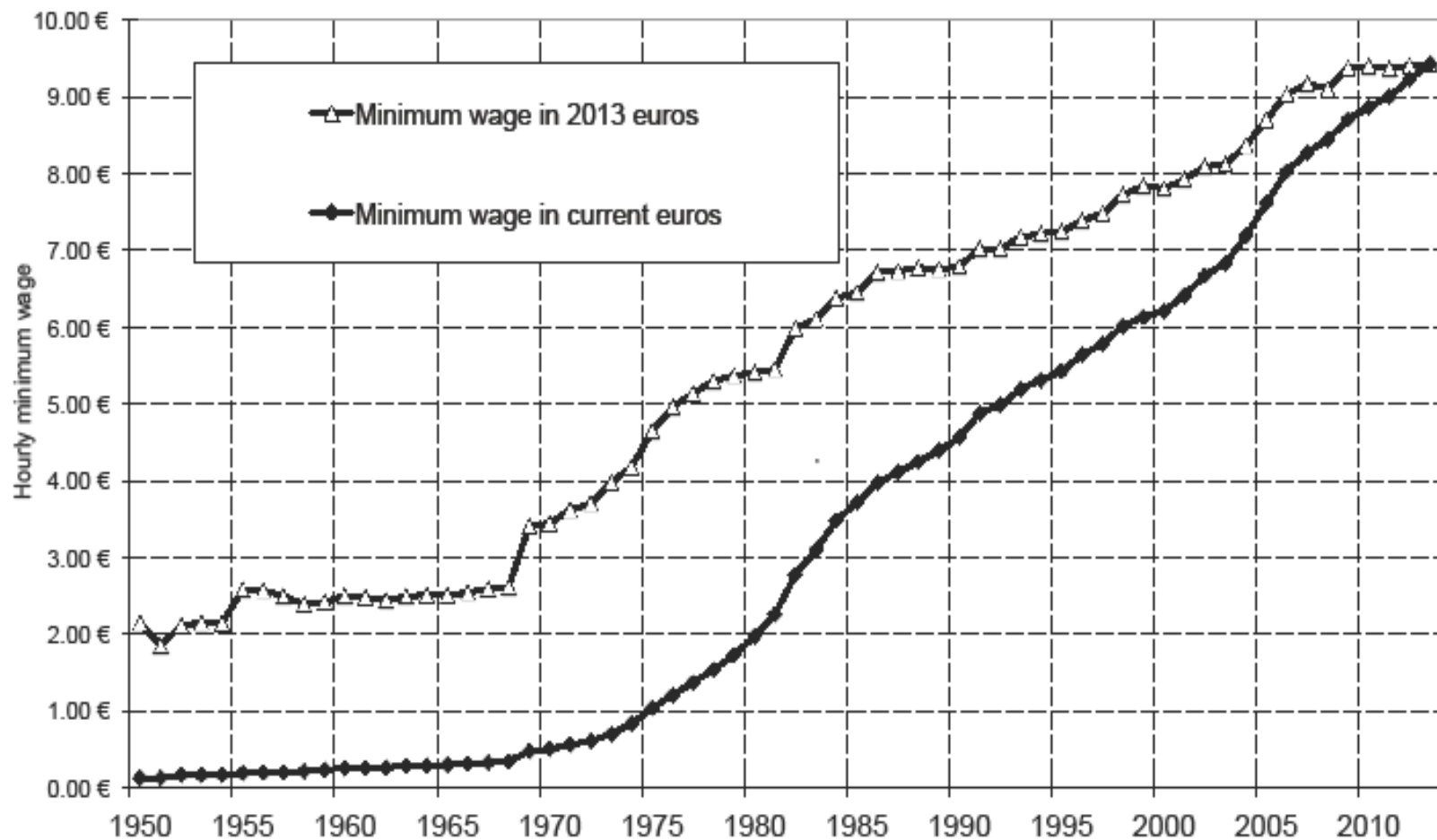
# The limitations of the basic story

- Education vs technology = the main determinant of labor income inequality in the long run
- However other forces also play a role: **labor market institutions** (in particular salary scales and minimum/maximum wages)
- Basic justification for rigid (or quasi rigid) salary scales: the « wage = marginal product » story is a bit too naive; in practice it is difficult to measure exactly individual productivities; so one may want to reduce arbitrariness in wage setting
- Also, hold-up problem in presence of firm-specific skill investment: in terms of incentives for skill acquisition, it can be better for both employers and employees (via unions) to commit in advance to salary scales and long run labor contracts
- Extreme case of hold-up problem: local monopsony power by employers to hire certain skill groups in certain areas; then the efficient policy response is to raise the minimum wage
- See [Card-Krueger](#) debate: when the minimum wage is very low (such as US in early 1990s... or in 2010s), raising it can actually raise employment by raising labor supply

- Minimum wages have a rich and chaotic history: **see graphs** on US vs France 1950-2013
- A national minimum wage was introduced in the US in 1933; it is now equal to 7,2\$/h, and Obama would like to raise it to 9\$ in 2015-16 (very rare adjustments in the US)
- In France, MW introduced in 1950; now equal to 9,5€/h
- Introduced in UK in 1999 (6,2£/h, i..e. 8,1€)
- No national MW in Germany (but new Merkel-SPD coalition plans to introduce MW at 8,5€/h in 2014-15) or in Nordic countries, but binding salary scales negotiated by unions and employers
- Minimum wages are useful, but it's all a matter of degree; and the right level also depends on the tax system and the education system
- If high low-wage payroll tax & poor training system for low-skill workers, then the employment cost of high minimum wages can be very large

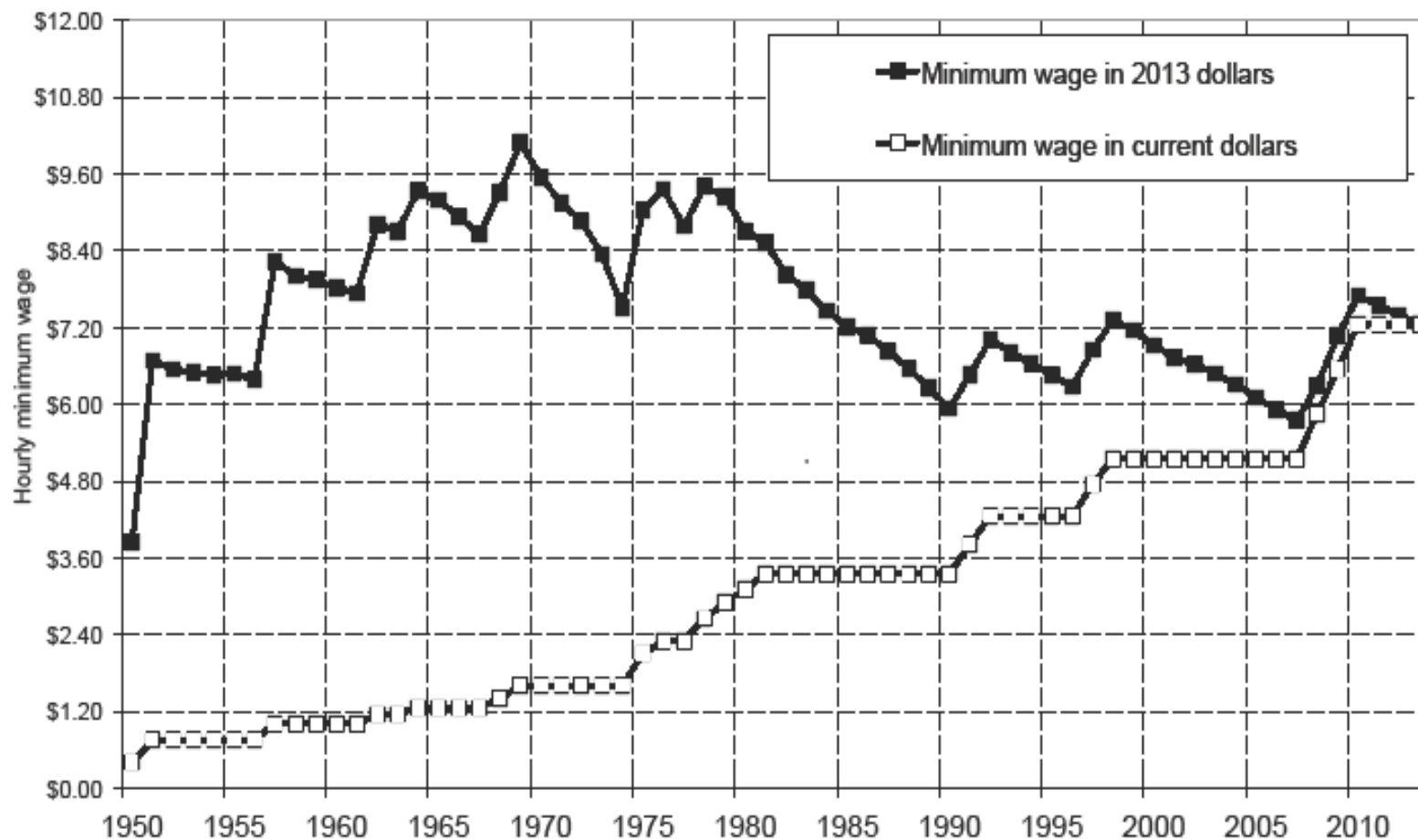


Figure S9.1. Minimum wage in France, 1950-2013



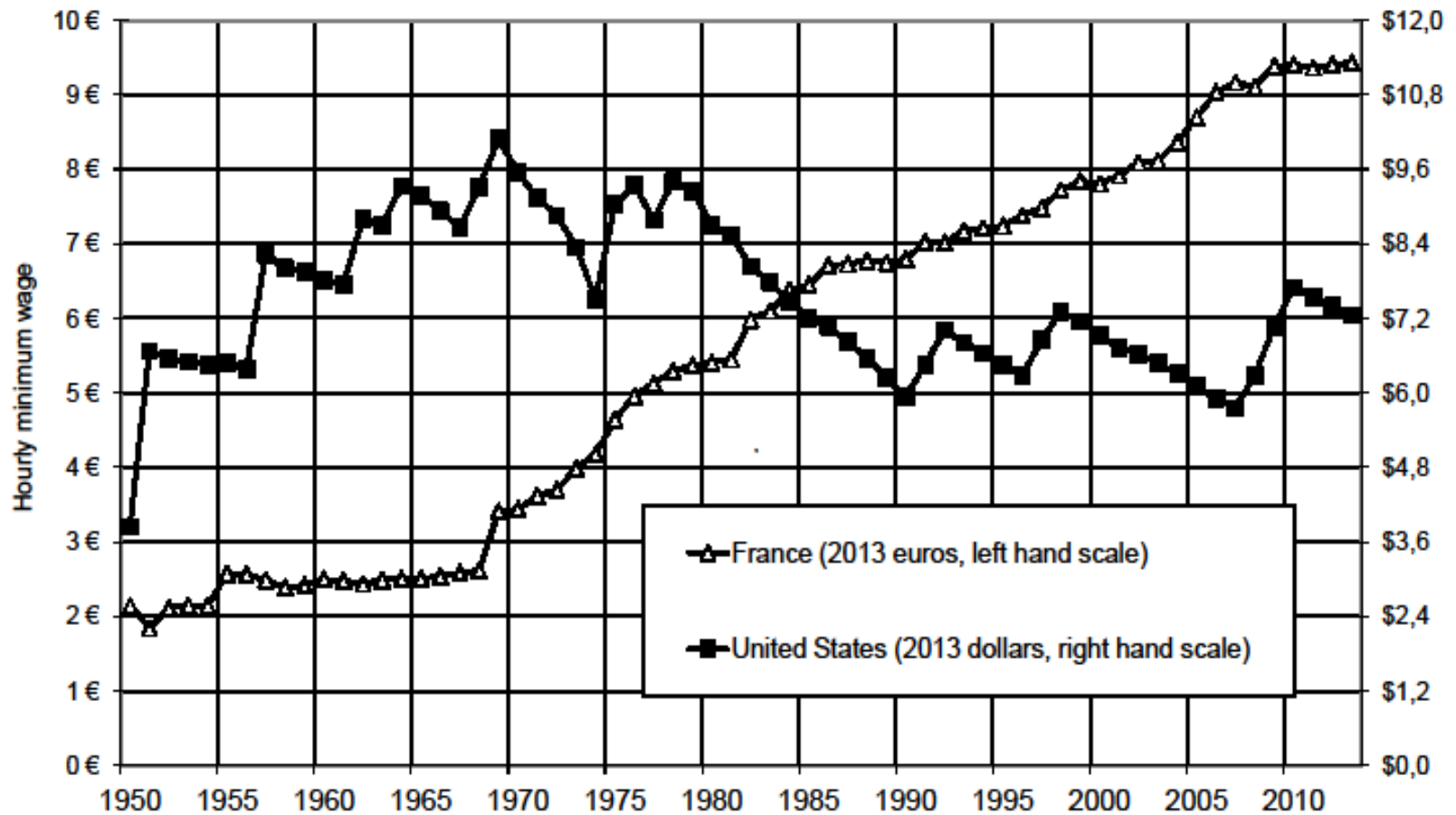
Expressed in 2013 purchasing power, the hourly minimum wage rose from € 2.1 to €9.4 in France between 1950 and 2013. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

Figure S9.2. Minimum wage in the United States, 1950-2013



Expressed in 2013 purchasing power, the hourly minimum wage rose from \$3.8 to \$7.3 between 1950 and 2013 in the U.S. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

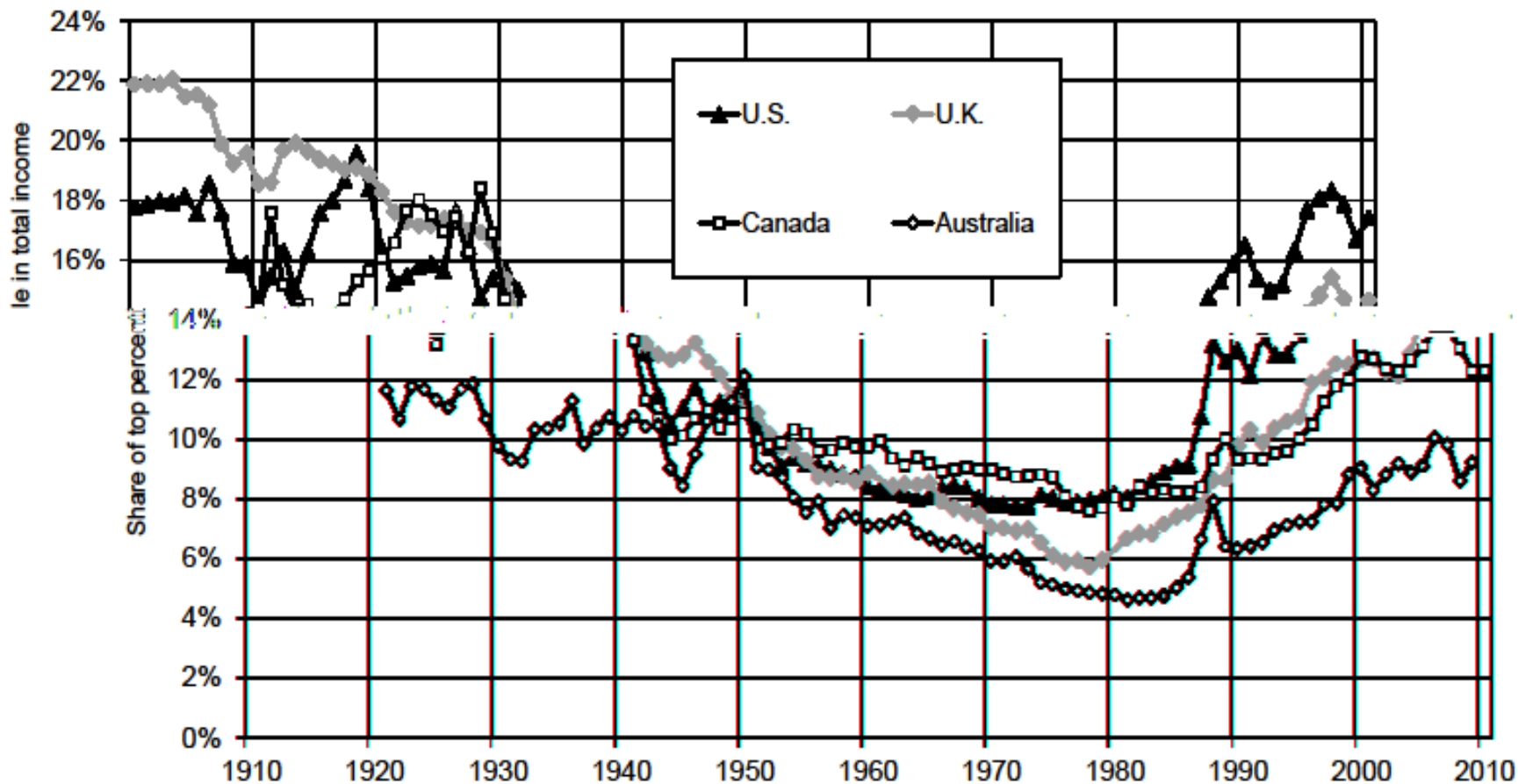
Figure 9.1. Minimum wage in France and the U.S., 1950-2013



Expressed in 2013 purchasing power, the hourly minimum wage rose from 3,8\$ to 7,3\$ between 1950 and 2013 in the U.S., and from 2,1€ to 9,4€ in France. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

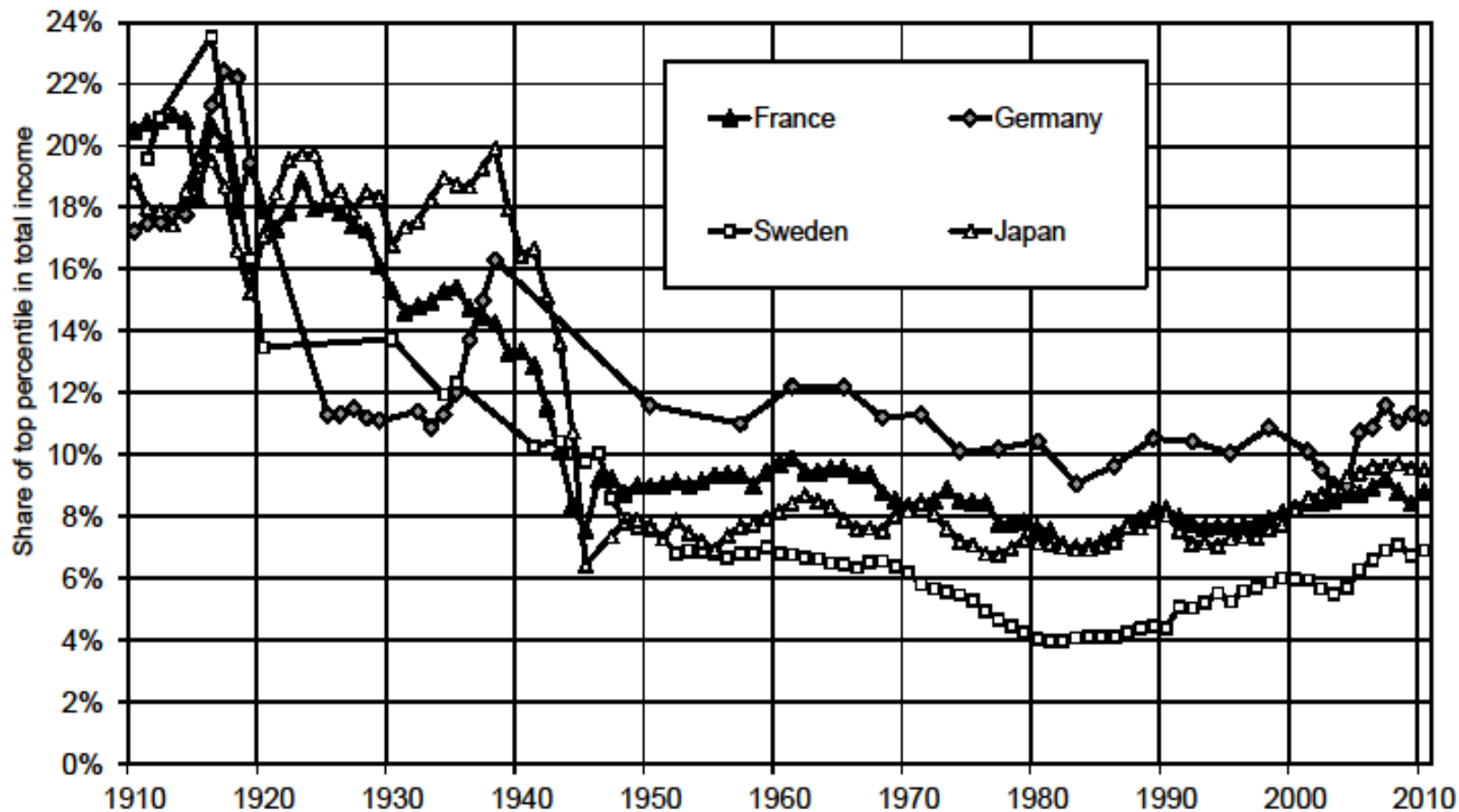
- Top wages = other key limitation of the perfect-competition model: with a pure “education vs technology” story, it is difficult to understand why the recent rise in inequality is so much concentrated within very top incomes, and why it occurred in some countries and not in others (globalization and technical change occurred everywhere: Japan, Germany, France.., not only US-UK)
- A model with imperfect competition and CEO bargaining power (CEOs can sometime extract some than their marginal product, and they do so more intensively when top tax rates are lower) is more promising
- In particular, this can explain why top income shares increased more in countries with the largest decline in top tax rates since the 1970s-80s (i.e. US-UK rather than Japan-Germany-France-etc.)
- For a theoretical model and empirical test based upon this intuition, see Piketty-Saez-Stantcheva, [AEJ 2014](#) (see also [Slides](#))
- **To summarize: higher US wage inequality is both a matter of unequal skill and a matter of institutions**

Figure 9.2. Income inequality in Anglo-saxon countries, 1910-2010



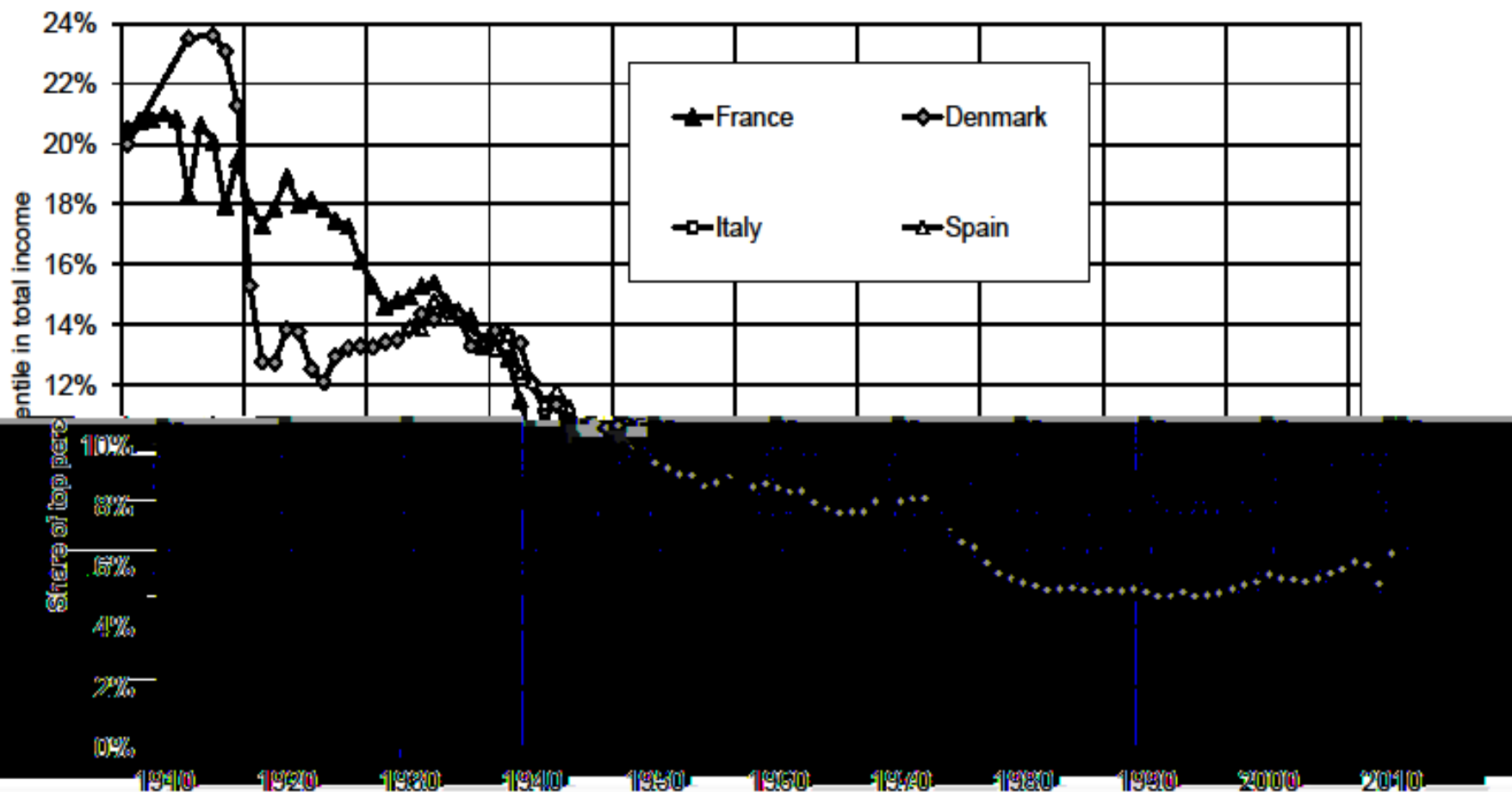
The share of top percentile in total income rose since the 1970s in all Anglo-saxon countries, but with different magnitudes. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

Figure 9.3. Income inequality: Continental Europe and Japan, 1910-2010



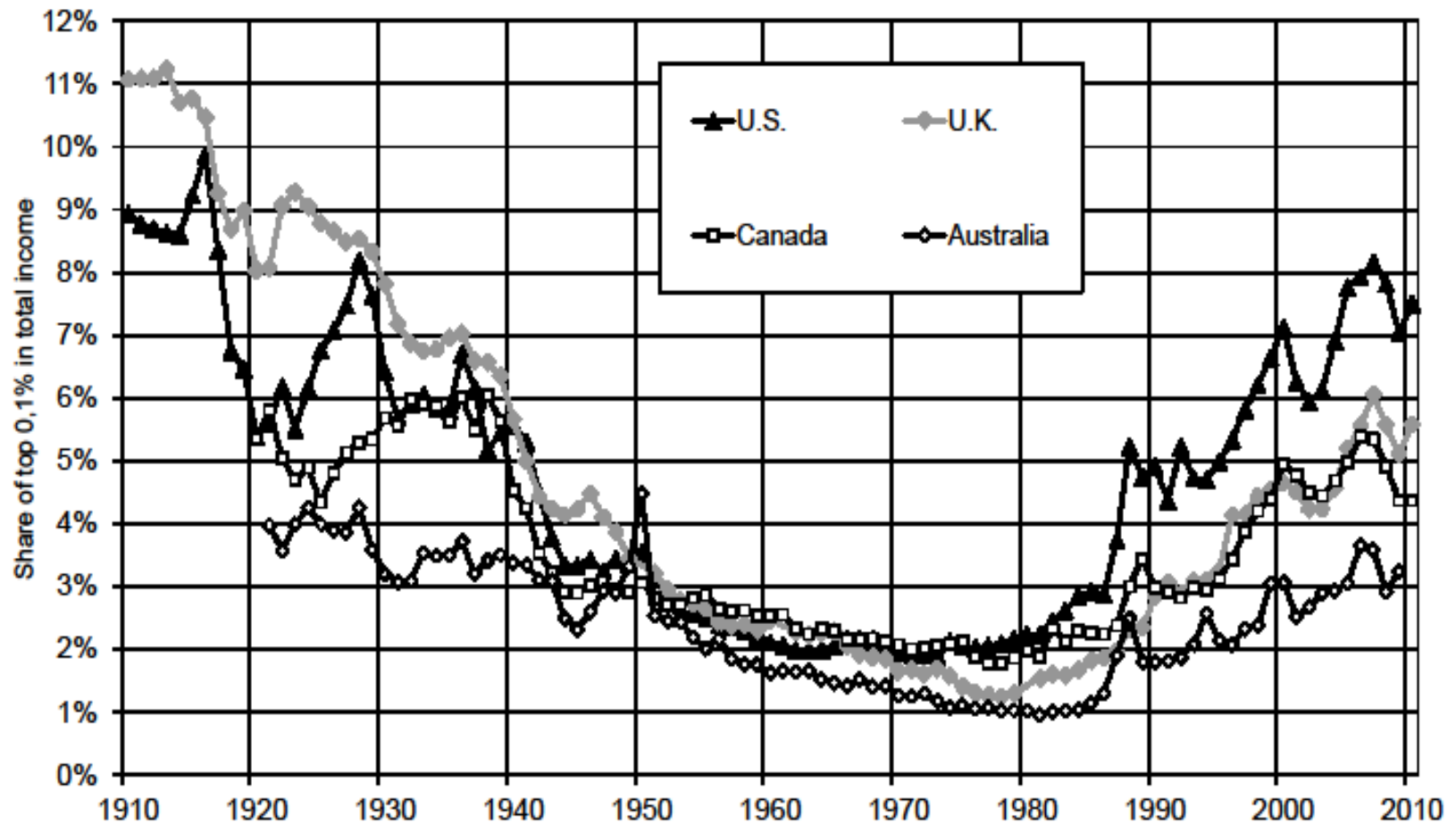
As compared to Anglo-saxon countries, the share of top percentile barely increased since the 1970s in Continental Europe and Japan. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

Figure 9.4. Income inequality: Northern and Southern Europe, 1910-2010



As compared to Anglo-saxon countries, the top percentile income share barely increased in Northern and Southern Europe since the 1970s. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c)

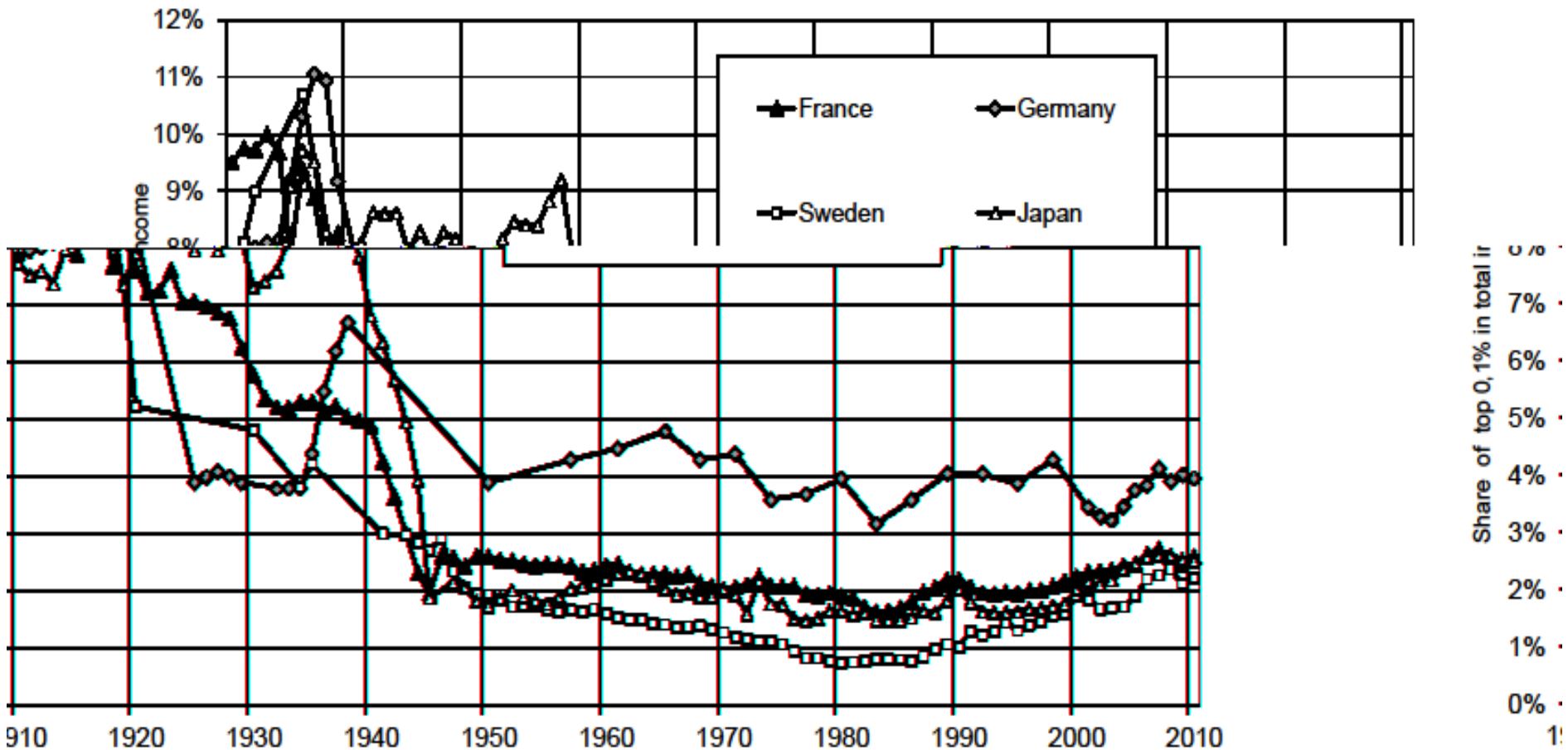
Figure 9.5. The top 0,1% income share in Anglo-saxon countries, 1910-2010



The share of the top 0,1% highest incomes in total income rose sharply since the 1970s in all Anglo-saxon countries, but with varying magnitudes. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

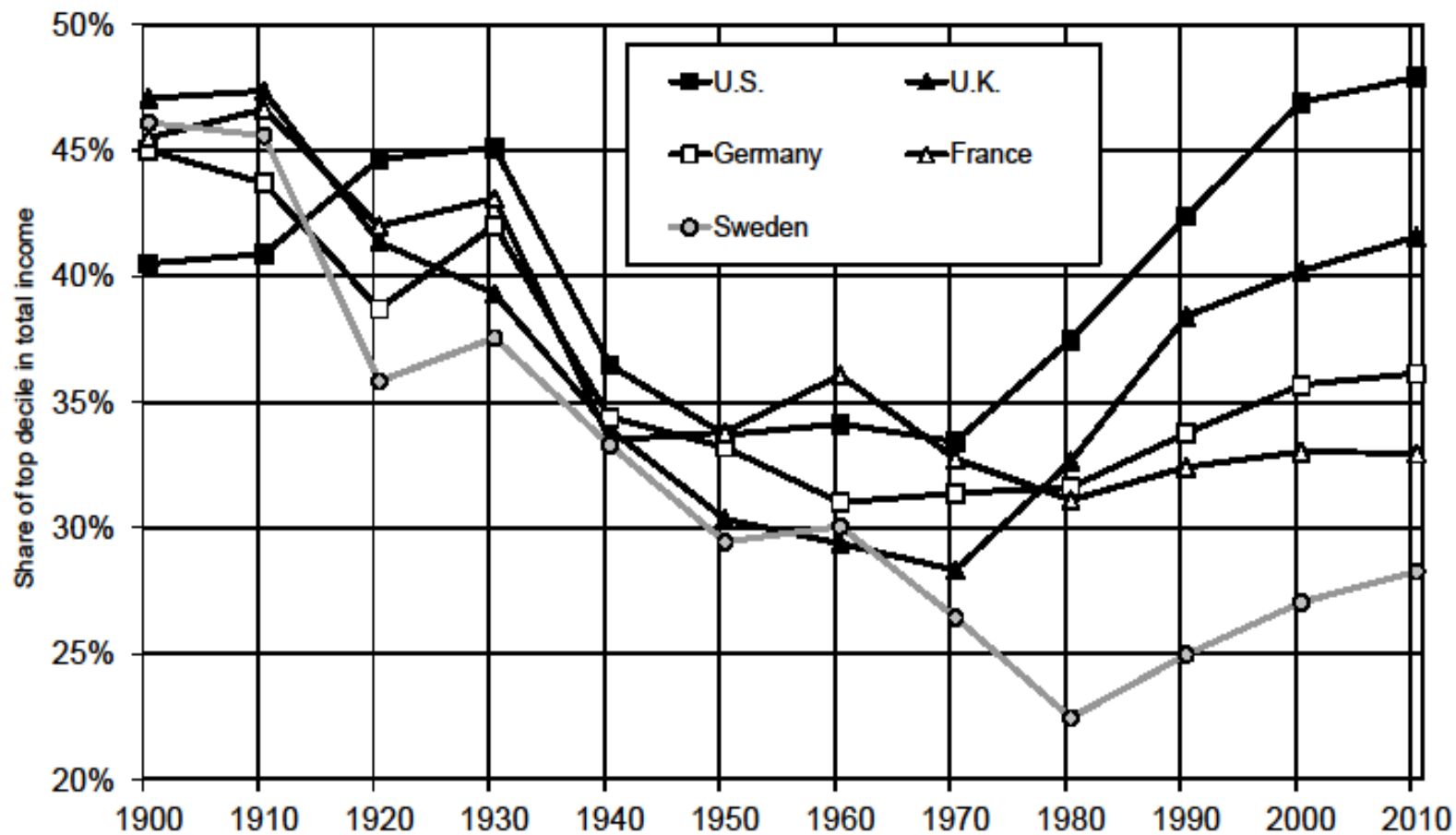


Figure 9.6. The top 0,1% income share: Continental Europe and Japan, 1910-2010



As compared to Anglo-saxon countries, the top 0,1% income share barely increased in Continental Europe and Japan. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

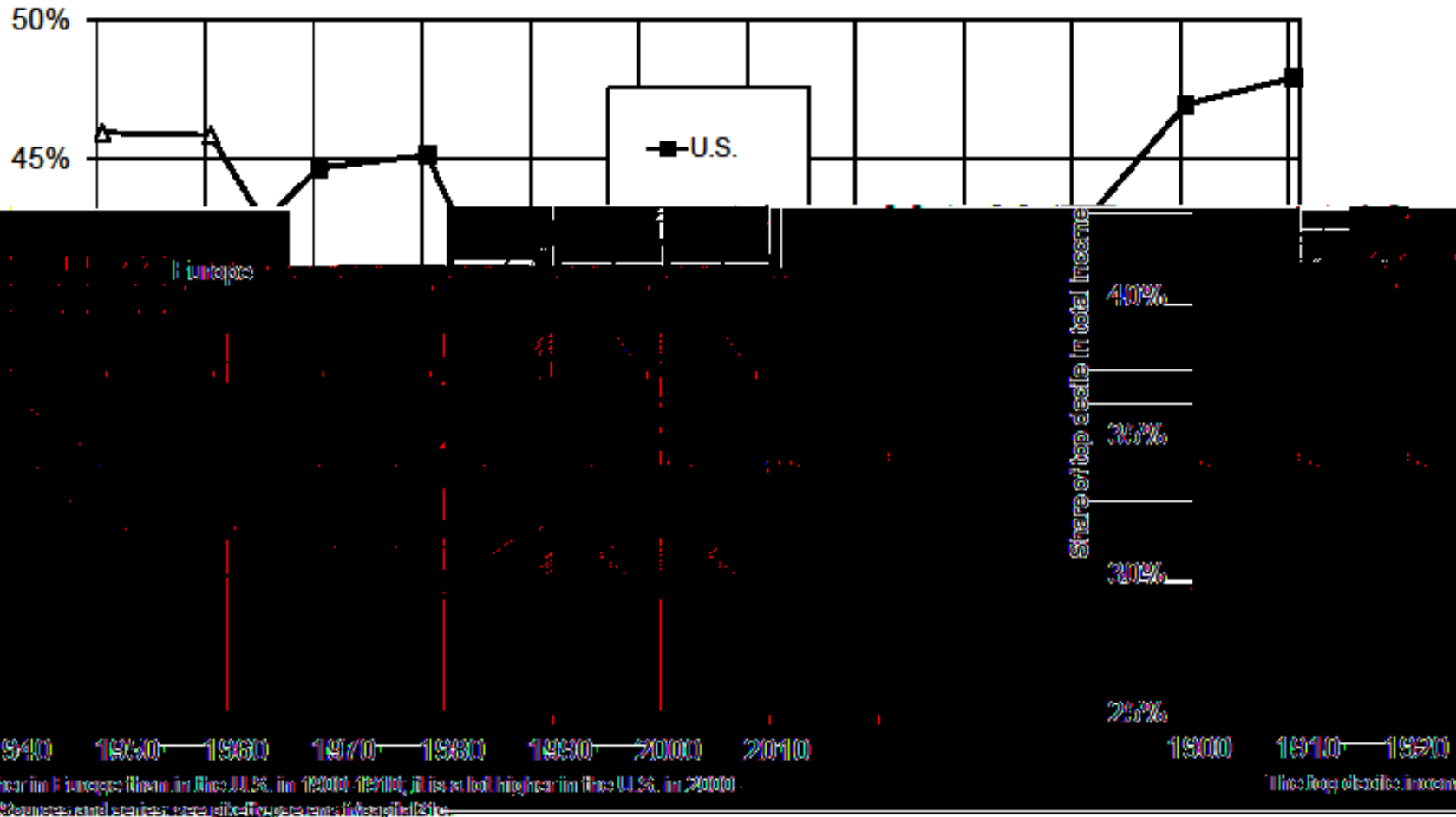
Figure 9.7. The top decile income share: Europe and the U.S., 1900-2010



In the 1950s-1970s, the top decile income share was about 30-35% of total income in Europe as in the U.S.

Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

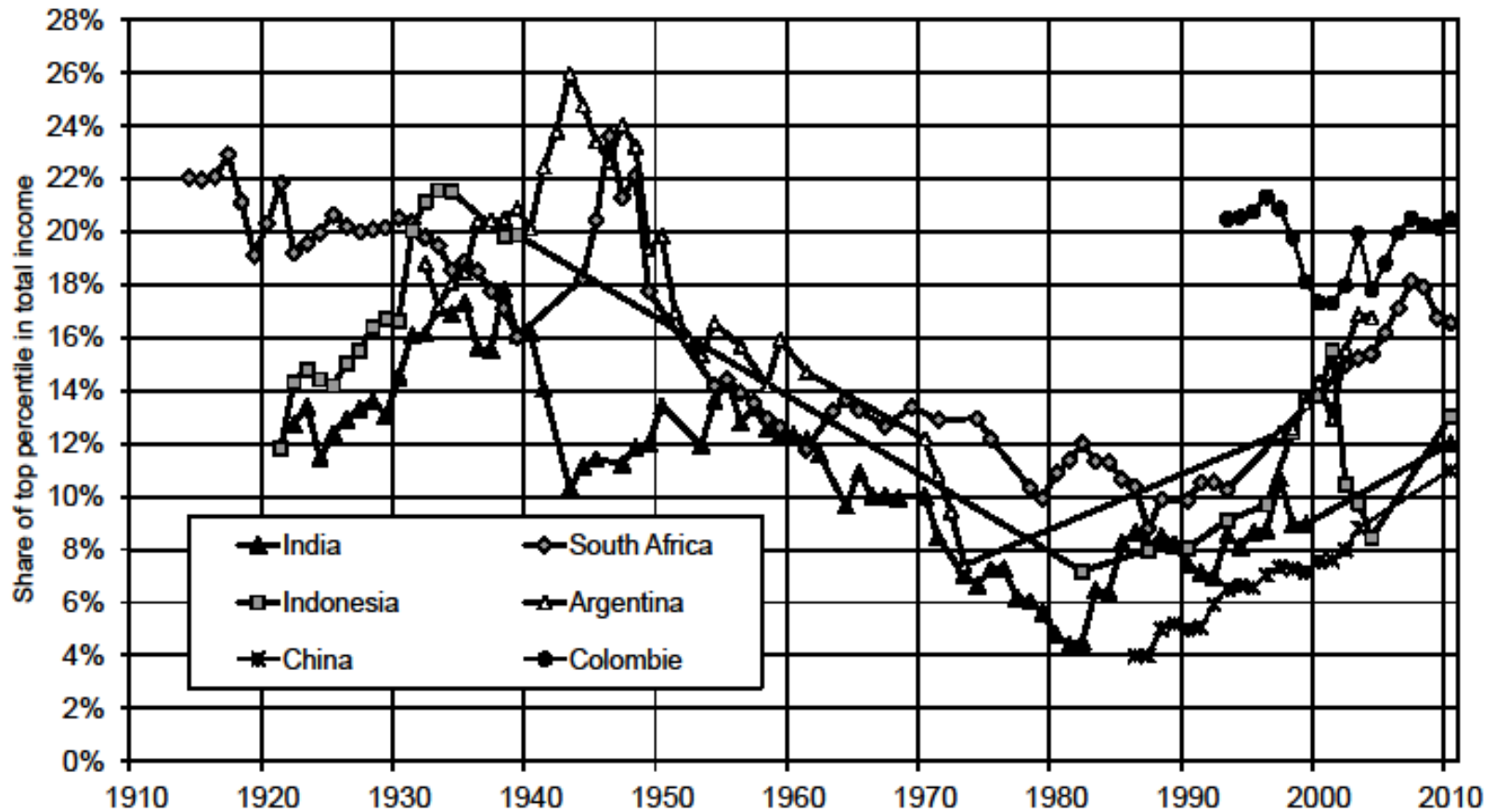
Figure 9.8. Income inequality: Europe vs. the United States, 1900-2010



# Inequality in poor and emerging countries

- Much less historical research than for rich countries; highly imperfect data sources
- Existing series suggest a long-run U-shaped pattern, with orders of magnitude close to rich countries: e.g. in India, Indonesia, South Africa, top 1% income shares seem to be close to 15-20% in 2000-10, i.e. close to interwar levels in these countries, and less than today's levels in US
- It is striking to see that inequality of labor income is higher in the US than in poor countries (except Colombia): very high inequality of skills in the US, or specific institutions/social norms, or data problems?

Figure 9.9. Income inequality in emerging countries, 1910-2010



Measured by the top percentile income share, income inequality rose in emerging countries since the 1980s, but ranks below U.S. level in 2000-2010. Sources and series: see [piketty.pse.ens.fr/capital21c](http://piketty.pse.ens.fr/capital21c).

- China: official inequality estimates are unplausibly low; lack of transparency of tax statistics; new survey data on income and wealth recently collected by Chinese universities suggest high and rising inequality
- On-going research on colonial inequality: very high top shares due to tiny colonial elite? See recent work by Atkinson on UK colonies, and on-going work on French colonies

# Inequality and the financial crisis

- Rising top income shares and stagnant median incomes have probably contributed to rising household debt and financial fragility in the US (and possibly also to current account deficit); see [Kumhof-Rancière-Winant 2013](#)
- However Europe's financial system is also very fragile (in spite of the fact that top income shares  $\uparrow$  much less than in the US), so rising inequality cannot be the only explanation
- Other factor: the rise of wealth-income ratio and of gross financial positions (**financial globalization**) (see [lecture 3](#) and [Piketty-Saez IMF Review 2013](#))
- Also the rise in the capital share  $\alpha$  may have contributed to a rising current account surplus in a number of countries (e.g. Germany) and therefore to global imbalances; see [Behringer-Van Treeck 2013](#)

# Note on historical data sources on income and wealth inequality

- In this course, I focus upon the interpretation of the results and say relatively little about methodological and data issues; for more details on these issues, see for instance my book's [technical appendix](#) or the [WTID](#) web site
- However it is useful to have a sense of how the raw data sources look like: see for instance income tax tabulations for [France 1919](#)
- Of course, it is always better to have micro files rather than tabulations; but tax administrations did not start producing micro files before the 1970s-80s (1990s-2000s in some countries); for earlier periods, and sometime also for the present, we only have tabulations; the point is that we can actually infer the entire distribution from tabulations, using Pareto extrapolation techniques



- Reminder: Pareto distributions have a density function  $f(y)=ac^a/y^{(1+a)}$  and a distribution function  $1-F(y) = (c/y)^a$  (=population fraction above  $y$ ) with  $c = \text{constant}$  and  $a = \text{Pareto coefficient}$
- Intuition: higher coefficient  $a = \text{faster convergence toward } 0 = \text{less fat upper tail} = \text{less income concentration at the top}$
- Key property of Pareto distributions: **ratio average/threshold = constant**
- Note  $y^*(y)$  the average income of the population above threshold  $y$ . Then  $y^*(y)$  can be expressed as follows :  $y^*(y) = [\int_{z>y} z f(z)dz ] / [\int_{z>y} f(z)dz ]$   
i.e.  $y^*(y) = [\int_{z>y} dz/z^a ] / [\int_{z>y} dz/z^{(1+a)} ] = ay/(a-1)$
- I.e.  $y^*(y)/y = b = a/(a-1)$
- If  $a=2$ ,  $b=2$ : average income above 100 000€ = 200 000€, average income above 1 million € = 2 million €, etc.
- Typically, France 2010s, US 1970s:  $b = 1.7-1.8$  ( $a=2.2-2.3$ )
- France 1910s, US 2010s:  $b = 2.2-2.5$  ( $a=1.7-1.8$ )
- For wealth distributions,  $b$  can be larger than 3:  $b = \text{index of concentration}$
- Pareto coefficients are easy to estimate using tabulations: see for instance Kuznets 1953, my [2001 book](#) (appendix A-B) , and [Atkinson-Piketty-Saez 2011](#) for graphs on  $b$  coeff over time & across countries

- With more time (and money), it is also possible to collect individual-level micro data in tax registries
- For instance, in France, inheritance tax returns and registries have been well preserved since the Revolution, so it is possible to study the evolution of wealth concentration over the entire 1800-2010 period (see next lecture and work with [Postel-Vinay-Rosenthal 2006](#) and [2013](#))
- Sometime land tax registries exist for even earlier periods (Roman Egypt)
- For very ancient periods, it is also possible to use data on height at death (stature) as a proxy for socio-economic inequality: see comparison of inequality in hunter-gatherer and agricultural societies in prehistoric times by [Boix-Rosenbluth 2013](#))